SOAP
Society for Obstetric Anesthesia and Perinatology

Meeting Syllabus

SOAP 45th Annual Meeting

"SOAP 2013: Global Perspectives"

April 24-28, 2013
Caribe Hilton Hotel ♦ San Juan, Puerto Rico

Jointly Sponsored by:

American Society of Anesthesiologists

The Society for Obstetric Anesthesia and Perinatology presents

SOAP 45th Annual Meeting

"SOAP 2013: Global Perspectives"

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Welcome to the 2013 Annual Meeting in San Juan, Puerto Rico

Dear Friends,

On behalf of the SOAP Board of Directors and the SOAP 2013 Annual Meeting Program Committee we are thrilled to welcome you to beautiful sunny Puerto Rico. We are confident that you will find this year's meeting truly outstanding. Our theme, "Global Perspectives," is meant to provide us all with a broader view of maternal health. We are happy to welcome a variety of specialists, each sharing his or her own concept of maternal well-being. Our Gertie Marx/ FAER lecturer Ndola Prata comes to us from the School of Public Health at University of California Berkeley where she serves as the Scientific Director in the Bixby Center for Population, Health and Sustainability. She will be speaking on maternal mortality in resource-poor settings. The obstetrician's perspective will be presented by Michael Greene, who has spoken at SOAP before – to rave reviews – and the cardiologist's, by Dennis McNamara, leader of the Peripartum Cardiomyopathy Network, acclaimed for his work in that area. We are especially pleased to welcome José Cordero to our meeting. Dr. Cordero, a former Assistant Surgeon General of the United States, and founding member and director of the Center for Disease Control and Prevention's National Center on Birth Defects and Developmental Disabilities, is a world-renowned expert on teratogenicity and birth defects. Quite fortunately for us, he lives here in Puerto Rico where he is Dean of the School of Public Health at the University of Puerto Rico. We are fortunate to have his neonatologist's viewpoint regarding the challenges of preterm births.

We also hope you will enjoy many venues that have become regular features at SOAP: the Gertie Marx competition, the Best Paper session, several oral abstract and poster review sessions, a Pro-Con, and the Research Hour. This year we welcome back the Breakfast with the Experts, moderated by former SOAP president David Wlody, and look forward to the Ostheimer and the Hehre lectures, which are always highlights of the Annual Meeting. We will offer two Clinical Fora this year: "Evolving Practices" and "Obstetric Emergencies," which will include a presentation on the maternal airway by Allan Klock, former president of the Society for Airway Management, and one of the leaders in our field regarding airway management. In keeping with our "Global" theme, the International Outreach Committee will take the stage for a panel discussion that will emphasize the scientific approach to international outreach and outreach-related research.

Come early and attend our pre-meeting events. Jose Carvalho will continue to lead the popular ultrasound workshop, and Brendan Carvalho and John Sullivan are introducing a new transthoracic echocardiography workshop. Phil Hess will return with a Seminar, this year on preeclampsia. This meeting represents a historic first: Our meeting host Vilma Ortiz has organized a multinational pre-meeting symposium that will be delivered in Spanish. It will serve the important role of educational outreach from us at SOAP to our colleagues in much of our hemisphere. We are grateful to Dr. Ortiz for her vision and proud to partake with her in this endeavor.

We hope you will join us in Puerto Rico for the most exciting and innovative SOAP Annual Meeting to date!

Sincerely,

Barbara M. Scavone, M.D.
Scientific Chair
2013 SOAP Annual Meeting

Vilma E. Ortiz, M.D.
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SOAP is Going Paperless!

The 45th Annual SOAP Meeting will be paperless

Printed documents will not be available at the meeting. Documents will be available on the website should you wish to print them beforehand or to download them to an iPad or other tablet device before the meeting. The complete conference documents will also be available via a flash drive that will be distributed to you at the meeting.

Making a meeting paperless yields the benefit of considerably reducing the cost and the carbon footprint of the meeting. A paperless meeting also makes it easier for meeting participants to locate and store documents and allows for faster preparation and distribution of conference materials.

To facilitate the paperless meeting, meeting attendees are requested to follow these suggestions:

- Meeting participants should bring their own computing devices – extra computers are not available for use during the meeting. Questions concerning rental of any computer equipment may be directed to the Hotel Caribe Hilton AV department. The Caribe Hilton also has a business center for printing documents.
- Wireless internet is NOT available in the meeting rooms, but is available in guest rooms and in other hotel locations. Power sources (power strips) will NOT be available in the meeting rooms. Please be sure your portable devices are fully charged before coming to the meeting, or print your documents in advance of the meeting.

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Program Information

Mission Statement

The Society for Obstetric Anesthesia and Perinatology (SOAP) was founded in 1968 to provide a forum for discussion of problems unique to the peripartum period. SOAP is comprised of anesthesiologists, obstetricians, pediatricians, and basic scientists who share an interest in the care of the pregnant patient and the newborn.

The mission of this Society is to improve the pregnancy-related outcomes of women and neonates through the support of obstetric anesthesiology research, the provision of education to its members, other providers, and pregnant women, and the promotion of excellence in clinical anesthetic care.

A membership in SOAP is an opportunity to meet people who share your interests, and to stimulate improvements in health care for pregnant patients.

Accreditation and Designation

This activity has been planned and implemented in accordance with the Essential Areas and policies of the Accreditation Council for Continuing Medical Education through the joint sponsorship of the American Society of Anesthesiologists and the Society for Obstetric Anesthesia and Perinatology. The American Society of Anesthesiologists is accredited by the ACCME to provide continuing medical education for physicians.

The American Society of Anesthesiologists designates this live activity for a maximum of 30.25 *AMA PRA Category 1 Credit(s)*™.* Physicians should claim only the credit commensurate with the extent of their participation in the activity.

*This amount includes the optional Pre-Meeting Workshops and Breakfast with the Experts.

Target Audience

The SOAP 45th Annual Meeting is intended for anesthesiologists, obstetricians, neonatologists, obstetric medicine specialists, maternal-fetal medicine specialists, residents, fellows and medical students. The Society supports the attendance by associate members in the educational sessions of the annual meeting. The program is generated from member requests and an assessment of need by the Program Committee. Attendance at this meeting does not guarantee competency or proficiency in the performance of any procedures which may be discussed or taught during the course.

Mission of SOAP Program Committee

The mission of the Society's Program Committee is to provide anesthesiologists, obstetricians, and other physicians and members of related allied health specialties with the knowledge that will reinforce past learning as well as disseminate new concepts, practices, and skills involving anesthesia and analgesia for the pregnant woman.

Participation in the SOAP 45th Annual Meeting

Attendance shall be open to all health practitioners, provided that they have registered for the meeting. CME credit will only be offered to M.D.s, D.O.s or equivalent. A completed Physician Verification of Attendance form must be turned in to SOAP at the conclusion of the meeting. The form will be available on-site.

Educational Format

CME activities may include the following formats: plenary sessions, debates, lectures, poster discussions, oral abstracts, problem-based learning, and skill-set workshops.

Annual Meeting Objectives

At the completion of this conference the participants should be able to:

1. Formulate comprehensive care plans for parturients with suspected placenta accreta, peripartum cardiomyopathy, and severe preeclampsia and provide evidence-based care for patients undergoing external cephalic version;
2. Manage the maternal airway;
3. Respond to maternal cardiopulmonary arrest in accordance with national guidelines and expert opinion;
4. Formulate appropriate anesthetic care plans for management of complex, high-risk, and/or rare clinical cases;
5. Identify, discuss and critically evaluate current and recent peer-reviewed research related to obstetric anesthesia, obstetrics, perinatology, and allied medical disciplines;
6. Design and implement research investigations related to obstetric anesthesia, obstetrics, perinatology, and allied medical disciplines that are built upon the foundations of current and recent research investigations;
7. Compare recent findings related to obstetric anesthesia to the prevailing standard of care, and adjust patient care plans accordingly;
8. Recognize factors related to academic success in obstetric anesthesia and apply that to career development;
9. Explain barriers to maternal and neonatal health in resource-poor settings;
10. Provide international outreach in the field of obstetric anesthesia in resource-poor settings;
11. Perform scientific evaluation of international outreach efforts as they relate to obstetric anesthesia.

Special Needs Statement

The American Society of Anesthesiologists and the Society for Obstetric Anesthesia and Perinatology are committed to making its activities accessible to all individuals and fully comply with the legal requirements of the Americans with Disabilities Act and the rules and regulations thereof. If you are in need of an accommodation, please do not hesitate to call the SOAP office at (847) 825-6472 and/or submit a description of your needs in writing to soap@asahq.org.

Commercial Support Acknowledgement

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Disclosure and Resolution of Conflicts of Interest

The American Society of Anesthesiologists and the Society for Obstetric Anesthesia and Perinatology adhere to ACCME Essential Areas, Standards, and Policies regarding industry support of continuing medical education. Disclosure of the Planning Committee and faculty's commercial relationships will be made known at the time of the activity. Faculty are required to openly disclose any limitations of data and/or any discussion of any off-label, experimental, or investigational uses of drugs and devices.

In accordance with the ACCME Standards for Commercial Support of CME, the American Society of Anesthesiologists and the Society for Obstetric Anesthesia and Perinatology will implement mechanisms, prior to the planning and implementation of this CME activity, to identify and resolve conflicts of interest for all individuals in a position to control content of this CME activity.

Disclaimer

The information provided in this CME activity is for continuing education purposes only and is not meant to substitute for the independent medical judgment of a healthcare provider relative to diagnostic and treatment options of a specific patient's medical condition

1st Latin American Symposium on Obstetric Anesthesia

Programa Científico 24 de abril, 2013

	7:30 - 8:00 a.m.	Desayuno / Breakfast
Auditorium	8:00 - 8:10 a.m.	Bienvenida y Presentación de Conferenciantes Welcome and Introduction of Speakers Vilma E. Ortiz, M.D. (EE.UU.)
	8:10 - 8:40 a.m.	Lecture #1 Retos Durante la Inducción de Anestesia General en la Gestante Obesa Safely Off to Sleep: Challenges of Induction of General Anesthesia in the Obese Parturient Vilma E. Ortiz, M.D. (EE.UU.)
	8:40 - 9:10 a.m.	Lecture #2 Papel del Anestesiólogo en el Manejo de la Preeclampsia Severa y el Síndrome HELLP "Role of the Anaesthetist in the Management of Severe Preeclampsia and HELLP Syndrome" Mauricio Vasco, M.D. (COLOMBIA)
	9:10 - 9:40 a.m.	Lecture #3 Anestesia Para Cirugía Fetal "Anesthesia for Fetal Surgery (EXIT Procedure)" Héctor J. Lacassie, M.D. (CHILE)
	9:40 - 10:00 a.m.	Preguntas & Respuestas - Panel de Conferenciantes Q&A - Speaker Panel Moderadora: Monica Maria Siaulys, M.D., Ph.D. (BRAZIL)
	10:00 - 10:40 a.m.	Receso / BREAK
	10:40 - 11:15 a.m.	Lecture #4 Entrenamiento Inter-Profesional Basado en Simulación: Una Estrategia Educativa Para Mejorar la Seguridad de la Gestante "Interprofessional Simulation-Based Team Training: An Educational Strategy For Improving Perinatal Patient Safety" Roxane Gardner, M.D., D.Sc. (EE.UU.)
	11:15 - 11:45 a.m.	Case Presentation / Discussion Hemorragia Postparto: Actitudes Terapeuticas "Postpartum Hemorrhage: Therapeutic Approaches" Emila Guasch Arevalo, M.D. (ESPA ÑA)
	11:45 a.m. - 12:15 p.m.	Case Presentation / Discussion Cardiomiopatía Periparto "Peripartum Cardiomyopathy" Paloma Toledo, M.D., M.P.H. (EE.UU.)
	12:15 - 12:30 p.m.	Preguntas & Respuestas- Panel de conferenciantes / Q&A –Speaker panel Moderador: David L. Hepner, M.D. (EE.UU.)
	12:30 p.m.	Clausura del Simposio. Meeting Adjourns.
Flamboyan	1:00 – 2:30 p.m.	Latin American Symposium Almuerzo/Lunch

Program Schedule

Wednesday, April 24, 2013

San Cristobal Foyer	7:00 a.m. – 4:00 p.m.	Registration Hours
Auditorium	7:30 a.m. – 12:30 p.m.	Latin American Symposium in Spanish
Tropical	8:00 a.m. – 12:00 p.m.	Morning Ultrasound Workshop Course Director: Jose C.A. Carvalho, M.D., Ph.D., FANZCA, FRCPC Yayoi Ohashi, M.D., Ph.D.; Rebecca L. Smith, M.B.Ch.B.
Las Olas	8:00 a.m. – 12:00 p.m.	Morning Transthoracic Echocardiography Workshop Course Directors: Brendan Carvalho, M.B.B.Ch., FRCA, M.D.C.H.; John T. Sullivan, M.D., M.B.A
Auditorium	1:00 – 5:00 p.m.	Seminar on Preeclampsia Nuts and Bolts to Cutting Edge
		Hypertension in Pregnancy: Who, What, When Course Director: Philip E. Hess, M.D.
		Consequences of Preeclampsia: Things You Don't Want to Have Manuel C. Vallejo, Jr., M.D., D.M.D.
		Anesthetic Care in Preeclampsia John A. Thomas, M.D.
		Past, Current, and Future Research: Where is the Cutting Edge? Ruth Landau, M.D.
		Interactive Case Panel: While You Are on Service... Philip E. Hess, M.D.; John A. Thomas, M.D.; Manuel C. Vallejo, Jr., M.D., D.M.D.; Ruth Landau, M.D.
Tropical	1:00 – 5:00 p.m.	Afternoon Ultrasound Workshop Course Director: Jose C.A. Carvalho, M.D., Ph.D., FANZCA, FRCPC Yayoi Ohashi, M.D., Ph.D.; Rebecca L. Smith, M.B.Ch.B.
Las Olas	1:00 – 5:00 p.m.	Afternoon Transthoracic Echocardiography Workshop Course Directors: Brendan Carvalho, M.B.B.Ch., FRCA, M.D.C.H.; John T. Sullivan, M.D., M.B.A
Atlantic Garden	6:00 – 8:00 p.m.	Welcome Reception at the Caribe Hilton Hotel

Thursday, April 25, 2013

San Cristobal Foyer	6:00 a.m. – 6:00 p.m.	Registration Hours
San Cristobal EFG	6:30 - 7:30 a.m.	Continental Breakfast - Exhibits Open
San Geronimo Ballroom	7:30 – 7:45 a.m.	Welcome to the 45th Annual Meeting Vilma E. Ortiz, M.D.; Barbara M. Scavone, M.D.; McCallum R. Hoyt, M.D., M.B.A.
San Geronimo Ballroom	7:45 – 9:15 a.m.	Gertie Marx Research Competition Moderator: Gerard Bassell, M.D.
San Geronimo Ballroom	9:15 – 9:30 a.m.	Distinguished Service Award Recipient: Alex Pue, M.D. Presenter: Dennis C. Shay, M.D.
San Cristobal EFG San Cristobal ABCD	9:30 – 10:15 a.m.	Coffee Break, Exhibits, Poster Viewing and Poster Walk Arounds
San Geronimo Ballroom	10:15 – 11:15 a.m.	Gertie Marx/ FAER Education Lecture Maternal Morality in Resource-Poor Settings Introduction: Barbara M. Scavone, M.D. Speaker: Ndola Prata, M.D., M.Sc.
San Geronimo Ballroom	11:15 a.m. – 12:15 p.m.	Poster Session 1 Moderator: Kenneth E. Nelson, M.D.
San Geronimo Ballroom	12:15 – 1:45 p.m.	SOAP Business Meeting & Election; Box Lunch
San Geronimo Ballroom	1:45 – 3:15 p.m.	Oral Presentation 1 Moderator: Katherine W. Arendt, M.D.

*Translated into Spanish

Program Schedule

Thursday, April 25, 2013 *(cont.)*

San Cristobal EFG San Cristobal ABCD	3:15 – 4:00 p.m.	Coffee Break, Exhibits Poster Viewing and Poster Walk Arounds
San Geronimo Ballroom	4:00 – 5:30 p.m.	Clinical Forum 1: "Evolving Practices" Moderator: McCallum R. Hoyt, M.D., M.B.A
		A Balanced View of the Use of General Anesthesia for Cesarean Delivery Joy L. Hawkins, M.D.
		Analgesia for External Cephalic Version Carolyn Weiniger, M.D., B.Ch.
		Internal Iliac Artery Balloon Occlusion for Placenta Accreta Ashley M. Tonidandel, M.D., M.S.
San Geronimo Terrace	6:00 – 7:00 p.m.	Fellows' Reception *(By Invitation)*
Boardroom 3-10	6:00 – 9:00 p.m.	Residents' Research Forum

Friday, April 26, 2013

San Cristobal Foyer	6:00 a.m. – 1:00 p.m.	Registration Hours
Atlántico Garden	6:00 – 7:00 a.m.	Zumba Class *(Optional)*
San Cristobal EFG	7:00 – 8:00 a.m.	Continental Breakfast - Exhibits Open
San Geronimo Ballroom	8:00 – 9:30 a.m.	Best Paper Session Moderator: Jill M. Mhyre, M.D.
San Geronimo Ballroom	9:30 – 10:30 a.m.	What's New in OB?* The Obstetrician's Perspective: Obstetrical Directions in the Near Future Introduction: Vilma E. Ortiz, M.D. Speaker: Michael Greene, M.D.
San Cristobal EFG San Cristobal ABCD	10:30 – 11:15 a.m.	Coffee Break, Exhibits Poster Viewing and Poster Walk Around
San Geronimo Ballroom	11:15 a.m. – 12:15 p.m.	What's New in OB Medicine?* The Cardiologist's Perspective: Peripartum Cardiomyopathy Introduction: John T. Sullivan, M.D., M.B.A Speaker: Dennis McNamara, M.D.
San Geronimo Ballroom	12:15 p.m. – 1:15 p.m.	Poster Session 2 Moderator: May Pian-Smith, M.D., M.S.
	1:15 p.m.	Open Afternoon

Saturday, April 27, 2013

Flamingo Room	7:00 – 8:00 a.m.	Breakfast with the Experts *(Optional)* Moderator: David Wlody, M.D. Faculty: Brenda A. Bucklin, M.D.; David Gambling, M.D.; William R. Camann, M.D.; Stephen Pratt, M.D.; Jose C.A. Carvalho, M.D., Ph.D., FANZCA, FRCPC; Alan C. Santos, M.D., M.P.H.; Scott Segal, M.D., MHCM; Lawrence C. Tsen, M.D.; Linda S. Polley, M.D.; Manuel C. Vallejo, Jr., M.D., D.M.D.; Jill Mhyre, M.D.; Cynthia A. Wong, M.D.
San Cristobal EFG	7:00 – 8:00 a.m.	Continental Breakfast
San Geronimo Ballroom	8:00 – 9:00 a.m.	Oral Presentation 2 Moderator: Wendy Teoh, M.B.B.S, FANZCA
San Cristobal EFG San Cristobal ABCD	9:00 – 9:30 a.m.	Coffee Break Poster Viewing, and Poster Walk Arounds

Program Schedule

Saturday, April 27, 2013 *(cont.)*

San Geronimo Ballroom	9:30 – 10:30 a.m.	Special Lecturer: The Neonatologist's Perspective - The Challenge of Premature Births in Puerto Rico: Why Are So Many Born So Soon in Paradise?* Introduction: Barbara M. Scavone, M.D. Speaker: José Cordero, M.D.
San Geronimo Ballroom	10:30 – 11:30 a.m.	Gerard W. Ostheimer Lecture: What's New in OB Anesthesia? Introduction: Alex Butwick, M.B.B.S., FRCA, MS Speaker: Arvind Palanisamy, M.D., FRCA
Caribe Lagoon Exhibit Hall	11:30 a.m. – 1:00 p.m.	Lunch on your own
San Geronimo Ballroom	1:00 – 2:00 p.m.	Fred Hehre Lecture: Passion* Introduction: Pamela Flood, M.D. Speaker: Richard Smiley, M.D., Ph.D.
San Geronimo Ballroom	2:00 – 3:00 p.m.	Poster Session 3 Moderator: Ellen Lockhart, M.D.
San Geronimo Ballroom	3:00 – 4:00 p.m.	International Outreach Committee Panel Moderator: Ashraf Habib, M.D., B.Ch., M.Sc., FRCA Speakers: Medge D. Owen, M.D.; Emmanuel K. Srofenyoh, M.D.; Cynthia A. Wong, M.D.
San Geronimo Ballroom	4:00 – 5:00 p.m.	Research Hour - Epidural Fever Moderator: Scott Segal, M.D., MHCM Speakers: Laura Goetzl, M.D.; Michael A. Froelich, M.D., MS
Las Olas & Terrace	6:00 – 10:00 p.m.	SOAP Banquet at the Caribe Hilton

Sunday, April 28, 2013

San Cristobal EFG	7:00 – 8:00 a.m.	Continental Breakfast
San Geronimo Ballroom	8:00 – 9:00 a.m.	Pro-Con Debate: General Anesthesia is the Technique of Choice for Suspected Placenta Accreta* Moderator: David Bogod, M.B.B.S., FRCA, LLM Pro: Yaakov (Jake) Beilin, M.D. Con: John A. Thomas, M.D.
San Geronimo Ballroom	9:00 – 10:15 a.m.	Clinical Forum 2: "Obstetric Emergencies"* Moderator: Maya S. Suresh, M.D. The Obstetric Airway P. Allan Klock, M.D. Maternal Cardiopulmonary Arrest Sharon Einav, M.D.
San Geronimo Ballroom	10:15 – 11:15 a.m.	Best Case Reports Review Moderator: Robert Gaiser, M.D.
San Geronimo Ballroom	11:15 – 11:30 a.m.	Closing Remarks and Adjournment

*Translated into Spanish

SOAP appreciates the support of its exhibitors.
Please meet with the exhibitors during the times listed below.

Wednesday, April 24, 2013

5:00 - 6:00 p.m. Exhibits Open
6:00 - 8:00 p.m. Welcome Reception

Thursday, April 25, 2013

6:30 - 7:30 a.m. Breakfast with Exhibitors
9:30 - 10:15 a.m. Break with Exhibitors
3:00 - 4:00 p.m. Break with Exhibitors

Friday, April 26, 2013

7:00-8:00 a.m. Breakfast with Exhibitors
10:30-11:15 a.m. Break with Exhibitors

Program Material

Wednesday, April 24, 2013

Latin American Symposium in Spanish

Lecture #1
Retos Durante la Inducción de Anestesia General en la Gestante Obesa
Safely Off to Sleep: Challenges of Induction of General Anesthesia in the Obese Parturient

Vilma E. Ortiz, M.D. (EE.UU.)

Objetivos:

- La necesidad y el impacto de una valoración exhaustiva de las vías respiratorias en la gestante obesa.
- Los cambios fisiológicos que ocurren durante el embarazo y su impacto durante la preoxigenación,
- La posición óptima de la gestante obesa durante la preoxigenación y la inducción de la anestesia general.

La obesidad afecta cada vez más a un porcentaje mayor de la población, convirtiéndose en una seria amenaza para la salud pública. Aunque no contamos con una definición específica y aceptada internacionalmente de qué se entiende por obesidad en el caso de una mujer embarazada, nosotros consideraremos obesa a una mujer durante su embarazo si su índice de masa corporal (IMC) es igual o mayor a 30 kg/m^2 en la primera consulta prenatal o preconcepcional y severamente obesa (obesidad mórbida) si dicho índice es igual o mayor a 40.

La obesidad es un trastorno metabólico e inflamatorio que afecta a todos los sistemas fisiológicos. Gestantes con un alto IMC tienen mayor probabilidad de complicaciones durante el periodo prenatal, parto y posparto que mujeres no obesas. El feto también se encuentra en alto riesgo. He aquí la importancia de una valoración pre-anestésica.

Los cambios fisiológicos originados por la obesidad materna aumentan y complican aquellos ocasionados por el embarazo en sí. Por ejemplo, el síndrome de hipotensión en decúbito supino tiende a manifestarse a partir de las 18-20 semanas de gestación. En la gestante obesa el exceso de tejido graso en el abdomen exagera la compresión aorto-cava, aumentando la reducción del gasto cardiaco y del flujo sanguíneo útero-placentario.

La incidencia de cesáreas en las gestantes obesas es mayor respecto a las de peso normal. Según la gestante aumente su IMC así mismo aumentará la incidencia de cesárea. Además de estar asociada con un incremento de complicaciones postoperatorias, una cesárea en la paciente obesa supone una alta probabilidad de hemorragia y de que la operación en sí misma dure más tiempo; lo cual implica que es posible que haya que proceder a la anestesia general en cualquier momento.
Hay tres pasos imprescindibles para mantener la seguridad de la gestante obesa durante la inducción de la anestesia general:

1) Una *evaluación exhaustiva* de las vías respiratorias nos puede alertar sobre la posibilidad de dificultad durante la intubación (¿habrá necesidad de intubación por fibra-óptica?). Dicha evaluación consiste en la descripción de lo siguiente:
    - Clasificación de Mallampati
    - Apertura oral
    - Distancia tiro-mentoniana
    - Dentadura
    - Movilidad y circunferencia del cuello
    - Tamaño de la lengua

Debemos tener en mente que la apnea del sueño puede complicar el embarazo, particularmente en la mujer obesa. En estas mujeres la acumulación de tejido graso en los músculos de la faringe, el aumento de tejido blando en el cuello y la congestión nasal, contribuyen a la reducción del calibre de las vías respiratorias durante el tercer trimestre.

2) *Preoxigenación* adecuada, logrando maximizar las reservas de oxígeno disponibles durante la apnea que acompaña la inducción de la anestesia general.

3) Preoxigenación de la paciente en *posición de torso elevado* (cabeza elevada), preferiblemente Trendelenburg invertido. Esta posición permite que la fuerza de gravedad ayude a desplazar el diafragma y órganos abdominales en dirección de los pies, facilitando una mejor expansión de los pulmones.

Algunas ventajas de la posición semi-sentada (torso elevado) durante la preoxigenación e inducción de la anestesia general en la paciente obesa:

- mayor comodidad debido a una mecánica respiratoria favorable (por ej. durante la preoxigenación). La posición de Trendelenburg invertido, con uso de soporte de apoyo para la cabeza y apoyapiés para prevenir el deslizamiento del paciente, permite que el contenido abdominal descienda en posición caudal (hacia los pies), facilitando además la angulación occipito-atlanto-axial
- contribuyendo a un aumento en la capacidad funcional residual y en la reserva intrapulmonar de oxígeno
- resultando en un periodo más largo en el cual la paciente mantiene una saturación de oxígeno favorable durante el periodo de apnea que acompaña a la inducción de la anestesia general
- aumento en el área de sección transversal de la faringe
- mejor visualización durante la laringoscopia

Desventaja: Posibilidad de hipotensión

Ya que el despertar de la anestesia general es un momento durante el cual pueden ocurrir problemas de obstrucción de las vías respiratorias, la paciente obesa debe ser extubada en posición de torso elevado cuando esté completamente despierta.

1. Panaro HA and Ortiz VE. The Obese Parturient. In: Ortiz and Wiener-Kronish (editors), *Perioperative Anesthetic Care of the Obese Patient*. Informa Healthcare USA, Inc. 2010, pp.174-184
2. Izci B, Vennelle M, Liston WA, et al. Sleep-disordered breathing and upper airway size in pregnancy and post-partum. Eur Respir J. 2006; 27: 321-7
3. Knight M, Kurinczuk JJ, Spark P, et al. Extreme obesity in pregnancy in the United Kingdom. Obstet Gynecol. 2010; 115: 989-97
4. McKeen DM, George RB, O'Connell CM, et al. Difficult and failed intubation: Incident rates and maternal, obstetrical, and anesthetic predictors. Can J Anesth. 2011; 58: 514-524
5. Mace HS, Paech MJ and McDonnell NJ. Obesity and obstetric anaesthesia. Anaesth and Intensive Care. 2011; 39: 559-570

Lecture #2
Papel del Anestesiólogo en el Manejo de la Preeclampsia Severa y el Síndrome HELLP
"Role of the Anaesthetist in the Management of Severe Preeclampsia and HELLP Syndrome"

Mauricio Vasco, M.D. (COLOMBIA)

Objetivos

Luego de esta conferencia el asistente estará en capacidad de:

1. Identificar los criterios de severidad en pacientes con trastornos hipertensivos del embarazo
2. Participar de manera interdisciplinaria en el manejo periparto de estas pacientes.
3. Conocer las técnicas analgésicas y anestésicas.

Nuestro papel principal como anestesiólogos es proporcionar de manera segura una adecuada analgesia para el trabajo de parto y anestesia para la operación cesárea, participar en el manejo periparto, Realizar monitoria invasiva, manejar la paciente críticamente enferma y tomar decisiones relacionadas con el soporte de órganos (manejo de la vía aérea y soporte ventilatorio, terapia de remplazo renal, uso de vasoactivos, prevención y manejo de complicaciones neurológicas). Durante esta presentación revisaremos el manejo periparto de las pacientes con trastornos hipertensivos que desarrollan criterios de disfunción orgánica severa lo que denominaremos "criterios de severidad"

LOS TRASTORNOS HIPERTENSIVOS DEL EMBARAZO (THE) se definen como la presencia de Hipertensión (Presión arterial sistólica. PAS > 140 mmHg y/o Presión arterial diastólica. PAD > 90 mmHg) en dos tomas separadas y se clasifican así:

- HIPERTENSIÓN GESTACIONAL:
  Hipertensión detectada por primera vez después de la semana 20 de embarazo en ausencia de proteinuria. Resuelve en los 3 meses postparto.

- PREECLAMPSIA
  Hipertensión y proteinuria (Proteinuria definida como > 300 mg/día en orina de 24 horas ó > 3+ en tirilla) detectada por primera vez después de la semana 20 de embarazo.

- ECLAMPSIA
  Convulsiones en la embarazada, puede no estar asociada a proteinuria o Hipertensión.

- HIPERTENSIÓN CRÓNICA
  Hipertensión presente antes del embarazo o diagnosticada antes de las 20 semanas de gestación.

- PREECLAMPSIA SUPERPUESTA A UNA HIPERTENSIÓN CRÓNICA
  Inicio de nuevos signos y síntomas de preeclampsia después de la semana 20 de gestación en una mujer con hipertensión crónica.

El síndrome de HELLP se define como el desarrollo de hemólisis, disfunción hepática y trombocitopenia en pacientes con THE (Hemolisis LDH> 600, alteración de pruebas hepáticas AST- ALT >70, trombocitopenia < 150.000), se divide en tres grupos siendo el tipo 1 (conteo plaquetario menor de 50000) el de más gravedad.

Las pacientes con trastornos hipertensivos que presentan disfunción orgánica severa "criterios de severidad", asociados o no a proteinuria, presentan igual probabilidad de desarrollar desenlaces adversos maternos (abrupcio de placenta, hemorragia intracerebral) y/o neonatales (prematurez).

CUALES SON LOS CRITERIOS DE SEVERIDAD?

- PA ³ 160 /110 mmHg
- Proteinuria ³ 5 g /orina 24 horas
- Oliguria (< 30 ml / 3 horas)
- Creatinina mayor de 1.2 mg%
- Edema Pulmonar
- Dolor epigástrico o en hipocondrio derecho
- Trombocitopenia < 100.000
- Síndrome HELLP (Hemolisis LDH> 600, alteración de pruebas hepáticas AST- ALT >70, trombocitopenia < 150.000)
- Síntomas neurológicos (cefalea, trastornos visuales y auditivos)
- Eclampsia
- FETALES (Restricción del crecimiento intrauterino por debajo del percentil 5, anomalías en la monitoria del flujo de arterias uterinas o umbilicales)

DE QUE MUEREN LAS PACIENTES CON TRASTORNO HIPERTENSIVO DEL EMBARAZO Y CRITERIOS DE SEVERIDAD?

Las causas de muerte en estas pacientes están dadas por las complicaciones cerebrales (accidente cerebrovascular hemorrágico e isquemia cerebral) el edema pulmonar agudo y la disfunción de órganos (hígado, sistema hematológico y cardiovascular), los neonatos mueren por complicaciones asociadas a prematurez o por complicaciones derivadas de la pérdida del bienestar fetal que precipitan cesáreas de emergencia p ej: abrupcio de placenta.

MANEJO PERIPARTO

El manejo de estas pacientes se basa en los siguientes pilares; Terminación del embarazo como única medida para frenar la progresión de la enfermedad, prevención y tratamiento de la Eclampsia, Manejo de la crisis hipertensiva, Manejo adecuado de los Fluidos. La conducta obstétrica ante criterios de severidad es la estabilización materna y posterior terminación del embarazo antes de la semana 34 de gestación dependiendo de las condiciones maternas o fetales; con el fin de mejorar los desenlaces neonatales se realiza maduración al feto con cortico esteroides aplicados a la madre. Todas las intervenciones terapéuticas durante esta fase deben ser realizadas bajo monitoria materna y fetal.

PREVENCIÓN DE LAS CONVULSIONES

El medicamento de elección definido por el estudio MAGPIE es el Sulfato de Magnesio. La Dosis de impregnación para pasar en 20 minutos es de 4 gramos IV seguida por una infusión IV a 1 gramo /hora: se debe ajustar la dosis según monitorización materna de los reflejos osteotendinosos, el gasto urinario, el sensorio y la frecuencia respiratoria. En caso de toxicidad por sulfato de Magnesio el medicamento de elección que antagoniza su efecto es el Gluconato de Calcio, 2 gramos IV en 5 minutos, nunca suspender el sulfato de magnesio durante la anestesia con el pretexto que puede potenciar la hipotensión asociada a técnicas neuroaxiales o prolongar el efecto de los relajantes musculares de tipo no despolarizante. En caso de Eclampsia en pacientes que vienen recibiendo la infusión de sulfato de magnesio el medicamento de elección para el manejo de la convulsipon es el mismo Sulfato de Magnesio en dosis de 2 gramos IV adicionales en 10 minutos y se incrementaría la infusión IV a 2 gr / hora, las benzodiacepinas y la fenitoina no son superiores a éste.

MANEJO DE LA CRISIS HIPERTENSIVA

Se define crisis hipertensiva en la embarazada cuando las cifras tensionales se encuentran en los siguientes rangos; PAS ≥ 160mmHg y/o PAD ≥ 110mmHg. El objetivo terapéutico es obtener en la primera hora de iniciado el tratamiento una reducción de la PAS ≤ 150 -160 mmHg ya que la hipertensión sistólica por encima de ese valor se asocia a mayor incidencia de accidente cerebrovascular hemorrágico en especial en pacientes con Síndrome HELLP. Tres medicamentos

son de elección su escogencia depende de las condiciones de la paciente y las preferencias del grupo tratante.

Nifedipino 10 mg vía oral evaluando cada 20 minutos, suministrar hasta 3 dosis en la primera hora para alcanzar la meta terapéutica. No suministrar por vía sublingual.

Labetalol Bolo endovenoso inicial de 20 mg, si a los 20 minutos no se alcanza el objetivo terapéutico aplique nuevo bolo endovenoso de 40 mg, si pasados otros 20 minutos no se alcanza el objetivo terapéutico aplique nuevo bolo endovenoso de 80 mg; este último bolo se repetirá cada 20 minutos si el objetivo terapéutico no se ha alcanzado por 1 dosis más, hasta completar una dosis acumulada de 220 mg. Las infusiones continuas de este agente no son tan efectivas para alcanzar la meta terapéutica temprana al inicio del tratamiento.

Hidralazina: Bolo endovenoso inicial de 5 mg cada 20 minutos hasta alcanzar el objetivo terapéutico, dosis máxima acumulada de 20 mg. Cuando se utilice este agente realizar una modesta expansión de volumen con cristaloides IV (250 ml). En caso de no alcanzar las metas terapéuticas con los esquemas anteriormente mencionados se recomienda el uso de medicamentos parenterales en infusión continua, en su orden Nicardipina, Nitroprusiato, Labetalol, acompañado de monitoria invasiva de la presión arterial.

MANEJO DE FLUIDOS

Luego de la hemorragia intracerebral la causa más frecuente de mortalidad materna es el edema agudo de pulmón. La expansión de volumen con cristaloides o coloides de manera rutinaria no está indicada y puede incrementar el riesgo de edema pulmonar agudo sin mejorar otros desenlaces. Adicionalmente no existe evidencia para el uso de precarga ó cocarga hídrica con el fin de atenuar la hipotensión asociada a técnicas neuroaxiales en pacientes con THE. Como recomendación general las pacientes deben recibir entre 1 – 2 cc/kg/hora de cristaloides, máximo 80 ml/ hora, este aporte lo reciben con el Sulfato de Magnesio para profilaxis de eclampsia, si adicionalmente la paciente tiene infusiones adicionales (Oxitocina) estas se deben concentrar; en caso de hemorragia obstétrica o falla renal el remplazo de fluidos ya es individualizado a la situación clínica y guiado por monitoria invasiva o mínimamente invasiva. En las pacientes que desarrollan oliguria (< 30 ml en 3 horas), los retos de volumen deben ser modestos sin sobrepasar bolos de 250 ml de cristaloides, la mayoría de pacientes con 3 bolos de esta cantidad a intervalos de 20 minutos presentaran una respuesta favorable en la diuresis.

MONITORIA

Las paciente con THE presenta dos perfiles hemodinámicos definidos por catéter de arteria pulmonar (CAP); el más frecuente (80%) se caracteriza por un aumento en el gasto cardiaco , aumento de resistencias vasculares sistémicas y presiones de llenado normales o discretamente bajas; el resto de pacientes presenta un patrón de gasto cardiaco normal o bajo con aumento importante en las resistencias vasculares sistémicas y presiones de llenado altas; la Ecocardiografía trastorácica muestra la mayoría de veces un patrón hiperdinámico, con disfunción diastólica. Inicialmente las pacientes se monitorizan con presión arterial no invasiva, oximetría de pulso, electrocardiografía continua y sonda vesical, el feto debe tener monitoria continua de la frecuencia cardiaca fetal. La evaluación de la Base exceso al ingreso de estas pacientes puede definir un subgrupo con mayor riesgo de Disfunción orgánica, síndrome HELLP y desenlaces adversos neonatales (Base exceso, EB > -8), el papel de biomarcadores como el péptido natri urético cerebral (BNP) para caracterización hemodinámica está por definirse.

CUALES SON LAS INDICACIONES DE MONITORIA INVASIVA?

Catéteres venosos centrales

- Indicada en pacientes oligúricas (< 30 ml / 3 horas) sin respuesta a expansión modesta de fluidos.
- Utilización de fármacos vasoactivos parenterales.
- La medición de la presión venosa central (PVC) es controversial, se correlaciona poco con las presiones de oclusión del capilar pulmonar (PCWP) si es mayor de 4 mmHg.

Línea arterial: Recomiendo utilizarla de rutina en preeclampsia severa.

- Anticipación de análisis frecuente de gases arteriales (edema pulmonar, necesidad de ventilación mecánica).
- Uso de vasodilatadores parenterales arteriales potentes (nitroprusiato, nicardipina, nitroglicerina)
- Enfermedad cardiaca preexistente o concomitante.
- Anestesia general.
- Obesidad.

Catéter de arteria pulmonar:

- PVC que no se correlaciona con el grado de oliguria (mayor de 4 mmHg)
- Compromiso cardiorespiratorio (edema pulmonar, cianosis)
- Enfermedad cardiaca preexistente o coexistente.
- Definir el perfil hemodinámico para orientar terapia vasoactiva.

PAPEL DE LA MONITORIA MINIMAMENTE INVASIVA

La utilización de catéter de arteria pulmonar (CAP) es una medida operador dependiente y con probabilidad de complicaciones graves por lesiones vasculares, arritmias o interpretación inadecuada de los datos derivados luego de su colocación; disponemos actualmente de tecnologías de monitoria mínimamente invasivas del gasto cardiaco que obviarían el uso del CAP, las tecnologías que dependen del análisis de la onda de pulso) necesitarían la colocación de una línea arterial (VIGILEO®, LiDCOplus®, PiCCOplus®), otras tecnologías como la bioimpedancia y la bioreactancia no requieren de la utilización de línea arterial , esta última, NICOM system®, es la menos afectada por artefactos e interferencia electromagnética. Existen múltiples reportes de estas tecnologías para evalua el perfil hemodinámico asociado a técnicas analgésicas /anestésicas en embarazadas y algunas ya han sido validadas en el manejo periparto de pacientes con preeclampsia severa al compararlas con CAP (LiDCOplus®).

ABORDAJES NEUROAXIALES

La incidencia de complicaciones mayores luego de abordajes neuroaxiales en población obstétrica es de 1 ⁄ 20000 – 30000 en anestesia espinal y de 1 ⁄ 25000 en analgesia epidural. En la ausencia de contraindicaciones, las técnicas neuroaxiales de analgesia son de elección y deben ser instauradas lo más temprano posible anticipando la caída en el conteo plaquetario; la anestesia neuroaxial es el método ideal de anestesia para operación cesárea en pacientes con THE. La alteración de la coagulación más frecuente en los THE es la trombocitopenia. El conteo plaquetario para abordar el neuroeje de manera segura no está definido, Existen tres criterios para tomar la decisión; el conteo plaquetario, la velocidad de la caída en el conteo plaquetario y la presencia de coagulopatía por clínica o laboratorio. Pacientes con conteos plaquetarios por encima de 75000 sin signos clínicos de coagulopatía y conteo plaquetario previo de las últimas 6 horas sin una caída abrupta (30% del valor inicial) pueden recibir un abordaje neuroaxial. Si las plaquetas y la Deshidrogenasa láctica (LDH) son normales en THE con criterios de severidad es poco probable que las pruebas de coagulación (PT, PTT, fibrinógeno) estén anormales por lo que no se deben indicar de rutina antes del abordaje neuroaxial. La utilización de tromboelastografía o PFA-100 de manera rutinaria para evaluar la función plaquetaria no está indicada en este grupo poblacional.

MANEJO ANESTESICO

ANALGESIA NEUROAXIAL PARA EL TRABAJO DE PARTO

Las técnicas neuroaxiales de alivio del dolor para el trabajo de parto, técnicas móviles (Combinada espinal epidural o concentraciones bajas de anestésico local mas opioide vía epidural en volúmenes altos) disminuyen la respuesta presora durante las contracciones, permiten además en caso de cesárea de urgencia titular el anestésico local para obtener una epidural anestésica; "se debe abordar de manera temprana o profiláctica el neuroeje siempre y cuando no exista contraindicación". Cuando existen contraindicaciones por ej, coagulopatía materna, infección sistémica severa o en el sitio de la punción, hipertensión endocraneana; la analgesia sistémica IV con opioides Fentanyl o remifentanil por un sistema controlado por el paciente (PCA) y monitoria materna individualizada, son una buena opción.

ANESTESIA NEUROAXIAL PARA OPERACIÓN CESÁREA

Las técnicas neuroaxiales son de elección para operación cesárea; la espinal, la combinada espinal epidural (CSE) y la epidural son efectivas; la espinal al ser técnicamente más fácil, presentar bloqueo anestésico de rápida instauración y menor incidencia de hematoma espinal es la técnica más utilizada. La hipotensión asociada a técnicas neuroaxiales en pacientes con preeclampsia es menos frecuente que en gestantes sin esta entidad; Cuando se presenta hipotensión (Disminución en la cifras de PAS < 30% de la basal o PAM < 110 mmHg) se maneja con bolos de fenilefrina 50-100 mcg IV o efedrina 3- 5 mg IV.

ANESTESIA GENERAL PARA OPERACIÓN CESÁREA

Puede estar indicada en pacientes con coagulopatía, edema pulmonar agudo y eclampsia; el objetivo primordial es evitar la respuesta presora a las maniobras de laringoscopia e intubación / extubación y evitar la broncoaspiración. El anestesiólogo debe tomarse el tiempo necesario para obtener estos objetivos debido a que la técnica de inducción de secuencia rápida puede tener consecuencias hemodinámicas adversas con hemorragia intracerebral asociada. Los inductores más utilizados son el Tiopental sódico y el propofol, los coadyuvantes incluyen opiodes (remifentanil, alfentanil, fentanilo), Sulfato de magnesio, Lidocaina, Labetalol. Se debe disponer de un algoritmo y los insumos para el manejo de la vía aérea difícil y el recurso para la atención del neonato.

AGENTES UTEROTÓNICOS

La oxitocina es el agente de elección para la prevención de hemorragia posparto (HPP) asociada a atonía uterina, estudios de monitoria hemodinámica han mostrado la vasodilatación y aumento del gasto cardiaco que puede producir este agente si se utiliza en bolo IV rápido; se recomienda la utilización de oxitocina 1 – 3 U IV en 60 segundos para evitar estos efectos hemodinámicos adversos , seguido por infusiones de oxitocina para 4 horas; el misoprostol es agente de segunda línea para prevención de atonia uterina en caso de no disponer de oxitocina o como coadyuvante a la oxitocina para el tratamiento de la HPP, la metilergonovina está contraindicada en pacientes con THE.

MANEJO POSPARTO

Las pacientes con criterios de severidad deben ser manejadas en un ambiente donde se pueda realizar monitoria y vigilancia adecuada (Unidad de Alta dependencia Obstétrica o Unidad de Cuidados Intensivos). La analgesia luego de operación cesárea se basa en la utilización de acetaminofén más morfina intratecal; en caso de coagulopatia que contraindique el uso de técnicas neuroaxiales se recomienda el manejo balanceado con acetaminofén y opioides parenterales (Morfina – Hidromorfona), personalmente no utilizo Meperidina o Tramadol por el riesgo de desencadenar convulsiones , se debe individualizar el uso de Antiinflamatorios no esteroideos (AINES) por el riesgo de disfunción renal y disfunción plaquetaria; el bloqueo del plano abdominal transverso (TAP block) está indicado en pacientes sin coagulopatía en los que no se usa morfina intratecal. El sulfato de Magnesio en infusión parenteral debe mantenerse 24 horas luego de la terminación del embarazo o luego de la última convulsión si esta fue posparto, se debe individualizar su uso en pacientes en falla renal. Se debe realizar una estratificación de riesgo para detección de pacientes en alto riesgo de eventos tromboembólicos, como norma general pacientes con THAE y criterios de severidad a las que se les realizo Cesárea que no estén coagulopáticas necesitaran tromboprofilaxis farmacológica y/o mecánica. La utilización de corticoesteroides (Dexametasona) para mejorar los desenlaces en Síndrome HELLP no han mostrado beneficio anteparto y/o posparto, actualmente se están aleatorizando pacientes con HELLP tipo I para evaluar los desenlaces maternos y neonatales en este subgrupo de pacientes.

CONCLUSIONES

El anestesiólogo es integrante fundamental del grupo interdisciplinario de manejo en pacientes con THE y criterios de severidad. La estabilización inicial de estas pacientes incluye el manejo adecuado y racional de fluidos, la utilización de sulfato de magnesio para prevención y/o tratamiento de la eclampsia, el manejo de la crisis hipertensiva y la detección de coagulopatia. Se debe monitorizar adecuadamente las pacientes con el fin de definir su perfil hemodinámico y riesgo de complicaciones. Las intervenciones neuroaxiales analgésicas y/o anestésicas son las de elección cuando no están contraindicadas. La anestesia espinal es segura, se asocia a menor hipotensíon que en pacientes sin THE y el uso de vasopresores para manejo de la hipotensión asociado a técnicas neuroaxiales está más indicado que la expansión de fluidos rutinaria. El cuidado posparto es fundamental con el fin de la detección y/o tratamiento de complicaciones maternas, se debe disponer de recursos adecuados para el manejo del neonato.

LECTURAS RECOMENDADAS

1. Dennis AT. Management of pre-eclampsia: issues for anaesthetists. Anaesthesia. 2012 Sep; 67(9):1009-20.
2. Gogarten W. Preeclampsia and anaesthesia. Curr Opin Anaesthesiol. 2009 Jun; 22(3):347-51.
3. Haram K, Svendsen E, Abildgaard U. The HELLP syndrome: clinical issues and management. A Review. BMC Pregnancy Childbirth. 2009 Feb 26;9:8
4. Dyer RA, Piercy JL, Reed AR. The role of the anaesthetist in the management of the pre-eclamptic patient. Curr Opin Anaesthesiol. 2007 Jun; 20(3):168-74.

Lecture #3
Anestesia Para Cirugía Fetal
"Anesthesia for Fetal Surgery (EXIT Procedure)"
Héctor J. Lacassie, M.D. (CHILE)

Notes: _____

Anestesia para Cirugía Fetal

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Objetivos:

- Evaluar la racionalidad del uso de anestesia para procedimientos intrauterinos
- Describir las diferentes técnicas anestésicas y evaluar las actualmente en uso.
- Describir la técnica EXIT (*ex-utero intrapartum treatment*), como modelo de cirugía fetal.

A pesar del manejo perinatal actual, algunos defectos congénitos aún poseen alta morbi-mortalidad tanto intra uterina como en el período post natal temprano. En casos seleccionados, la intervención fetal intra uterina puede alterar la historia natural de la enfermedad.

Existen algunas alteraciones anatómicas con consecuencias fisiopatológicas prenatales predecibles que atentan contra la viabilidad extrauterina y que son susceptibles de ser corregidas antes del nacimiento (tabla 1).

Defecto	**Repercusión fisiopatológica**	**Tratamiento**
Valvas uretrales	Hidronefrosis Hipoplasia pulmonar	Derivación vésico-amniótica Cistostomía
Malformación quística adenomatoídea	Hipoplasia pulmonar Hidrops fetal	Lobectomía pulmonar
Quilotórax	Hipoplasia pulmonar Hidrops fetal	Derivación tóraco-amniótica
Hernia diafragmática congénita con herniación hepática	Hipoplasia pulmonar	Oclusión traqueal transitoria (PLUG)/ *Fetendo* (fetoscopía sin histerotomía)
Teratoma sacrocoxígeo	Insuficiencia cardiaca por alto flujo	Resección Oclusión vascular videoasistida
Sindrome de transfusión feto-fetal	Robo vascular	División placentaria videoasistida Oclusión vascular
Tumor cervical	Obstrucción vía aérea (CHAOS)	Traqueostomía bajo soporte placentario (EXIT)

PLUG: acrónimo para “plug the lung until it grows” (ocluir el pulmón hasta que crezca)
CHAOS: acrónimo para “congenital high airway obstruction síndrome” (síndrome de obstrucción congénita de vía aérea alta)
EXIT: acrónimo para “ex utero intrapartum treatment” (tratamiento extra uterino intraparto)

Tabla 1. Malformaciones que interfieren con el desarrollo y pueden beneficiarse con la cirugía antenatal. Modificada de Sutton et al. (1)

Numerosas líneas de evidencia sugieren que en el feto de más de 20 semanas de gestación se están desarrollando, del punto de vista estructural y funcional, las vías del dolor, centros de percepción de dolor corticales y subcorticales, junto a todo el sistema neuroquímico encargado de la transmisión y modulación del dolor (2). En los fetos en desarrollo se debiera describir el dolor como *actividad nociceptiva* más que *dolor* propiamente tal, ya que este último término engloba tanto la percepción como la interpretación emocional del estímulo, que hasta al menos las 20 semanas, aún no está integrado.
Por otra parte, la manipulación quirúrgica fetal es técnicamente más fácil de realizar entre las 18 a 30 semanas de gestación ya que antes de este período es muy pequeño y frágil y después existe un alto riesgo de parto prematuro (1). Así, será necesario proveer de anestesia tanto para la madre como el feto para estos procedimientos.

Técnica Anestésica
Prácticamente todas las drogas administradas a la madre atravesarán la barrera útero-placentaria, dependiendo de su tamaño molecular, carga iónica, unión a proteínas, gradiente de concentración, etc. (3). Esto es una ventaja real para lograr anestesia en el feto y poder realizarle algún procedimiento invasivo, con el sólo hecho de administrarle drogas a la madre.
La técnica anestésica más frecuentemente usada es la anestesia mixta, es decir, una anestesia epidural asociada a una anestesia general. Con el componente epidural se logra anestesia materna y analgesia para el post operatorio, mientras que con el componente general (gases halogenados) se logra tocolisis y anestesia para el feto, por el traspaso placentario de drogas. La desventajas de esta técnica son: a) riesgo de complicaciones en el manejo de la vía aérea materna, b) hipotensión arterial generada por el bloqueo simpático de la técnica regional, asociado al uso de halogenados y nitroglicerina; c) riesgo de prolongación del efecto del relajante neuro muscular al interactuar con sulfato de magnesio; d) depresión miocárdica fetal por los halogenados.
A la técnica anterior se le han realizado algunas modificaciones como por ejemplo la inyección en el cordón de relajante muscular (vecuronio: 0,2 mg/kg), opiáceos (fentanyl: 10-25 ug/kg) para reducir la respuesta fetal al stress (4) y vagolíticos (atropina: 20 ug/kg) si es necesario.
Actualmente está en boga el uso de opiáceos de ultracorta duración como el remifentanil. Se ha reportado el uso de remifentanil en dosis entre 0,1-0,2 $ug \cdot kg^{-1} \cdot min^{-1}$ para procedimiento EXIT. Los autores opinan que bajo monitorización adecuada, una infusión cuidadosamente titulada de remifentanil puede ser

administrada en forma segura como coadyuvante de una técnica anestésica neuroaxial para procedimientos EXIT (5).
La gran ventaja de la técnica es que permite tener a la paciente levemente sedada, sin manipular su vía aérea y se logra analgesia fetal caracterizada por disminución de los movimientos fetales y de la frecuencia cardiaca fetal (5). Por otra parte, esta técnica por si sola es insuficiente para procedimientos más invasivos, sin embargo, puede ser un coadyuvante muy eficaz.

Procedimiento EXIT
El procedimiento EXIT es un excelente modelo de cirugía fetal. Fue originalmente diseñado para la reversión de la oclusión traqueal del feto con hernia diafragmática congénita grave (6) (tabla 2). Su objetivo es mantener la circulación feto-placentaria intacta hasta que se asegure la vía aérea fetal por medio de intubación de la tráquea (por intubación oro-traqueal o traqueotomía) (7).
Nuestra experiencia ha sido exitosa en los casos que se han realizado, con tiempos de circulación placentaria efectiva de hasta 42 min., que ha permitido lograr control de la vía aérea en todos los casos. Otras series clínicas han reportado tiempos de circulación de hasta 66 minutos (8). La técnica anestésica sugerida se ve en la tabla 3.
El procedimiento requiere de un trabajo conjunto entre múltiples especialistas y un protocolo claro y coordinado en cuanto a indicaciones, especialistas involucrados y logística del proceso para lograr la máxima coordinación y eficiencia para un óptimo resultado.

1. Masas de cabeza y cuello
2. CHAOS (Congenital High Airway Obstruction Syndrome)
3. Resección CCAM (Malformación Adenomatosa Quística Congénita)
4. Reversión de oclusión traqueal
5. EXIT para establecer ECMO
6. Agenesia pulmonar unilateral
7. Puente para separación de siameses

Tabla 2. Lesiones susceptibles de ser tratadas con el procedimiento EXIT

TÉCNICA ANESTESICA: Instalar catéter epidural y luego inducir A. General

- Objetivos:
  - Anestesia materna (remifentanil + halogenados)
  - Tocolisis (halogenados)
  - Anestesia fetal (remifentanil + halogenados)

- Técnica:
  - Inducción de secuencia rápida
  - 2 vías venosas gruesas: teflón 14G o similar
  - Presión arterial invasiva (línea arterial)
  - Sonda vesical
  - Mantención:
    - Gases halogenados ≥ 2 MAC
    - Remifentanil 0,05-0,3 ug/kg/min
  - Infusión NTG 15-20 ug/kg/min (tocólisis)
  - Efedrina para mantener PAM materna
  - Suspender NTG y disminuir gases halogenados a ½ MAC sólo tras sección del cordón umbilical
  - Iniciar uterotónicos tras el alumbramiento: oxitocina (o carbetocin) y metilergonovina según necesidad
  - Iniciar analgesia por el catéter epidural

Tabla 3. Técnica anestésica sugerida para operación cesárea asociada al procedimiento EXIT. MAC: concentración alveolar mínima; NTG: nitroglicerina; PAM: presión arterial media.

1. Sutton LN, Sun P, Adzick NS. Fetal neurosurgery. Neurosurgery 2001;48: 124-42; discussion 42-4.
2. Anand KJ, Hickey PR. Pain and its effects in the human neonate and fetus. N Engl J Med 1987;317: 1321-9.
3. Lacassie HJ, Nunez G. Drogas y Embarazo. Rev Chil Anest 2000;29: 62-76.
4. Adzick NS, Harrison MR. Fetal surgical therapy. Lancet 1994;343: 897-902.
5. Fink RJ, Allen TK, Habib AS. Remifentanil for fetal immobilization and analgesia during the ex utero intrapartum treatment procedure under combined spinal-epidural anaesthesia. Br J Anaesth 2011;106: 851-5.
6. Harrison MR, Adzick NS, Bullard KM et al. Correction of congenital diaphragmatic hernia in utero VII: a prospective trial. J Pediatr Surg 1997;32: 1637-42.
7. Mychaliska GB, Bealer JF, Graf JL et al. Operating on placental support: the ex utero intrapartum treatment procedure. J Pediatr Surg 1997;32: 227-30; discussion 30-1.
8. Bouchard S, Johnson MP, Flake AW et al. The EXIT procedure: experience and outcome in 31 cases. J Pediatr Surg 2002;37: 418-26.

Lecture #4
Entrenamiento Inter-Profesional Basado en Simulación: Una Estrategia Educativa Para Mejorar la Seguridad de la Gestante
"Interprofessional Simulation-Based Team Training: An Educational Strategy For Improving Perinatal Patient Safety"

Roxane Gardner, M.D., D.Sc. (EE.UU.)

Objetivos:

- Aprenda cómo interprofesional basada en la simulación de entrenamiento del equipo puede ayudar a construir equipos más fuertes de obstetricia y mejorar la atención obstétrica.
- Identificar las estrategias para la implementación basada en la simulación de entrenamiento en equipo para mejorar el trabajo en equipo y la seguridad de la atención en obstetricia.

Numerosas cuestiones y eventos contribuyen a dañar y herir a las madres y sus recién nacidos. La "Joint Commission", una organización independiente sin fines de lucro que acredita y certifica a más de 20.000 organizaciones de atención de salud en los Estados Unidos, analizó 84 casos de daño perinatal y la muerte que les informaron entre 1995 y 2004. Problemas con la comunicación, el liderazgo, la evaluación del paciente y la competencia de las habilidades clínicas fueron algunos de los factores que contribuyen identificadas en el 50% o más de estos casos. En un análisis más reciente, los problemas de comunicación fueron identificados en más de la mitad de 107 casos de daños y mortalidad materna reportada entre 2004 y 2012.

La educación interprofesional (IPE) en el trabajo en equipo mediante la técnica de simulación ofrece una forma única, ideal para aprender y practicar deliberadamente las habilidades necesarias para convertirse en un alto rendimiento, el equipo de expertos perinatal. Cuando varios profesionales que conforman un equipo Perinatal colaborar juntos en actividades de formación del equipo, desarrollan un modelo de acción mental de lo que caracteriza a las mejores prácticas, la excelencia en el trabajo en equipo, el aprendizaje de las formas en que pueden ayudar a mitigar el uno al otro error y evitar el daño a los pacientes. Apoyo a la IPE en la asistencia sanitaria recientemente ha cobrado fuerza tal que la Organización Mundial de la Salud (OMS) publicó "Un Marco Para la Acción Sobre la Educación Interprofesional y Práctica Cooperativa" en 2010.

(Disponible en: http://whqlibdoc.who.int/hq/2010/WHO_HRH_HPN_10.3_eng.pdf).

La Colaborativa de Educación Interprofesional en 2011 identificaron cuatro dominios de competencias básicas para la práctica de colaboración interprofesional.

(Disponible en: http://www.aacn.nche.edu/education-resources/ipecreport.pdf). El objetivo del aprendizaje interprofesional es preparar a profesionales de la salud para trabajar juntos deliberadamente con el propósito de construir un sistema más seguro y mejor orientada a la salud centrado en el paciente y la comunidad.

Simulación, según David Gaba, es "una técnica no una tecnología para interactivas inmersivas actividades que detallen, reemplazar o volver a crear experiencias reales en el entorno de trabajo". Gaba explica que la simulación puede ser utilizado para una variedad de propósitos, que implica un amplio espectro de profesiones.

¿La formación de los equipos y la simulación hacer una diferencia en la salud? Las pruebas reunidas hasta el momento indica que dicha formación puede hacer una diferencia positiva en la confianza de los alumnos, la competencia y los resultados clínicos. Simulación de la formación basada en el trabajo en equipo facilita resultados positivos en Obstetricia:

- Draycott, et al. (2006) - Disminución de los bajos APGARs 5 minutos y HIE
- Crofts, et al. (2007) - un mejor manejo de la distocia de hombros
- Maslovitz, et al. (2007) - la identificación de errores en la gestión de eventos críticos
- Ellis, et al. (2008) - un mejor manejo de la eclampsia
- Robertson, et al. (2009) - el rendimiento del equipo mejora de la gestión de las emergencias obstétricas
- Walker, et al. (2011) - mejora el trabajo en equipo gestoras emergencias obstétricas en México
- Grobman, et al. (2011) - desarrollar / implementar la distocia de hombros protocolo
- Fisher, et al. (2012) - mejora de la gestión de un paro cardíaco materno

Creación de un ambiente de aprendizaje continuo, como con un programa de ejercicios de seguridad obstétrica, ayudará a reforzar las habilidades del equipo. Un enfoque para desarrollar una simulacros de seguridad incluye los siguientes pasos clave:

1. Identificar los grupos de interés
2. Reclutar y entrenar a los "campeones" y los instructores
3. Identificar y priorizar los temas importantes
4. El Taladros
    a. Tener metas explícitas
    b. Integrar las habilidades clínicas de los principios de CRM de trabajo en equipo y comunicación
    c. Identificar las medidas de resultado
    d. Incluya el tiempo para investigar a
5. Dar información al personal
6. Desarrollar protocolos de seguridad, guías de eventos críticos paso a paso o algoritmos

El logro de la práctica de alto rendimiento del equipo que ejemplifica la excelencia en el trabajo en equipo y la comunicación es nuestro imperativo ético como profesionales de la salud que atienden a las madres y sus recién nacidos. Estamos entre los profesionales asociados en este imperativo para apoyar la atención al paciente segura, promover la colaboración interprofesional y mejorar nuestros conocimientos, habilidades y destrezas en la forma en que trabajamos juntos, el cuidado de los pacientes en eventos rutinarios y críticos.

Selected References

1. Crofts JF, Bartlett C, Ellis D, Hunt LP, Fox R, Draycott TJ. Management of shoulder dystocia: skill retention 6 and 12 months after training. Obstet Gynecol. 2007; 110(5):1069-74.
2. Draycott T, et al. Does Training in Obstetric Emergencies Improve Neonatal Outcome? *BJOG.* 2006;113, 177-182.
3. Ellis D, Crofts JF, Hunt LP, Read M, Fox R, James M. Hospital, simulation center, and teamwork training for eclampsia management: a randomized controlled trial. Obstet Gynecol. 2008 Mar;111(3):723-31.
4. Fisher N, Eisen LA, Bayya JV, Dulu A, Bernstein PS, Merkatz IR, Goffman D. Improved performance of maternal-fetal medicine staff after maternal cardiac arrest simulation-based training. Am J Obstet Gynecol. 2011 Sep;205(3):239.e1-5. Epub 2011 Jun 15.
5. Freeth D, Hammick M, Reeves S, et al. Effective Interprofessional Education. Oxford: Blackwell Publishing, 2005.
6. Gaba, DM. The Future Vision of Simulation in Healthcare. Qual Saf Health Care, 2004;13, 2-10.
7. Grobman WA, Hornbogen A, Burke C, Costello R. Development and Implementation of a Team-Centered Shoulder Dystocia Protocol. Sim Healthcare. 2010; 5:199-203.
8. Institute of Medicine. *Health Professions Education: A Bridge to Quality.* Washington, DC: National Academy Press; 2003.
9. Interprofessional Education Collaborative Expert Panel. (2011). Core competencies for interprofessional collaborative practice: Report of an expert panel. Washington, D.C.: Interprofessional Education Collaborative.
10. Maslovitz S, Varkai G, Lessing J, et al. Recurrent obstetric management mistakes identified by simulation. Obstet Gynecol. 2007;109:1295–1300.
11. Robertson B, Schumacher L, Gosman G, Kanfer R, Kelley M, DeVita M. Simulation-based crisis team training for multidisciplinary obstetric providers. Simul Healthc. 2009 Summer;4(2):77-83.
12. Walker DM, Cohen SR, Estrada F, Monterroso ME, Jenny A, Fritz J, Fahey JO. PRONTO training for obstetric and neonatal emergencies in Mexico. Int J Gynaecol Obstet. 2012 Feb;116(2):128-33. Epub 2011 Nov 21.

Case Presentation / Discussion
Hemorragia Postparto: Actitudes Terapeuticas
"Postpartum Hemorrhage: Therapeutic Approaches"

Emila Guasch Arevalo, M.D. (ESPA ÑA)

Objectives:
The objectives of this presentation are to review
1. The postpartum haemorrhage (PPH) problem in terms of morbidity, mortality and its importance as a global health problem
2. How to measure as accurately as possible the amount of bleeding
3. Hemorrhage preparedness and massive transfusion protocol – what is in place?
4. Our experience in a tertiary referral hospital in PPH

Summary:
PPH is the major cause of maternal mortality in all over the world. Mortality reduction, is one of the World Health Organization (WHO) main objectives. In the developed world, its importance is more related to the rate of hysterectomy and as it is nowadays not a leading cause of direct maternal mortality. Many risk factors (obesity, previous CS, hypertension, twin pregnancy, etc…) have been recognized for PPH, but many of them occur among women without any risk factor at all. As an unexpected feature in healthy patients it´s often underestimated, so when we act, it´s usually late and we find a cold, acidotic and shocked woman. Normal bleeding after a vaginal delivery is 500 mL and 100 mL after a CS. Simulation scenarios have been purposed as a possible solution for this.

Uterine atony is the most frequent cause of PPH, followed by genital tract trauma, retained placenta products and finally coagulation primary problems.

Massive haemorrhage (MH) and massive transfusion protocols (MTP): Team work
MH is challenging. Prompt identification is one of the keys for a successful treatment.

The use of MTP have demonstrated its usefulness and its use is highly recommended in every obstetric department.

Coordination among obstetricians, anesthesiologists, nurses or midwives, blood bank and others, is crucial in order to get a better outcome for the woman and for the uterus as well.

Before using MTP, it´s important to regard that patients must be kept warm, avoid acidosis and hypocalcaemia and volemia must be restored. General anaesthesia is sometimes mandatory. Calling for help is recommended in MH.

Fibrinolysis can be anticipated, so fibrinogen is the first factor to be consumed. Fresh frozen plasma, cryoprecipitates or fibrinogen concentrates, should be given soon, and always guided by protocols.

One of the key points is time: You have to act and do it quickly and in a coordinated direction; PPH management is a very good example of team work.

Monitoring in obstetric hemorrhage:
We need 2 large peripherical bores in place for warm volume restoration Active warming of a bleeding patient is an effective, well recognized and cheap measure to take into account.

Initial non invasive monitoring (pulse, ECG, SpO2, NIBP, EtCO2) is mandatory, and as soon as possible, it should be transformed into invasive BP monitoring. Waste of time in monitoring is not adviced (our priority is volume and blood replacement).

If available, tromboelastography (TEG) is recommended for blood products administration

If TEG is not available, analytic determinations every 2 hours is recommended, while MH is going on.

Our experience in PPH
We have collected every PPH who needed transfusion of at least 2 RBPC, that took place in our tertiary referral hospital since july 2005 till nowadays, where we have had more than 60000 deliveries and we have regitered more than 400 women until now.

We describe major risk factors in our population, our transfusion thresholds, amount of RBPC and other products transfused, and our complications intra and postoperative in the PACU.

Key points:
1. Obstetric anesthesiologists should be up to date with national protocols, when available, and it´s highly recommended to have a local well known protocol involving obstetricians, nurses, blood bank, etc.
2. Every labour ward, should be aware of PPH risk factors and women with pre-partum high risk for PPH, should be referred to a tertiary hospital
3. Simulations, protocols, audits and team work are crucial to try to minimize morbidity and to avoid mortality in our hospitals.

References:
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Título: "Hemorragia Postparto: Actitudes Terapeuticas"

Objetivos:
1. Los objetivos de esta presentación son revisar
   La hemorragia postparto (HPP), en términos de morbilidad, mortalidad y su importancia como problema de salud mundial
2. Cómo medir con la mayor precisión posible la cantidad de sangrado
3. Hemorragia masiva y protocolo de transfusión masiva
4. Nuestra experiencia en un hospital terciario de referencia en la HPP

Resumen:
HPP es la principal causa de mortalidad materna en todo el mundo. La reducción de la mortalidad, es uno de los objetivos principales de la Organización Mundial de la Salud (OMS). En el mundo desarrollado, su importancia está más relacionado con la tasa de histerectomía y hoy en día no es la principal causa de mortalidad materna directa en esta parte del planeta.

Muchos factores de riesgo (obesidad, CS anterior, hipertensión, embarazo gemelar, etc ...) han sido reconocidos para el desarrollo de una HPP, pero muchas hemorragias se producen en mujeres sin factores de riesgo en

absoluto. Este tipo de hemorragia, dado que ocurre a menudo en pacientes sanas, se subestima, por lo que cuando actuamos, por lo general es tarde y nos encontramos con una mujer fría, con acidosis y en shock.
El sangrado normal después de un parto vaginal es de 500 ml y 100 ml después de una cesárea.

Se han propuesto escenarios y cursos específicos de simulación como una posible solución para paliar este problema de infraestimación.
La atonía uterina es la causa más frecuente de la HPP, seguido del traumatismo del tracto genital, la placenta retenida y finalmente, los problemas de coagulación primarios. (regla de las cuatro T)

Hemorragia Masiva (MH) y protocolos de transfusión masiva (MTP): Trabajo en equipo

La MH es un reto para todos los profesionales implicados. La rápida identificación es una de las claves para un tratamiento exitoso.
El uso de los MTP ha demostrado su utilidad y su uso es muy recomendable en todos los departamentos de obstetricia.

La coordinación entre los obstetras, anestesiólogos, enfermeras o matronas, el banco de sangre y otros, es crucial para obtener un mejor resultado tanto para la mujer como para el útero.

Antes de utilizar los MTP, es importante considerar que las pacientes deben ser mantenidas calientes, evitar la acidosis y la hipocalcemia mientras se restaura la volemia. La anestesia general es a veces necesaria e incluso imprescindible, en aras de asegurar un adecuado transporte de oxígeno a los tejidos. Pedir ayuda es altamente recomendable cuando ocurre una MH.
La fibrinólisis se puede prever, por lo que el fibrinógeno es el primer factor que se consume. La reposición con plasma fresco congelado, crioprecipitados o concentrados de fibrinógeno, se debe decidir rápidamente y siempre guiados por protocolos.

Uno de los puntos clave es el tiempo: Hay que actuar y hacerlo rápidamente y en una dirección coordinada, la gestión de la HPP es un muy buen ejemplo de trabajo en equipo.

Monitorización de la hemorragia obstétrica:

Necesitamos 2 grandes vías venosas periféricas para la restauración de volumen, preferentemente líquidos calientes (a 37ºC)

El calentamiento activo de un paciente sangrante es una medida eficaz, bien reconocida y barata y se debe recomendar.

Inicialmente se comienza con la monitorización no invasiva convencional (pulso, ECG, SpO2, NIBP, EtCO2) siendo ésta obligatoria, y tan pronto como sea posible, a medida que la hemorragia se perpetúa y se hace MH debería procederse a la monitorización invasiva. No se aconseja centrar la prioridad en la monitorización, nuestra prioridad es restaurar la volemia.
Si está disponible, se recomienda el uso de la tromboelastografía (TEG) para la administración de los hemoderivados.

Si no se dispone de TEG, se recomienda realizar determinaciones analíticas cada 2 horas, mientras que continue la situación de MH.

Nuestra experiencia en la HPP

Hemos recogido todas las mujeres que sufrieron una PPH y que necesitaron una transfusión de al menos 2 RBPC, que tuvieron lugar en nuestro hospital terciario de referencia desde julio de 2005 hasta la actualidad, donde hemos tenido más de 60.000 partos. Hemos recogido más de 400 mujeres hasta la actualidad.

Se describen los principales factores de riesgo en nuestra población, nuestros umbrales de transfusión, la cantidad de productos RBPC y otras transfundidos, y nuestros complicaciones intra y postoperatorio en la Unidad de Reanimación.

Puntos clave:

1. Los anestesiólogos obstétricos y que hagan obstetricia en su práctica deben estar al día de los protocolos nacionales, cuando estén disponibles, y es muy recomendable contar con un protocolo local bien conocido que implique a obstetras, enfermeras, banco de sangre, etc.
2. En todas las unidades obstétricas, se debe ser consciente de los factores de riesgo de PPH y las mujeres de alto riesgo pre-parto, deben ser remitidas a un hospital de tercer nivel
3. Las simulaciones de trabajo, protocolos, auditorías y trabajo en equipo son cruciales para tratar de minimizar la morbilidad y evitar la mortalidad en los hospitales debido a esta causa.

Case Presentation / Discussion
Cardiomiopatía Periparto
"Peripartum Cardiomyopathy"

Paloma Toledo, M.D., M.P.H. (EE.UU.)

Objectives:
The objectives of this presentation are to review

1. The postpartum haemorrhage (PPH) problem in terms of morbidity, mortality and its importance as a global health problem
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Título: "Hemorragia Postparto: Actitudes Terapeuticas"
Emilia Guasch. MD, PhD. Servicio de Anestesia-Reanimación. Hospital Universitario La Paz. Madrid. España.

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Los objetivos de esta presentación son revisar
1. La hemorragia postparto (HPP), en términos de morbilidad, mortalidad y su importancia como problema de salud mundial
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Program Material

Wednesday, April 24, 2013

Seminar on Preeclampsia Nuts and Bolts to Cutting Edge

Hypertension in Pregnancy: Who, What, When
Course Director: Philip E. Hess, M.D.

Consequences of Preeclampsia: Things You Don't Want to Have
Manuel C. Vallejo, Jr., M.D., D.M.D.

Anesthetic Care in Preeclampsia
John A. Thomas, M.D.

Past, Current, and Future Research: Where is the Cutting Edge?
Ruth Landau, M.D.

Interactive Case Panel: While You Are on Service…
Philip E. Hess, M.D.; John A. Thomas, M.D.; Manuel C. Vallejo, Jr., M.D., D.M.D.; Ruth Landau, M.D.

Hypertension in Pregnancy: Who, What, When
Course Director: Philip E. Hess, M.D.

Objectives

- Describe the spectrum of hypertension in pregnancy
- Identify patients who are at risk for preeclampsia
- Describe the physiological changes in preeclampsia
- Discuss the pathophysiology of preeclampsia

Summary

Despite decades of research, there has been little success in the prevention and treatment of preeclampsia. Fortunately, in the last decade significant advance has been made in understanding the pathophysiology of the disease. Preeclampsia is one of the leading causes of maternal mortality in the world. It leads to both short-term and long-term morbidity for the mother, and significant risk to the fetus.

Pregnancy-Induced Hypertension (PIH) is a spectrum of diseases that spans from benign to deadly. Although numbers vary by region and population, approximately 20% of parturients have PIH. The majority of these are diagnosed with Gestational hypertension, while about 7% have preeclampsia. Among those with preeclampsia, most (75%) are mild. Classically, risk factors include advanced maternal age, nulliparity, low socioeconomic status, pre-pregnancy obesity or excessive weight gain during pregnancy, Gestational DM, extended birth interval, and preexisting hypertension or renal disease.

	Timing	BP	Additional
Chronic HTN	<20 weeks gestation >12 weeks postpartum	140/90	-
Gestational HTN	>20 weeks gestation <12 weeks postpartum	140/90	-
Preeclampsia (Mild)	>20 weeks gestation <12 weeks postpartum	140/90	Proteinuria
Preeclampsia (Severe)	>20 weeks gestation <12 weeks postpartum	160/110	Renal injury Major systemic injury

Gestational hypertension and chronic hypertension in pregnancy carry a lesser risk to mother and fetus, but may progress to the more significant preeclampsia. Frequent monitoring is necessary. Preeclampsia is categorized as mild or severe, and the distinction is important. Mild preeclampsia does carry increased risk of morbidity, but can be managed conservatively for a short period of time. Severe preeclampsia requires delivery of the fetus. Additionally, the patient must receive magnesium for seizure prophylaxis (and possibly fetal cerebral protection), and blood pressure control. Neither of these treatments halts the disease; at present there is no cure for preeclampsia other than delivery. Approximately 10% of patients diagnosed with preeclampsia are identified prior to 34 weeks gestation. These patients carry the greatest risk of morbidity & mortality, and fetal complications. 25% – 30% of patients are diagnosed postpartum.

The spectrum of injury in preeclampsia is large. Primary is the injury to the kidney, which manifests as proteinuria, but can lead to complete renal failure. The glomerulus in preeclampsia develops pathological endotheliosis, wherein the glomerular structure is lost and the capillaries are filled with edematous fluid.

Significant Renal Injury	Systemic injury			Symptoms	Fetal
Proteinuria of 5g/24hr, or 3+dipstick	Liver	Neurologic	Hematologic	Headache	Intra-uterine growth restriction
Oliguria (<500cc in 24 hours)	-Hepatic inflammation -Intra-hepatic necrosis and hemorrhage -Hepatic capsular hematoma	Hyperreflexia Clonus	-Hemoconcentration (hematocrit >40%) -Microangiopathic hemolytic anemia	Visual changes: Scotomata blurring blindness	Oligohydramnios
Elevation of serum creatinine	Elevated enzymes: AST / ALT / Alkaline phosphatase / LDH	Intracranial hemorrhage	-Thrombocytopenia (count <100,000/ mm^3)	Abdominal pain	Ischemic encephalopathy
Serum Uric Acid >5.5 mg/dl	Prolongation of Prothombin time	PRES syndrome	HELLP syndrome DIC	Malaise	Abruption

On initial presentation, patients have elevated SVR, reduced filling volume and pressure, and high cardiac output. These values improve with fluid resuscitation, probably reflecting a stress response. The elevated hydrostatic pressure and damaged endothelium lead to non-dependent edema, and result in elevated hematocrit. With fluid resuscitation the SVR decreases, and the cardiac output increases significantly – so much so that it was initially believed that preeclampsia was due to high cardiac output. In fact, using sophisticated techniques, both the systolic and diastolic function of the heart are depressed, and the damage likely leaves the patient at lifelong risk of heart disease.

In addition to being caused by high cardiac output, preeclampsia has had many theoretical causes. These include:

Genetics – there is a definite genetic predisposition to the disease. The mother, fetus, and father all playing a part.

Immune maladaptation – there is some evidence of a relationship with the immune system, but this may not be a strong as was previously thought.

Malnutrition – the association between malnutrition and the risk for preeclampsia has been demonstrated. Poor nutrition is not the cause of the disease, but may lead to a predisposition. Similarly, supplementation with calcium, vitamins, etc. have not proven to be very successful.

Inflammatory response – The markers of inflammation are elevated in patients who are diagnosed with preeclampsia. However, the timing of these markers seems to suggest that inflammation is a sign of preeclampsia, not the cause. An imbalance of thromboxane is clearly part of the response of the body to the disease. Treatment with aspirin, to prevent production of thromboxane has been disappointing.

Oxidative stress – recent evidence suggests that excess free oxygen radical may cause endothelial dysfunction and end organ injury in preeclampsia. While one study demonstrated an incredible reduction in the number of cases of preeclampsia with vitamin C & E supplementation, others have found no benefit. The onset of free radical species points to an effect of the disease, and not the cause.

Anti-angiogenic imbalance – in the last decade an overwhelming amount of data points to the imbalance of anti-angiogenic biomarkers as playing a primary role in the pathogenesis of preeclampsia. To briefly summarize:

Vascular growth, integrity, and health are maintained by several angiogenic hormones. Of interest in preeclampsia are vascular endothelial growth factor (VEGF), placental growth factor (PlGF), and transforming growth factor-β (TGFβ), and their respective receptors (Flt1 and endoglin). In response to ischemia, the receptors dislocate from the endothelial cell surface and become solubilized (sFlt1 and sENG). There soluble receptors bind their respective, preventing them from maintaining the endothelial system. This leads to endothelial permeability (edema), loss of capillary bed volume (elevated SVR), inflammation and creation of oxygen free radicals. Furthermore, the absence of VEGF causes loss of fenestrations in the kidney, liver and brain – the three organs most affected by preeclampsia. Studies have demonstrated that sFLT and sENG increase about 5-6 weeks before the clinical presentation of preeclampsia, and that the ratio of sFLT:PlGF may be predictive of preeclampsia in the second trimester.

sFLT and sENG are produced by hypoxia in the placenta. This explains the well described link between poor vascular development of the placenta (undilated spiral arteries) and preeclampsia. Finally, both pregnant and non-pregnant animals given sFLT develop hypertension and renal dysfunction, including the characteristic glomerular endotheliosis. The association between placental ischemia producing elevated sFLT levels has become the animal model for preeclampsia, which eluded researchers until now.

Key Points

Preeclampsia is one of the leading causes of maternal mortality and morbidity, most often due to subarachnoid hemorrhage.

No treatment exists for severe preeclampsia outside of delivery of the placenta. Therapy for patients with preeclampsia include magnesium for seizure prophylaxis and antihypertensive medications.

Preeclampsia is an endothelial disorder caused by hypoxia in the placenta, which causes an excess of soluble anti-angiogenic receptors .

References

1. Bellamy, L., et al. (2007). “Pre-eclampsia and risk of cardiovascular disease and cancer in later life: systematic review and meta-analysis.” BMJ 335(7627): 974.
2. Brosens, I. A., et al. (1972). “The role of the spiral arteries in the pathogenesis of preeclampsia.” Obstet Gynecol Annu 1: 177-191.
3. Cnattingius, S., et al. (2004). “Maternal and fetal genetic factors account for most of familial aggregation of preeclampsia: a population-based Swedish cohort study.” Am J Med Genet A 130A(4): 365-371.
4. Dekker, G. and P. Y. Robillard (2007). “Pre-eclampsia: Is the immune maladaptation hypothesis still standing? An epidemiological update.” J Reprod Immunol 76(1-2): 8-16.
5. Levine, R. J., et al. (2006). “Soluble endoglin and other circulating antiangiogenic factors in preeclampsia.” N Engl J Med 355(10): 992-1005.
6. Levine, R. J., et al. (2004). “Circulating angiogenic factors and the risk of preeclampsia.” N Engl J Med 350(7): 672-683.
7. Nagamatsu, T., et al. (2004). “Cytotrophoblasts up-regulate soluble fms-like tyrosine kinase-1 expression under reduced oxygen: an implication for the placental vascular development and the pathophysiology of preeclampsia.” Endocrinology 145(11): 4838-4845.
8. Poston, L., et al. (2011). “Role of oxidative stress and antioxidant supplementation in pregnancy disorders.” Am J Clin Nutr 94(6 Suppl): 1980S-1985S.
9. Rana, S., et al. (2012). “Angiogenic factors and the risk of adverse outcomes in women with suspected preeclampsia.” Circulation 125(7): 911-919.
10. Skjaerven R. The epidemiology of preeclampsia with focus on family data. In: Placental Bed Disorders, Basic Science and its Translation to Obstetrics. Eds. Pijnenborg R, Brosens I, Romero R. Cambridge Books Online.
11. Venkatesha, S., et al. (2006). “Soluble endoglin contributes to the pathogenesis of preeclampsia.” Nat Med 12(6): 642-649.

Consequences of Preeclampsia: Things You Don't Want to Have

Manuel C. Vallejo, Jr., M.D., D.M.D.

Learning Objective: Upon completion of this presentation, participants will be able to identify and discuss the anesthetic management of several acute maternal complications of preeclampsia including eclampsia, HELLP syndrome, liver rupture, pulmonary edema, renal failure, disseminated intravascular coagulopathy (DIC), hypertensive emergency, and hypertensive encephalopathy and cortical blindness.

Summary: After thromboembolic disease, eclampsia is the second most common cause of maternal death in the US, accounting for an estimated 50,000 maternal deaths per year worldwide. Eclamptic seizures are usually self-limiting and seldom last longer than 3 to 4 minutes. When a parturient is having an eclamptic seizure, she should be rolled onto one side, the airway protected with an oral padded tongue blade or gauze, iv amnestic such as midazolam (1-2 mg iv), and magnesium therapy (initial iv loading dose of 4 mg followed by a continuous infusion of 1-2 gm/hr) continued for up to two days post delivery. Furthermore, approximately 10% of eclamptic women will have repeated seizures if managed expectantly.

Liver rupture is one of the most severe consequences of severe preeclampsia/HELLP syndrome with a reported maternal death rate of more than 30%. Liver rupture occurs most commonly in multiparas of advanced age. A high index of clinical suspicion is key to prompt and accurate diagnosis. Imaging techniques such as ultrasound, computed tomography (CT), or magnetic resonance imaging (MRI) can enable early and accurate diagnosis of liver hematoma or rupture. Treatment requires a multidisciplinary approach in a tertiary care facility. Unnecessary manipulation of the liver should be avoided which may precipitate rupture. Expectant management with serial CT or abdominal ultrasound examinations may be all that is needed. If there is evidence of liver rupture, prompt surgical intervention under general endotracheal anesthesia is mandated. Hepatic artery embolization has been reported to have the highest maternal survival rate of around 90%, and should be attempted if hemorrhage can be controlled, and if the patient is hemodynamically stable.

Pulmonary edema refers to an excessive accumulation of fluid in the pulmonary interstitial and alveolar spaces secondary to vascular endothelial damage. It complicates around 0.05% of low-risk pregnancies but may develop in up to 2.9% of pregnancies complicated by preeclampsia. The causes are often multifactorial. Clinical diagnosis is characterized by worsening dyspnea and orthopnea with signs of respiratory compromise (tachypnea, auditory crackles, rales, and hypoxemia). An arterial blood gas and chest x-ray can assist in the diagnosis. The goal of management is to stabilize and deliver. The patient should be placed on oxygen supplementation with continuous monitoring of oxygen saturation, and the head and chest elevated to improve ventilation. Lasix (furosemide) iv can be given as a single dose of 20 to 40 mg over 2 minutes to promote diuresis; the dose can be increased to 40 to 60 mg to a maximum of 120 mg in 1 hour. Electrolytes (especially potassium) should be supplemented as needed, sodium and water restriction with strict input/output monitoring, and iv morphine sulfate (2 to 5 mg) given as needed to reduce adrenergic vasoconstrictor stimuli to the pulmonary arteriolar and venous beds.

Regarding renal failure, the characteristic histologic renal lesion in preeclampsia is glomerular endotheliosis in which the glomeruli are large and swollen with vacuolated endothelial cells. Other diagnoses should be excluded including hemolytic uremic syndrome, primary renovascular disease, and placental abruption, as well as conditions that may be reversible such as dehydration or obstructive uropathy. Supportive therapy includes blood pressure control, positioning to improve renal blood flow, and correcting fluid and electrolyte imbalances. If dialysis is required in pregnancy, hemodialysis is preferred over peritoneal dialysis.

Disseminated intravascular coagulopathy (DIC) is a consumptive coagulopathy and bleeding diathesis. Common causes of DIC in pregnancy are excessive blood loss with inadequate blood component replacement, placental abruption, amniotic fluid embolism, and severe preeclampsia/HELLP syndrome. Hypertensive crises can result in retinal detachment and/or hemorrhage, congestive heart failure, myocardial infarction, renal failure, liver failure, placental abruption, and hypertensive encephalopathy. Although rare, cerebrovascular accident (CVA) as a result of acute hypertension is the leading cause of maternal death in preeclampsia, and accounts for 15–20% of deaths from eclampsia. The risk of hemorrhagic stroke correlates directly with the degree of elevation in systolic blood pressure. In most cases, the cause of acute hypertension is the result of either worsening of underlying essential hypertension or acute exacerbation of preeclampsia itself. Efforts should be directed at blood pressure control and definitive management of hypertensive crisis in the setting of preeclampsia is delivery. If general anesthesia is needed, blood pressure control is essential, and premedication may be necessary to avoid the increase in blood pressure that often accompanies induction of general anesthesia.

Hypertensive encephalopathy and cortical blindness are known complications of severe preeclampsia. The incidence of cortical blindness in severe preeclampsia is 1–15%. Other ophthalmologic manifestations of preeclampsia include retinal detachment, retinal arteriolar vasospasm, and thrombosis of the central retinal arteries. The brain is normally protected from extremes of blood pressure by an autoregulatory system that ensures constant perfusion over a wide range of systemic pressures which becomes disrupted. The availability of improved neuroimaging such as single-photon emission computed tomography (SPECT) can distinguish between areas of hyper- and hypoperfusion and improve diagnosis. Cortical blindness usually reverses completely after delivery, although resolution may take several weeks.

Key points:

1. Preeclampsia remains a significant cause of both maternal and perinatal death.
2. Effective management is to stabilize and deliver with magnesium therapy, antihypertensive medications, and judicious use of intravenous fluid.
3. Cesarean section is usually undertaken for obstetric indications only.
4. Close observation after delivery for 24 to 48 hours postpartum.

References:

1. Norwitz ER, Hsu CD, Repke JT. Acute complications of preeclampsia. Clin Obstet Gynecol. 2002 Jun;45(2):308-29.
2. Dennis AT. Management of pre-eclampsia: issues for anaesthetists. Anaesthesia. 2012 Sep;67(9):1009-20. doi: 10.1111/j.1365-2044.2012.07195.x.
3. Sibai BM, Stella CL. Diagnosis and management of atypical preeclampsia-eclampsia. Am J Obstet Gynecol. 2009 May;200(5):481.e1-7. doi: 10.1016/j.ajog.2008.07.048.
4. Liu S, Joseph KS, Liston RM, Bartholomew S, Walker M, León JA, Kirby RS, Sauve R, Kramer MS; Maternal Health Study Group of Canadian Perinatal Surveillance System (Public Health Agency of Canada). Incidence, risk factors, and associated complications of eclampsia. Obstet Gynecol. 2011 Nov;118(5):987-94. doi: 10.1097/AOG.0b013e31823311c1.
5. Cooray SD, Edmonds SM, Tong S, Samarasekera SP, Whitehead CL. Characterization of symptoms immediately preceding eclampsia. Obstet Gynecol. 2011 Nov;118(5):995-9. doi: 10.1097/AOG.0b013e3182324570.

6. Sibai BM. Disparity in the rate of eclampsia and adverse pregnancy outcome from eclampsia: a tale of two countries. Obstet Gynecol. 2011 Nov;118(5):976-7. doi:10.1097/AOG.0b013e31823556c6.

7. Committee on Obstetric Practice. Committee Opinion no. 514: emergent therapy for acute-onset, severe hypertension with preeclampsia or eclampsia. Obstet Gynecol. 2011 Dec;118(6):1465-8. doi: 10.1097/AOG.0b013e31823ed1ef.

Anesthetic Care in Preeclampsia

John A. Thomas, M.D.

Objectives:

The objectives of this presentation are to review the following issues for preeclamptic patients:

1. General preanesthetic concerns
2. Optimal choice and challenges for labor analgesia
3. Optimal choice and challenges for cesarean section anesthesia
4. Hemodynamic and fluid management (choice of monitoring)

Summary:

Preeclampsia occurs in 6-8% of pregnancies and is a complicated multi-organ system disease, which can have significant anesthetic implications. Anesthetic management therefore requires a systematic approach incorporating a thorough preoperative evaluation and assessment, appropriate choices for providing analgesia and anesthesia, optimal fluid management and use of hemodynamic monitoring, and finally good multi-disciplinary communication.

Challenges in the anesthetic care of patients with preeclampsia:

A. Preanesthetic Concerns:

Optimal anesthetic care starts with a thorough pre-anesthetic evaluation. Since preeclampsia is a multiorgan system disease it can impact anesthetic management on multiple levels. Initially the anesthesia team must differentiate between mild and severe preeclampsia, as this will effect obstetric management and in turn anesthetic options. Important considerations include:

- Severity of disease (mild vs. severe)
- Potential for a difficult airway
- Coagulation and fluid status
- Understanding options and maintaining flexibility

The anesthetic care of mild preeclampsia does not differ much from standard care while severe preeclampsia requires a more thorough evaluation. The physical exam should focus on the airway exam and the anticipated obstetric management. The airway exam is critical to the anesthetic choices made, while understanding obstetric care will help assess the risk of operative delivery. Laboratory investigation that should be obtained prior to anesthesia include at a minimum a complete blood count in mild preeclampsia, while in severe preeclampsia, the coagulation status, liver function, renal function and urinalysis should also be considered.

Coagulation status and in particular the platelet counts of preeclamptic patients have been a major concern for anesthesia providers. General principles regarding platelet counts include the following:

- o > 100K is considered safe for regional anesthesia without further testing
- o 75K-100K without other signs of a coagulopathy is likely safe in most patients
- o >50K-75K without other signs of a coagulopathy may have a place in high-risk patients
- o < 50K is generally considered a contraindication to regional anesthesia

It is important to remember the choice to proceed with regional anesthesia in the face of thrombocytopenia should be based on the risk/benefit ratio for the patient. On one hand the practitioner must consider the potential for a difficult airway (1/250-300) versus the theoretical risk of developing an epidural hematoma (1/150,000-250,000). Other patient factors such as obesity, potential risk for emergency cesarean section, and co-existing disease should also play a role in decision to use regional anesthesia in the thrombocytopenic parturient. If significant thrombocytopenia is present close follow-up for complete neurologic recovery and the use of the smallest possible needle (spinal vs. epidural) when possible is recommended. In addition, the trend and severity with which a patient's platelet count is declining can be more important than the total number present. Patients with rapidly declining values often have more severe disease, increased likelihood of other organ system involvement, and less of a window of time before the labs change.

B. Choice of Analgesia or Anesthesia:

Use of regional (in particular epidural) analgesia and anesthesia is well accepted and is the recommended technique for severe preeclampsia when possible. Early epidural placement has been recommended by the ASA and supported by the American College of Obstetrics and Gynecology (ACOG). There are many well-documented benefits to epidural use in preeclampsia including:

- o A reduction in severe hypertension 2nd pain and catecholamine surges
- o Improvements in uteroplacental and intervillous blood flow
- o Ability to avoid GA risks for cesarean section if required

Early epidural placement, especially in high-risk patients (worsening preeclampsia, difficult airway, etc.) can allow time to assess the regional block and correct any inadequacies. Combined spinal-epidural is also an acceptable and option for severe preeclampsia patients but its use in labor does carry the potential risk that discovery of an inadequate epidural block will be delayed. We often avoid its use in patients with high risk for cesarean section and/or an anticipated difficult airway for this reason. Analgesia for labor can be provided via patient controlled narcotics in patients where regional anesthesia is not an option.

Spinal anesthesia has become an excepted alternative to epidural anesthesia for cesarean section in patients with severe preeclampsia. Multiple studies have demonstrated that precipitous and severe drops in maternal blood pressure are unlikely. In fact, patients with preeclampsia appear resistant to these changes. The risk of hypotension and vasopressor use is similar to that of epidural anesthesia. Spinal anesthesia offers many advantages such as smaller needle gauge, quicker onset, and greater reliability.

Occasionally, epidural placement cannot be undertaken (coagulopathy, emergency, or patient refusal). General anesthesia can be preformed safely in severe preeclampsia, but requires appropriate preparation and management. Considerations include:

- o Potential for airway difficulty (edematous/friable)
- o Acute hypertension with RSI & intubation
- o Drug interactions and implications of $MgSO_4$

It is important to prepare for the possibility of a difficult airway with good preoxygenation and having adequate ancillary equipment (difficult airway cart, small endotracheal tubes, etc.) available.

C. Fluid management and monitoring:

Fluid management and the use of hemodynamic monitoring can be very challenging in preeclamptic patients. Preeclamptic patients are volume depleted and can benefit from careful use of fluids during surgery and regional anesthesia. However, use of fluids and the need for monitoring will depend on the severity of preeclampsia, patient comorbidities, and the obstetric interventions. General principles regarding fluids and monitoring include:

- Standard monitors and measurement of urine output should be used when feasible
- Conservative fluid loading with IVF is safe and may be helpful
- Invasive monitoring is rarely needed, but can occasionally be helpful

  Clear indications for A-line placement exist

  - CVP measurements may be useful in certain circumstances
  - PAC should only be used in very select cases and its use has been discouraged due to a lack of evidence
- Newer non (less)-invasive techniques may become more useful and preferred, but access, knowledge and validation are needed

References:

1. Dennis AT. Management of pre-eclampsia: issues for anaesthetists. *Anaesthesia.* 2012 Sep;67(9):1009-20.
2. Dyer RA, Piercy JL, Reed AR. The role of the anaesthetist in the management of the pre-eclamptic patient. *Curr Opin Anaesthesiol* 20:168–174.
3. Gogarten W. Preeclampsia and anaesthesia. *Curr Opin in Anaesthesiol* 2009, 22:347–351.
4. Ramanathan J, Bennett K. Pre-eclampsia: fluids, drugs, and anesthetic management. *Anesthesiol Clin North America.* 2003 Mar;21(1):145-63.
5. Turner JA. Severe Preeclampsia: Anesthetic Implications of the Disease and Its Management. *Am J Ther.* 2009 Jul-Aug;16(4):284-8.
6. Turner JA. Diagnosis and management of pre-eclampsia: an update. *Int J Womens Health.* 2010 Sep 30;2:327-37.
7. Shennan AH, Redman C, Cooper C, Milne F. *Lancet.* Are most maternal deaths from pre-eclampsia avoidable? 2012 May 5;379(9827):1686-7.
8. Steegers EA, von Dadelszen P, Duvekot JJ, Pijnenborg R. Pre-eclampsia. *Lancet.* 2010 Aug 21;376(9741):631-44.

Past, Current, and Future Research: Where is the Cutting Edge?
Ruth Landau, M.D.

Notes: _____

Seminar on Preeclampsia SOAP 2013: Nuts and Bolts to Cutting Edge

Past, Current, and Future Research: Where is the Cutting Edge?

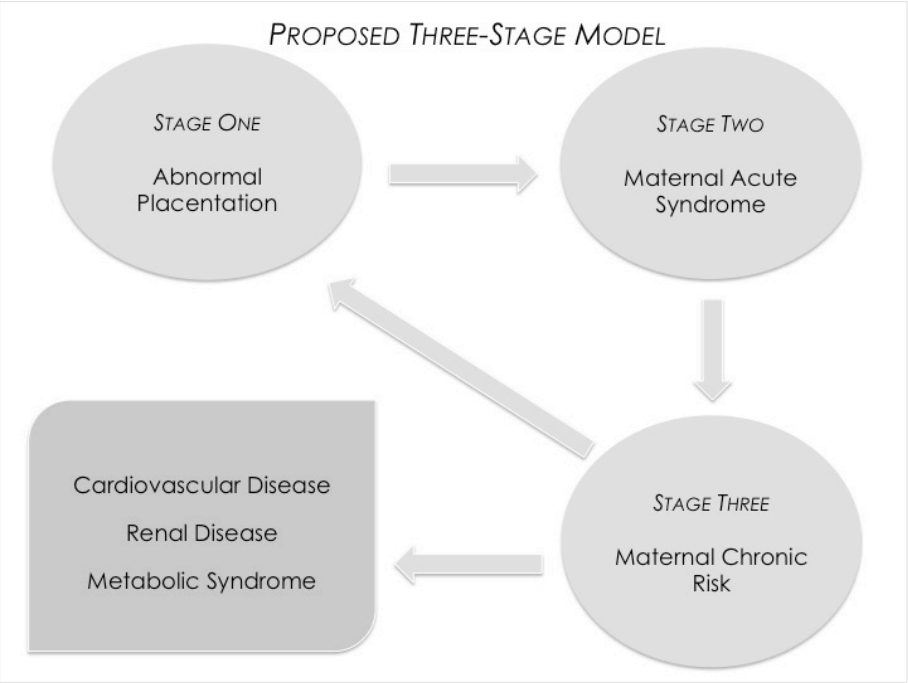
Ruth Landau, M.D.
University of Washington Medical Center

Objectives: to review the most recent literature related to preeclampsia focusing on three specific research avenues:

- Genomics & epigenetics (basic research)
- Biomarkers & predictors with potential for intervention (translational research)
- Long term consequences for the mother and offspring (epidemiological studies)

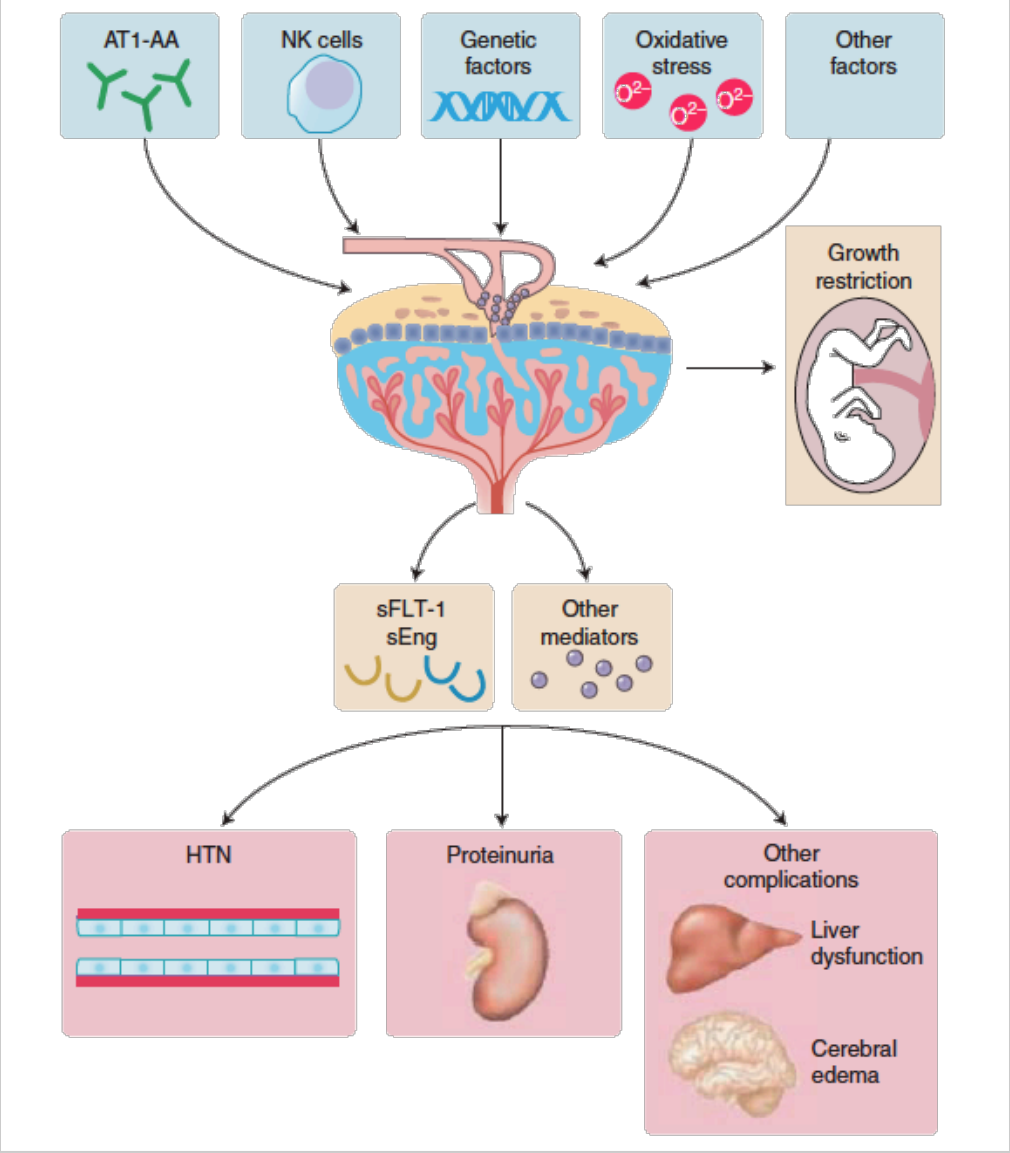
Summary:
Preeclampsia has been named decades ago the 'disease of theories'. Suffice is to say that 28,125 publications on preeclampsia have been published since 1914 which attests the fascination the medical community has for this disease.

Multiple pathophysiologic factors have contributed to establish the classic conceptual model of a two-stage process: *STAGE ONE* is characterized by abnormal placentation and vascular remodeling, *STAGE TWO* is the subsequent maternal syndrome characterized by endothelial injury and activation. Long believed to be a disease that resolves with delivery and is cured after, a *THIRD STAGE* has been more recently proposed, based on epidemiological studies that show an increased risk for cardiovascular morbidity and mortality, as well as renal failure in women who gave birth with a diagnosis of preeclampsia. The premise that offsprings of mothers with preeclampsia are also at increased risk for later life metabolic syndrome is currently also explored.

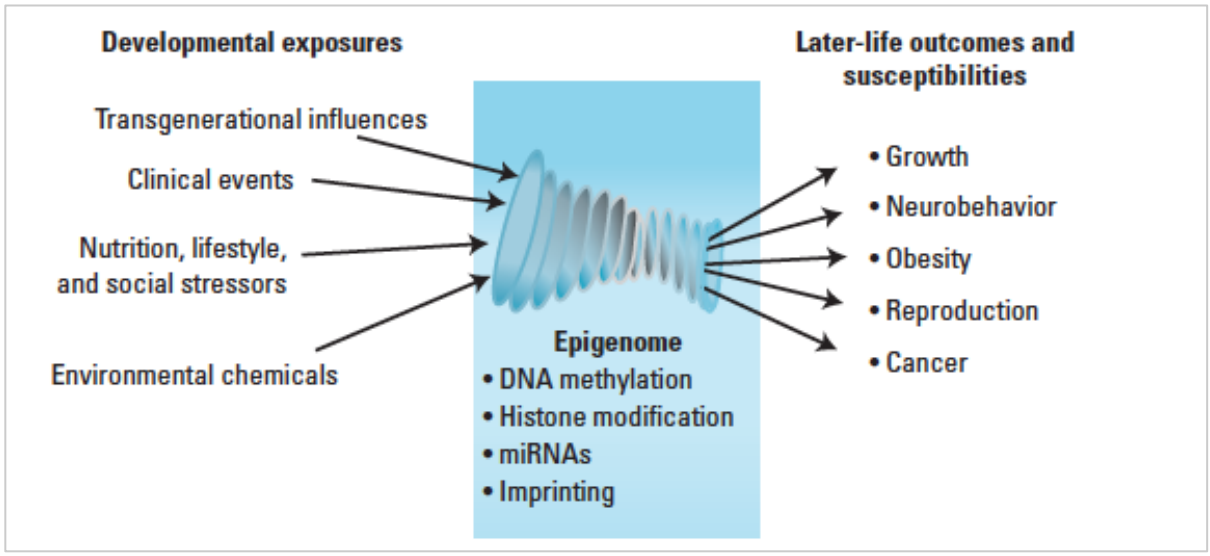


In normal pregnancy, the uterine spiral arteries that supply the intervillous space undergo extensive remodeling in association with trophoblast invasion. Their vascular luminal diameter is increased four-fold, and smooth muscle is absent from the vessel wall, creating a low-resistance vascular system to supply the placenta.

In preeclampsia, arterial remodeling is inadequate and limited to the superficial decidua, rendering the system more resistant to blood flow and subject to vascular reactivity, thereby limiting placental perfusion and increasing placental oxidative stress. Angiogenic and vasodilatory factors normally secreted by invading trophoblasts are abnormal in preeclampsia as well, thereby limiting the normal physiologic adaptation to pregnancy. Placental hypoxia/ischemia alone may not be sufficient to cause preeclampsia and other factors concur to result in placental dysfunction, and various pathways have been proposed (immune factors, genetic factors, oxidative stress). Anti-angiogenic factors produced by the placenta (s-Flt1 and s-Eng) have been extensively studied in recent years as potential biomarkers and an promising approach for preeclampsia treatment.



The premise that *in utero* exposure or 'genetic imprinting' with decreased uterine perfusion, exposure to anti-angiogenic factors and systemic endothelial dysfunction from the 2nd trimester onwards, will result in later life changes in blood pressure in the offspring have been examined in animal models and also humans. Besides the increase in blood pressure, early changes in endothelial function have been observed in young adults born to a pre-eclamptic pregnancy. In addition, *in utero* exposure to anti-angiogenic factors and endothelial dysfunction is thought to alter the programing of multiple systems, resulting in more than a simple rise in blood pressure and alteration of cardiovascular function, such that the following systems could potentially all be affected: the sympatho-adrenal and autonomic nervous function, kidney and renal function, immune function and pro-inflammatory pathways. Last but not least, sex-specific changes have been suggested, such as male born to preeclamptic mothers may be more affected than females (at least in animals).



Key points

- Epidemiological studies underscore that pre-eclampsia is not just a disease of pregnancy that resolves with delivery. In fact, pre-eclampsia may be considered a 'risk marker' for later-life diseases, including cardiovascular and renal diseases and metabolic syndrome in the mother.
- Epigenetic regulation is key for placental development and disturbed placental epigenetics is involved in the pathogenesis of pre-eclampsia, with in impact not only in the development of the syndrome with maternal and fetal consequences, but also disease susceptibility in later life for both mother and offspring.
- Anti-angiogenic factors and endothelial dysfunction provide the potential for biomarkers that could allow early prediction and detection of pre-eclampsia, and a novel promising target for therapeutic strategies.

Key references

- Boekelheide K, Blumberg B, Chapin RE, et al. Predicting later-life outcomes of early-life exposures. Environ Health Perspect 2012;120:1353-61.
- Mousa AA, Cappello RE, Estrada-Gutierrez G, et al. Preeclampsia is associated with alterations in DNA methylation of genes involved in collagen metabolism. Am J Pathol 2012;181:1455-63.
- Davis EF, Newton L, Lewandowski AJ, et al. Pre-eclampsia and offspring cardiovascular health: mechanistic insights from experimental studies. Clin Sci (Lond) 2012;123:53-72.
- Bahado-Singh RO, Akolekar R, Mandal R, et al. First-trimester metabolomic detection of late-onset preeclampsia. Am J Obstet Gynecol 2013;208:58 e1-7.
- Cha J, Sun X, Dey SK. Mechanisms of implantation: strategies for successful pregnancy. Nat Med 2012;18:1754-67.
- Gaugler-Senden IP, Tamsma JT, van der Bent C, Kusters R, Steegers EA, de Groot CJ. Angiogenic factors in women ten years after severe very early onset preeclampsia. PLoS One 2012;7:e43637.
- McElrath TF, Lim KH, Pare E, et al. Longitudinal evaluation of predictive value for preeclampsia of circulating angiogenic factors through pregnancy. Am J Obstet Gynecol 2012;207:407 e1-7.
- Skjaerven R, Wilcox AJ, Klungsoyr K, et al. Cardiovascular mortality after pre-eclampsia in one child mothers: prospective, population based cohort study. Bmj 2012;345:e7677.
- Staff AC, Benton SJ, von Dadelszen P, et al. Redefining Preeclampsia Using Placenta-Derived Biomarkers. Hypertension 2013.
- Verdonk K, Visser W, Russcher H, Danser AH, Steegers EA, van den Meiracker AH. Differential diagnosis of preeclampsia: remember the soluble fms-like tyrosine kinase 1/placental growth factor ratio. Hypertension 2012;60:884-90.
- Brown MC, Best KE, Pearce MS, Waugh J, Robson SC, Bell R. Cardiovascular disease risk in women with pre-eclampsia: systematic review and meta-analysis. Eur J Epidemiol 2013;28:1-19.
- Myatt L, Clifton R, Roberts J, et al. Can changes in angiogenic biomarkers between the first and second trimesters of pregnancy predict development of pre-eclampsia in a low-risk nulliparous patient population? Bjog 2013.
- Cerdeira AS, Karumanchi SA. Angiogenic factors in preeclampsia and related disorders. Cold Spring Harb Perspect Med 2012;2.

Program Material

Wednesday, April 24, 2013

Transthoracic Echocardiography Workshop
Course Directors: Brendan Carvalho, M.B.B.Ch., FRCA, M.D.C.H.; John T. Sullivan, M.D., M.B.A

Objectives:
Following this workshop, attendees will be able to:

1. Review the basic physics principles underlying the application of ultrasound imaging
2. Demonstrate basic proficiency in obtaining 2-D transthoracic ultrasound images of the heart, lung and vena cava as a part of the point-of-care, goal directed echocardiographic examination of the obstetric patient
3. Provide qualitative assessment of global cardiac function, valvular function, and intravascular volume status
4. Identify the presence of pneumothoraces and pericardial or pleural effusions
5. Recognize the applications and limitations of bedside TTE performed by the obstetric anesthesiologist and the appropriate indications for a formal cardiology consult

Summary: The use of focused, point-of-care, transthoracic echocardiography (TTE) is gaining recognition as a safe, non-invasive method for obtaining useful physiologic data in the critically ill patient. Anesthesiologists routinely use transesophageal echocardiography in anesthetized patients and employ surface ultrasound to assist in the placement vascular access catheters and regional anesthetics. TTE offers another opportunity for anesthesiologists to support clinical decision making including in the domain of obstetrics where the majority of patients are conscious with neuraxial anesthetic techniques, and TEE probe placement is not feasible. As with TEE, the skill set required to effectively employ TTE encompasses both image acquisition and interpretation.

Image Acquisition
Image acquisition of thoracic structures using surface ultrasound presents some challenges. As compared with TEE, the TTE probe is not stabilized and acoustic signal coupling can be compromised by the bony anatomy such as the ribs and sternum, as well as the air-filled pleura.

Interpretation
Competency in interpreting echocardiographic images has been categorized as emergency and levels 1-3. This range represents a continuum of escalating expertise.[1] The purpose of this workshop is to provide a basic overview of TTE application in obstetrics and an opportunity for limited practical experience in image acquisition and interpretation in the domain of emergency and level 1 examination.

Lower domain TTE interpretation emphasizes qualitative over quantitative evaluation. Anatomic and physiologic elements examined may include left and right ventricular systolic function, myocardial wall thickness, ventricular and atrial chamber size, inferior vena cava diameter and plasticity, and bilateral pleura.[2] These findings can be correlated with the clinical context and applied immediately to decision making. As this a new and developing application of an ultrasonography, there are limited data to link its use to improved outcomes. Those that advocate for its wider dissemination cite non-invasiveness and low-cost as obvious benefits and believe that it increases the accuracy of clinical assessment and guides further diagnostic work-up.[3] Caution is warranted in recognizing the limits of one's capabilities within the construct of the tiered competencies.

Potential Applications in Obstetrics
Within the domain of obstetric s, the most obvious application of its use includes evaluating unexplained hypotension. Other possible applications include guiding management during hemorrhage, pulmonary embolus/cor pulmonale, peripartum cardiomyopathy and perhaps severe preeclampsia. During hemorrhage, TTE can be used to assess adequacy of resuscitation. Severe cases of pulmonary embolism manifest with obvious right heart failure. Preeclampsia has been defined as a very heterogeneous clinical entity with widely variable CVP and cardiac output.[4] This, of course, occurs in the setting of vulnerability to pulmonary and cerebral edema, stroke and renal failure which may make guided fluid management decisions more valuable. In addition, the ability to conduct TTE in high-risk cardiac patients, determine volume status in peripartum hemorrhage or preoperatively screen obstetric patients may prove to be very beneficial for patient care and safety in the obstetric setting.

There are limited data linking the use of TTE with improved clinical outcomes and currently none in the setting of obstetric management. In acute care settings, however, the value of this point-of-care ultrasound application has been reported to aid in more rapid patient assessment. In a randomized, controlled trial in the setting of emergency medicine, for example, immediate evaluation of non-trauma patients that presented with hypotension with TTE substantially narrowed the differential diagnosis as compared with delayed use of TTE.[5]

Equipment
Optimizing image acquisition with TTE requires knowledge of basic technical aspects of ultrasound and appropriate equipment selection. Ultrasonic probes vary in size and shape of their footprints, frequency domains and special features. For TTE, low frequency, phased array probes are preferred as they can optimize image clarity with small acoustic windows and a deep moving target. Phased array probes can be used with most standard ultrasound machines, and may or may not require software modification.

Machine Controls
Machine controls vary between different manufacturers. However, common features include image mode (M, 2-D, Color Flow and Doppler), focus depth, signal gain, recording and freeze functions, and a basic familiarity with these controls will help in optimizing image acquisition. Advanced features including cardiac calculations are beyond the scope of emergency and level 1 interpretation domains.

Standard TTE Views
Parasternal long axis- "Scout view"

Probe placement: Left parasternal border at approximately the 3-4th intercostal space

Index orientation: Toward right shoulder (10 o'clock)

Optimizing the window: Apex is present to the left for orientation; Identify longest, widest mid-chamber view of the LV.

Visible: RV, LV and septum; MV and AV in the same plane

Applications:

1. LV and RV cavity size, wall excursion
2. Good view of the pericardium, pericardial fluid
3. Screening view of the aortic and mitral valves (valve excursion)

Parasternal short axis

Probe placement: Left parasternal border at approximately the 3-4th intercostal space (rotate the probe 90 degrees from PSLA view)

Index orientation: Toward left shoulder (2 o'clock)

Optimizing the window: Level of papillary muscles; look for circular LV chamber, not elliptical

Visible: Segments of the LV in short axis from apex to base; MV, AV, papillary muscles

Applications:

1. Global LV and RV systolic function estimation
2. Septal size and kinetics
3. Volume status

Apical 4-chamber
Probe Placement: Inferior/ lateral to nipple

Index orientation: Toward left shoulder or side (2-3 o'clock)

Optimizing the window: Center apex and septum, look for large mid-chamber cuts of LV and RV

Applications:
1. Compare chambers side-by-side
2. Doppler in-plane across valves
3. Aortic outflow track visualized (apical 5-chamber view)

Subcostal (IVC View)
Probe placement: Sub-xiphoid or right subcostal, aimed cephalad directly or thru the liver

Index orientation: Left (3 o'clock) or cephalad (12 o'clock)

Optimizing view: Identify RA and tilt the probe right for IVC (look for respiratory variation, emptying into RA, hepatic vein)

Applications:
1. Assessing volume status by applying *M-Mode* to this image, one can observe respiratory variation in the IVC diameter which is a relatively sensitive measure of volume status.
2. Although the focus of lower tiered interpretation domain remains qualitative, practitioners may find these reference values helpful: [6]

IVC Measured	% Collapse	CVP (cmH20)
<1.5cm	>50%	0-5
1.5-2.5cm	>50%	5-10
1.5-2.5cm	<50%	10-15
> 2.5 cm	Little Phasicity	15-20

Chest Ultrasound
Ultrasound is reliable and convenient way of examining lung pathology and has been reported to be superior to chest radiography in detecting pneumothorax.[7]

Probe Placement: Linear or curvilinear probe placed in longitudinal (cephalad-caudad axis) perpendicular to the ribs

Index orientation: Cephalad (12 o'clock)

Optimizing the window: Observe pleura and lung parenchyma between the ribs in both 2D and M mode. Pleura are hyperechoic (sliding sign in 2D and pleural lines/seashore sign in M mode). A and B lines (increased in pulmonary edema) artifacts should be noted. With pneumothorax, there is absent sliding sign of the pleura and bar code (vs. seashore) sign. Pleural effusions and hemothorax may be observed in the most dependent part of the lung.

Applications:
1. Diagnosing pneumothorax, hemothorax and pleural effusions
2. Identifying pulmonary edema

References:
(Endnotes)

1. Oxorn D: Con: Physician-performed ultrasound: The time has come for routine physician use in acute care medicine. Anesth Analg 2012;105(5):1004-6
2. Holm JH: Perioperative Use of Focus Assessed Transthoracic Echocardiography (FATE). Anesth Analg 2012;105(5):1029-32
3. Vignon P: PRO: Physician-performed ultrasound: The time has come for routine use in acute care medicine. Anesth Analg 2012;105(5):999-103
4. Visser W: Central hemodynamic observations in untreated preeclamptic patients. Hypertension 1991;17:1072-7
5. Jones AE: Randomized, controlled trial of immediate versus delayed goal-directed ultrasound to identify the cause of nontraumatic hypotension in emergency department patients. Crit Care Med 2004;32: 1703–8
6. Kircher BJ: Noninvasive estimation of right atrial pressure from the inspiratory collapse of the inferior vena cava. Am J Cardiology 1990;66(4):493-96
7. Rowan KR: Traumatic pneumothorax detection with thoracic US: Correlation with chest radiography and CT - Initial experience. Radiology 2002;225:210-4.

Program Material

Thursday, April 25, 2013

Gertie Marx Research Competition
Moderator: Gerard Bassell, M.D.

Gertie Marx/ FAER Education Lecture: Maternal Morality in Resource-Poor Settings
Introduction: Barbara M. Scavone, M.D.
Speaker: Ndola Prata, M.D., M.Sc.

Oral Presentation 1
Moderator: Katherine W. Arendt, M.D.

Clinical Forum 1: “Evolving Practices”
Moderator: McCallum R. Hoyt, M.D., M.B.A

A Balanced View of the Use of General Anesthesia for Cesarean Delivery
Joy L. Hawkins, M.D.

Analgesia for External Cephalic Version
Carolyn Weiniger, M.D., B.Ch.

Internal Iliac Artery Balloon Occlusion for Placenta Accreta
Ashley M. Tonidandel, M.D., M.S.

Gertie Marx Research Competition
Moderator: Gerard Bassell, M.D.

Abstract GM 1

Longitudinal Maternal Risk Assessment for Severe Early-Onset Preeclampsia

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Introduction: Early identification of women at risk of severe early-onset preeclampsia(sPE) is a key aim in high-risk obstetrics(1). Conventional markers of the disease such as serum uric acid have been of uncertain value(2). Recent studies have shown that systemic vascular resistance(SVR) and blood levels of placental angiogenic/antiangiogenic factors(PlGF/sFlt) may assist in identifying these patients as early as 24 weeks gestation(3,4).

Methods: We followed 20 normotensive women at high risk of developing sPE from 20 weeks gestation until delivery/32 weeks. Risk was determined by the presence of 2 or more of: complex medical and/or obstetric history; abnormal integrated placenta screening at 14-22 weeks; abnormal uterine artery Doppler or abnormal placental shape/size at 16-20 weeks. Noninvasive hemodynamic monitoring using bioreactance technology(NICOM) was performed at 20-22, 24, 26, 28, 30, and 32-34 weeks. Blood samples for uric acid, PlGF and sFlt levels were taken concurrently; PlGF and sFlt levels were determined by ELISA. Receiver Operating Characteristics(ROC) analysis assessed the ability of SVR and biomarkers to predict sPE. Correlations were performed using Spearman's Correlation Coefficient.

Results: Six out of twenty(30%) women delivered <33 weeks with ACOG-defined sPE. The median gestational age at which hypertension developed was 28 weeks. These women had significantly higher SVR, uric acid and sFlt and lower PlGF at 24 weeks than those who remained normotensive. The area under the curve, 95% CI, p value, cut-off values, sensitivity and specificity of the ROC analysis to predict sPE at 24 weeks are presented in table 1. SVR and sFlt positively correlated in the sPE group prior to antihypertensive treatment(r=0.65, p=0.01). Uric acid correlated with both sFlt(r=0.65, p=0.003) and sFlt/PlGF ratio(r=0.54, p=0.02).

Discussion: Serum uric acid, sFlt, sFlt/PlGF ratio and SVR may all be used to identify normotensive pregnant women who will subsequently develop sPE. The correlation of uric acid with the angiogenic/antiangiogenic factors lends value to its use in identifying those in the preclinical phase of sPE. The correlation of SVR with sFlt prior to the onset of clinical sPE suggests a causal role for this protein, possibly by diminishing the vasodilator action of PlGF.

References: 1)Am J Obstet Gynecol 2007;196:363.e1-7; 2)Acta Obstet Gynecol Scand 2006;85:519-525; 3)Hypertension 2008;51:1020-1026; 4) Circulation 2012;125:911-919.

Abstract GM 2

A Randomized Double-Blinded Trial of the Effects of Bupivacaine-Induced Motor Blockade During the Second Stage of Labor

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Introduction: The purpose of this study is to examine the effects of bupivacaine on the length of the second stage of labor in nulliparous women. Specifically, we sought to answer the question of whether or not bupivacaine lengthened the second stage. Many researchers believe that the bupivacaine-induced motor blockade is the etiology of the lengthened labor patterns in women receiving epidural analgesia. Our study's primary outcome was the difference in duration of the second stage in women having epidural bupivacaine versus epidural fentanyl alone. And finally, prior studies in our institution have shown an increase of operative vaginal delivery in women with epidurals, and it was hypothesized that this increase was secondary to the motor blockade caused by epidural bupivacaine. Our current study probed this question by looking at the obstetrical outcomes in women who had epidural bupivacaine versus those who had epidural fentanyl alone.

Methods: 310 nulliparous women with labor epidurals undergoing induction of labor at Parkland Hospital were randomized at 8 cm cervical dilation to receive either: 0.125% bupivacaine with 2 mcg fentanyl/cc at 10 cc/hr, or fentanyl 10 mcg/cc at 10 cc/hr in a double-blinded randomized fashion. Break-through pain was treated with PCEA boluses of the patient's randomized epidural solution, and either group could receive nurse-administered meperidine boluses per protocol. Bromage scores, VAS scores, and incidence of pruritus were ascertained at baseline and at regular intervals. Obstetrical and neonatal outcome were recorded.

Results: Patient demographics were similar in both groups, and there was no difference in maternal co-morbidities. There was no difference in the mode of delivery. 73% in the bupivacaine group delivered via SVD versus 81% in the fentanyl-only group (P 0.09). The operative vaginal delivery rate was 12% in the bupivacaine group versus 8% in the fentanyl-only group (P 0.17). The cesarean section rate was 15% in the bupivacaine group and 12% in the fentanyl-only group (P 0.38). The mean duration of the second stage was 93 minutes in the bupivacaine group versus 83 minutes in the fentanyl-only group (P 0.17). There was no statistical difference in the VAS scores between the two groups, with an average VAS score of 2/10. There was a statistically significant difference in the Bromage scores, with the fentanyl-only group having more motor function (5/6 on the Bromage scale) up to 60 minutes after randomization (P 0.03). There was no difference in low Apgar scores, admission to NICU, or naloxone administration.

Discussion: While epidural bupivacaine does cause motor blockade in laboring women, the duration of the second stage of labor was not lengthened. Neither obstetric nor neonatal outcomes were different in women who received epidural bupivacaine during the second stage from those who did not. Patient satisfaction was high overall (84-88%), irrespective of randomization.

Abstract GM 3

Carbetocin at Elective Cesarean Delivery: A Randomized Controlled Trial to Determine the Effective Dose, Part 3-Final

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Introduction: Carbetocin has been recommended as the preferred uterotonic at elective cesarean delivery (CD) by the Society of Obstetricians and Gynecologists of Canada since 2009 (1).Its main advantage is a longer half-life compared to that of oxytocin (40 min vs. 4-10 min) (2). A systematic review comparing carbetocin 100 mcg with variable doses of oxytocin at CD showed a reduction in the need for additional uterotonics with carbetocin, but no difference in the incidence of postpartum hemorrhage or side effects (3). Two previous dose-finding studies of carbetocin at elective CD, with doses varying from 20 to 120mcg, have shown similar efficacy across all doses (4,5). We aimed to determine the minimum effective dose of carbetocin (ED90) at elective CD.

Methods: We conducted a randomized, double-blind, dose-finding study of carbetocin. Inclusion criteria were ASA I/II women undergoing elective CD under spinal anesthesia. Carbetocin was administered intravenously over 1 minute upon delivery of the fetus. The obstetrician assessed the uterine tone at one-minute interval for 5 minutes and then at his/her discretion until the end of surgery and decided on the need for additional uterotonic. The dose of carbetocin for each patient was determined according to a biased coin up-and-down sequential allocation scheme designed to cluster doses close to ED90. The initial dose was 10 mcg, with increments/decrements of 5 mcg. The anesthesiologist, obstetrician and patient were blinded to the study dose. The primary outcome was the need for additional uterotonic intraoperatively, in which case the treatment was considered a failure. Secondary outcomes included use of additional uterotonic agents within 24 hours of the completion of surgery, estimated blood loss and side effects. Data analysis was done by the Dixon-Mood method for non-parametric data.

Results: Forty patients were recruited. The ED90 of carbetocin was calculated as 14.8 mcg (95% CI 13.7-15.8mcg). Thirty-seven patients did not require additional intraoperative uterotonics. Of the three patients that required additional uterotonic, one had received 15 mcg and two had received 10 mcg of carbetocin. Overall estimated blood loss using a hematocrit variation method was 785.6±402.8 ml. The overall incidence of hypotension was 37.5%.

Discussion: Our study shows that at elective CD, the ED90 of carbetocin is about 15mcg, which is less than one fifth of the currently recommended dose of 100 mcg. The lower incidence of hypotension in our study, as compared to 45-55% previously reported in other studies (4,5) may represent an advantage, however, this trend warrants confirmation in a larger study. Consideration should be given to the use of lower doses of carbetocin at elective CD.

References: 1) J Obstet Gynaecol Can 2009; 31:980-93; 2) Curr Ther Res 1990; 47: 528-540; 3) Cochrane database of systematic reviews 2012; 4:pCD005457; 4) Can J Anesth 2012; 59: 751-757; 5) SOAP 2012, abstract T-7

Abstract GM 4

Genetic Variants of Oxytocin Receptor Gene (OXTR), Morphine Use, Acute and Persistent Pain After Cesarean Delivery

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Background: It has recently been proposed that endogenous secretion of oxytocin during delivery and postpartum confers specific protection and explains the relatively low incidence of chronic pain after cesarean delivery compared with that occurring after other surgical procedures (1). To date, one study has reported the association of ABCB1 gene C3435T polymorphism and persistent pain after cesarean delivery (2). The aim of this study was to evaluate the effect of 3 SNPs previously identified on exon 3 of OXTR (3) on morphine use, acute and persistent pain after cesarean delivery.

Methods: This is a secondary analysis on a previously studied cohort of 620 women undergoing an elective cesarean delivery with a standardized spinal anesthetic (with 0.1mg morphine) (2). Post-operative pain was rescued with morphine iv PCA. Pain scores (VRPS 0-10) and nausea scores (0-10) were evaluated q4 for 24h. Persistent post-cesarean pain was evaluated by phone interview at 6 months. DNA isolated from venous blood was used, and exon 3 of OXTR was amplified by PCR and sequenced (Sanger method). Genetic variants and clinical outcomes were analyzed using one way ANOVA (SYSTAT 13, Chicago, IL, USA).

Results: The occurrence of 3 SNPs on exon 3 (rs2228485 C/T, rs468302 A/G, rs237902 C/T) was confirmed is this cohort; haplotype distribution revealed strong linkage disequilibrium (only 8/27 possible haplotypes, Fig). Morphine use, pain & nausea scores were significantly higher in women rs237902 CT or TT (19% of women) vs homozygotes for CC (Fig). There was no significant difference in morphine use between the 8 haplotypes (Fig). Persistent pain was present in 6% of women, and was not associated with any of the haplotypes or specific SNPs.

Discussion: Our findings suggest that rs237902 genotype of OXTR influences morphine use, pain scores and nausea after cesarean delivery. We could not demonstrate an effect of any haplotype or single SNP on the incidence of chronic pain. Further well-designed studies are needed to elucidate the effects of OXTR variants at the receptor, expression or transcription levels, and examine in large prospective cohorts whether OXTR haplotypes are associated with protection from chronic pain.

1. Anesthesiology 2013;118:143-51
2. Int J Obstet Anesth 2010;19:254-60
3. ASA 2010, Abstract A590

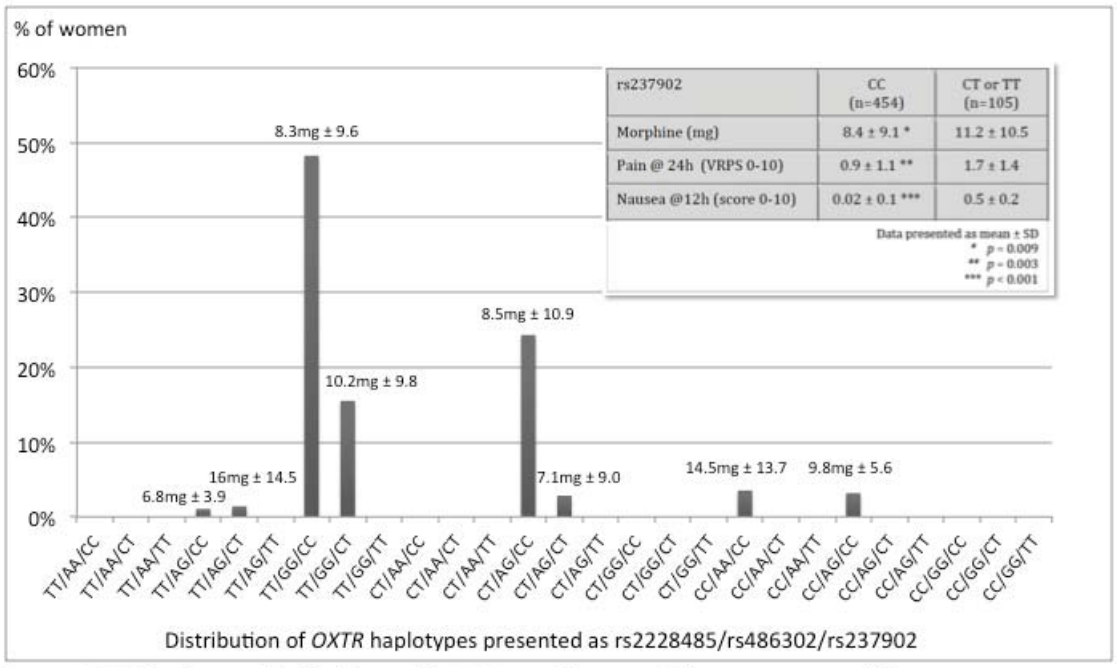

Figure. *OXTR* haplotype distribution and iv PCA morphine use 24h post-cesarean delivery.
Only 8 out of 27 possible haplotypes were found in this cohort, with a majority of women carrying TT/GG/CC (48%).
Post-cesarean morphine use during the first 24h is presented according to haplotype (value above the bar) in mg ± SD; there was no significant difference between groups (one way ANOVA).
Women homozygotes CC of rs237902 used less morphine than women CT or TT (19% of cohort) (data presented top right).

Abstract GM 5

Analysis of Dose Response of intravenous Anesthetic for Fetal Procedures

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Pre-natal procedures on fetuses are a relatively new phenomenon but with increasing successful outcomes they are increasing in demand in our institution. In one example of its utility is in the twin to twin transfusion syndrome which is known to have a perinatal loss ranging between 80-90%. During a fetal procedure, fetal immobility is of the utmost importance for success of the procedure and to avoid fetal injuries and complications. Even though remifentanil has been approved by the FDA for use during fetal procedures, there were only a handful of studies investigating its use in fetal procedures. One study showed that remifentanil is superior to local or regional anesthesia and another showed it was superior to diazepam. Both studies demonstrated that it produced excellent fetal immobility and maternal sedation safely. In Jackson Memorial Hospital it is the anesthetic of choice for fetal procedures and standard of care. Due to the scarcity of information in the literature, we have conducted a prospective clinical study to determine the minimum effective dose of Remifentanil required to achieve excellent fetal immobility during a fetal procedure using the Dixon and Massey up down sequential allocation method. A high resolution ultrasonographic examination of the gravid uterus was done to assess fetal activity prior to initiating the remifentanil infusions.

Forty eight pregnant females 18 yrs or older with no history of cardiac, renal or hepatic diseases scheduled to undergo a fetal procedure, were enrolled. Average age of our study population was 29 years, ranging from 47-20 years. Almost half (49%) of our patients were between 89-70 kg and 15% were more than 90kg. More than three quarters of the cases (77.8%); fetuses were noted to be active and only 22.2% had sluggish or low activity. Fetal movements were still present in 20 of 47 (43%) of the patients after the first 10 minutes, indicating a 57.4% (27/47) effective rate for the initial dose. Our study showed a mean effective remifentanil infusion of 0.097mcg/kg/min. The most rapid infusion required was 0.150mcg/kg/min and the least was 0.025mcg/kg/min. The resulting minimum effective remifentanil dose using the Dixon and Massey method was 0.085mcg/kg/min (95% CI 0.0599, 0.1095)

Studies have shown that fetoscopic surgeries performed successfully under local or regional anesthesia, did not result in excellent maternal sedation or fetal immobilization. Our study showed that we were able to achieve optimal surgical conditions by providing excellent fetal immobility and maternal sedation without a single case of fetal injury or maternal respiratory depression, with a minimum effective remifentanil dose of 0.085mcg/kg/min.

Abstract GM 6

A Randomized Controlled Study Assessing Bupivacaine Temperature on Epidural Labor Analgesia

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Introduction: Although labor epidural analgesia represents an effective form of pain relief, its slow onset and duration of satisfactory analgesia can be limitations. The administration of warmed, compared to room temperature, bupivacaine (0.5%) results in spinal or epidural blockade for cesarean delivery that has more rapid onset, more extensive distribution, and less need for supplementation. We hypothesized that similar advantages, for potentially the entire duration of labor, could be realized with an epidural analgesia technique using bupivacaine administered at body versus room temperature.

Methods: A total of fifty-four nulliparous women in labor were randomized to receive epidural bupivacaine (0.125% with fentanyl 2 mcg/mL) 20 mL at either body or room temperature (37°C or 20°C, respectively) followed by hourly 6 mL boluses of the same mix. Visual analog pain scores, sensory block level, oral temperature, and side effects were assessed after epidural loading (time 0), at 5, 10, 15, 20, 30, 60 minutes, and at hourly intervals. Analgesic onset was defined as time to achieve VAS ≤ 3. The study endpoint was vaginal delivery or decision to undergo cesarean delivery.

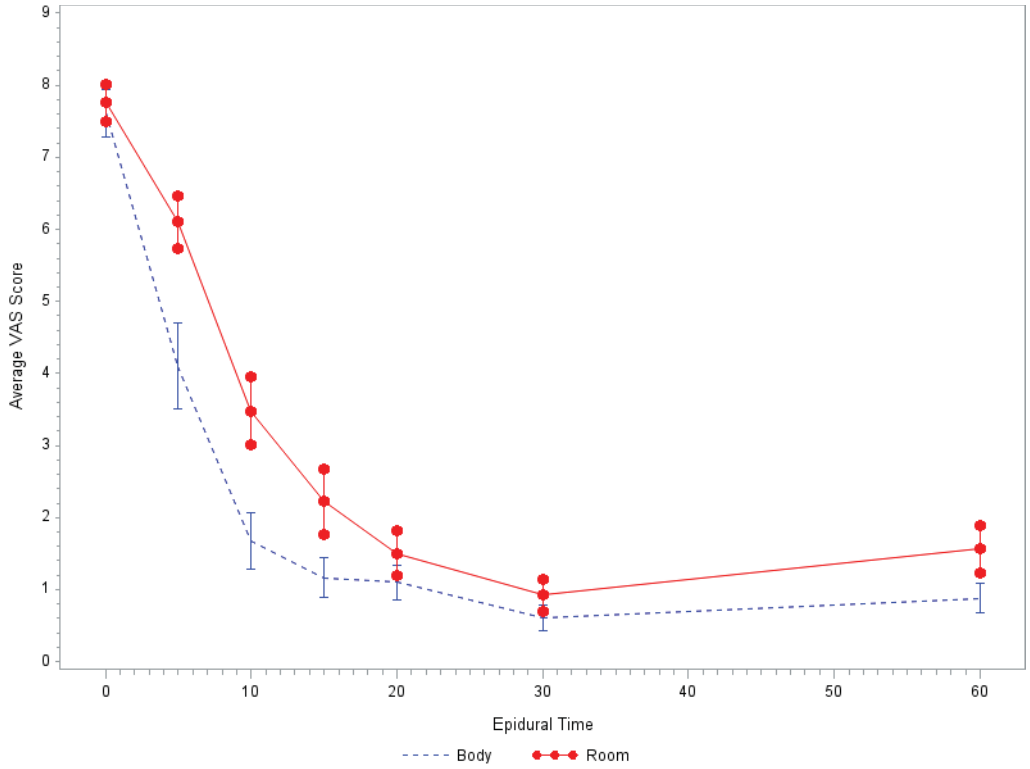
Results: Fifty women (25 in each group) completed the study. There were no differences between groups in patient demographics, initial pain scores, baseline temperature, or mode of delivery. Bupivacaine at 37°C resulted in shorter analgesic onset time (9.2±4.7 minutes vs. 16.0±10.5 minutes; p=0.005) and improved analgesia particularly in the first 15 minutes (Figure 1). Although patient temperature increased during the study (p<0.05), there was no difference between the 37° C and 20°C temperature groups (0.3°±0.8°F vs. 0.8°±1.0°F; p=0.09). Six (24%) and 10 (40%) patients experienced shivering in the 37°C and 20°C groups, respectively (p=0.23).

Discussion: The administration of epidural bupivacaine with fentanyl at 37°C versus 20°C resulted in faster onset and improved labor analgesia. Patient temperature increased during the study, with a trend towards a larger increase in the room temperature group. There were no differences in side effects between groups.

References:

1. Stienstra R, et al. Anesth Analg 1989.
2. Mehta PM, et al. Reg Anesth 1987.

Figure 1
Average visual analog scale (VAS) score for pain after epidural loading bolus as a function of time in minutes.



Gertie Marx/ FAER Education Lecture: Maternal Morality in Resource-Poor Settings

Speaker: Ndola Prata, M.D., M.Sc.

Objectives:

At the conclusion of this lecture the participants will be able to:

- Discuss the levels and rends of maternal mortality in resource poor countries.
- Recognize the challenges resource poor countries face in implementing morbidity and mortality reductions with existing health care workforce.
- List examples of interventions implemented in resource-poor countries to address task-shifting and sharing in obstetrics.
- Discuss areas where SOAP members can contribute to advance this important field in developing countries, especially Africa.

Summary:

Maternal mortality remains unacceptably high in resource-poor parts of the world, where many countries experienced little or no progress towards reduction in maternal mortality in the last two decades. In this part of the world a large number of women have limited or no accesses to obstetric care and deliver at home. The main obstetric causes of maternal mortality in resource-poor areas are hemorrhage, eclampsia, obstructed labor, unsafe abortion and sepsis. Women who reach health facilities to deliver or present with complications face delays in receiving care due to the lack of capacity of health facilities to respond to complications, including lack of trained personnel. To address the human resources crises, with most areas registering insufficient number of obstetricians and obstetric anesthesiologists, some countries have implemented task shifting and sharing for the provision of obstetric care. What this means is that mid-level providers such as clinical officers, midwives and mid-level anesthesiologists are trained to address all obstetric emergencies including surgery. For countries such as Mozambique and Ethiopia, results show that non-physicians can achieve similar maternal and newborn outcomes. In addition, retention of this group of mid-level providers seems easier to achieve, especially in rural areas where the turn-over of physicians is extremely high.

However, challenges still exist to maximize existing human capacity to improve health and newborn health outcomes. Mid-level providers are not trained in teams to address obstetric emergencies and most places lack updated clinical protocols for peripartum management.

Key points:

1. In countries with personnel crisis shifting and sharing tasks in obstetric emergencies can be the only short to medium term solution to improve maternal health outcomes.
2. Trained mid-level obstetric anesthesiologists are needed as they can play an important role in emergency response teams.
3. Developed countries professional associations can play and important role in the design of and implementation of training curricula for mid-level providers.

References:

1. Hogan MC, Foreman KJ, Naghavi M, Ahn SY, Wang M, Makela SM, Lopez AD, Lozano R, Murray CJ. Maternal mortality for 181 countries, 1980-2008: a systematic analysis of progress towards Millennium Development Goal 5. Lancet. 2010 May 8;375(9726):1609-23.

2. Khan KS, Wojdyla D, Say L, Gülmezoglu AM, Van Look PF. WHO analysis of causes of maternal death: a systematic review. Lancet. 2006 Apr 1;367(9516):1066-74.

3. Prata N, Passano P, Sreenivas A, Gerdts CE. Maternal mortality in developing countries: challenges in scaling-up priority interventions. Womens Health (Lond Engl). 2010 Mar;6(2):311-27.

4. Pereira C, Bugalho A, Bergström S, Vaz F, Cotiro M. A comparative study of caesarean deliveries by assistant medical officers and obstetricians in Mozambique. Br J Obstet Gynaecol. 1996 Jun;103(6):508-12.

5. Gessessew A, Barnabas GA, Prata N, Weidert K. Task shifting and sharing in Tigray, Ethiopia, to achieve comprehensive emergency obstetric care. Int J Gynaecol Obstet. 2011 Apr;113(1):28-31.

6. Wilson A, Lissauer D, Thangaratinam S, Khan KS, MacArthur C, Coomarasamy AA comparison of clinical officers with medical doctors on outcomes of caesarean section in the developing world: meta-analysis of controlled studies. BMJ. 2011 May 13;342:d2600.

Oral Presentation 1
Moderator: Katherine W. Arendt, M.D.

Abstract O1 1

Familial Clustering of Postpartum Hemorrhage in the Swedish Population

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Thomas Frisell, Ph.D. - Karolinska Institutet - Stockholm, Sweden
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Introduction: Postpartum hemorrhage (PPH) is the leading cause of maternal mortality worldwide. Whether there is an inherited predisposition to PPH has not, to our knowledge, been previously investigated.

Making use of national registers of birth and family relations, we explored familial clustering of PPH in the Swedish population. We also assessed whether clustering could be explained by familial sharing of known PPH risk factors.

Methods: We considered the deliveries of all full and half-siblings born in Sweden between 1997 and 2009. PPH was defined using diagnostic codes based on >1000 mL of estimated blood loss. Familial clustering of PPH was modeled using Alternating Logistic Regression, allowing pair-wise odds ratios to describe the within cluster correlations while at the same time estimating the effect of covariates on the outcome.

Results: In the eligible 466 580 deliveries, the overall risk of PPH was 4.4%. Odds of PPH were increased in women with a previous postpartum hemorrhage, both with the same partner (Odds ratio (OR)=4.0, 95% confidence interval (CI): 3.7, 4.3) and after partner change (OR=3.4, 95% CI: 2.8, 4.2). An affected sibling conferred higher odds of PPH in sisters (OR=1.5, 95% CI: 1.3, 1.8) as well as partners of brothers (OR=1.2, 95% CI: 1.1, 1.5).

Potential familial sharing of risk factors for PPH, including pre-pregnancy BMI, prolonged labor, induction of labor, postterm birth, and fetal size, did not substantially change these estimates of familial clustering.

Conclusion: There is a strong maternal influence on the predisposition to PPH, illustrated by recurrence in women irrespective of partner and by significant clustering in sisters. Lower odds of recurrence in women who change partners compared to those who don't and clustering in brothers also indicates some paternal influence.

These patterns suggest that the maternal influence on the risk of PPH is genetic and/or due to maternal specific environment shared, at least in part, by sisters. The paternal influence could be through a fetal genetic effect or environment shared by couples and brothers. Known risk factors for PPH did not influence estimates of familial clustering.

Clinically, these findings suggest that practitioners should assess family history when determining a woman's risk for PPH. Future research is needed to define the basis for the genetic predisposition to PPH.

Abstract O1 2

Advancing Obstetric Anesthesia Practice in a Tertiary Care Maternity in Romania: The Kybele Experience

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Mircea Onofriescu, M.D. - Cuza Voda Maternity - Iasi, Iasi
Alexandrina Caba, M.D. - Cuza Voda Maternity - Iasi, Iasi

Introduction: Despite joining the European Union in 2007, Romania continues to deal with many health care challenges. The practice of obstetric anesthesia is not different, with no uniform practices and a lack of standardized guidelines. Kybele (www.kybeleworldwide.org) is a 501 (c) (3) non-profit humanitarian organization founded in 2001 to promote safe childbirth worldwide through collaboration partnerships. In 2009 a Kybele team of obstetric anesthesiologists was invited by the Romanian Society of Anesthesia and the leadership of the Cuza Voda Maternity in Iasi, Romania, to establish a working partnership for improving childbirth practices. The Cuza Voda maternity in Iasi is a tertiary care obstetric center with the highest number of deliveries in Romania. In 2007, the Cesarean delivery (CD) rate was 36%, mostly done under general anesthesia. Between 2009-2011, Kybele teams of obstetric anesthesiologists, obstetricians and neonatologists visited Cuza Voda maternity once per year, working with the local physicians. We present the impact of the Kybele outreach program on obstetric anesthesia practice in this maternity unit.

Methods: The Kybele team spent one week each yearly visit, as hands-on workshops were organized for 10-15 anesthesiologists from the region, joining the anesthesiologists from Iasi. Neuraxial techniques for CD and labor analgesia were taught. The Kybele team also introduced the concept of changing the timing of prophylactic antibiotic administration to being before skin incision rather than after umbilical cord clamping and a small observational study was performed to evaluate this practice.

Results: Changes in anesthesia practice from pre-Kybele visit in 2007 are summarized in the table. The use of spinal anesthesia for CD increased from 19 % in 2007 to 78 % in 2011. Use of labor epidural analgesia however remains largely unchanged. The observational study involved 318 patients and found a numerically lower infection rate with pre-incisional compared with post-delivery antibiotic administration (12 % vs. 18 %).

Conclusions: The outreach program in Romania had a significant impact on the practice of obstetric anesthesia. Specifically, there was a change in anesthesia techniques for CD with the majority now being performed under spinal anesthesia. There was however no significant change in the number of labor epidurals, due to personnel and logistical problems. The practice of antibiotic administration also changed.

Table 1 : Number of Births, Delivery Mode and Anesthesia Technique - Cuza Voda Maternity, Iasi, Romania

	2007 (pre-Kybele)		2009		2010		2011	
Total Births (number / %)	6713	100	6818	100	6201	100	5186	100
Vaginal Deliveries (number / %)	4238	63.13	3868	56.73	3486	56.22	2853	54.99
Cesarean Deliveries (number / %)	2475	36.87	2950	43.27	2715	43.78	2334	45.01
General Anesthesia (number / %)	1969	79.56	1861	63.08	1202	44.27	504	21.59
Spinal Anesthesia (number / %)	481	19.43	1060	35.93	1500	55.25	1828	78.32
Epidural Anesthesia (number / %)	25	1.01	29	0.98	12	0.44	2	0.09
Labor Epidural (number / %)	188	4.43	220	5.69	195	5.6	175	6.13

Abstract O1 3

Transversus Abdominus Plane Block Improves Postoperative Analgesia for Cesarean Following Labor

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Heather Ballard, M.D. - Beth Israel Deaconess Medical Center - Boston, MA
Kavita Kantak, M.D. - WakeMed Health & Hospital - Raleigh, NC
Adrienne Kung, M.D. - Beth Israel Deaconess Medical Center - Boston, MA
Philip Hess, M.D. - Beth Israel Deaconess Medical Center - Boston, MA

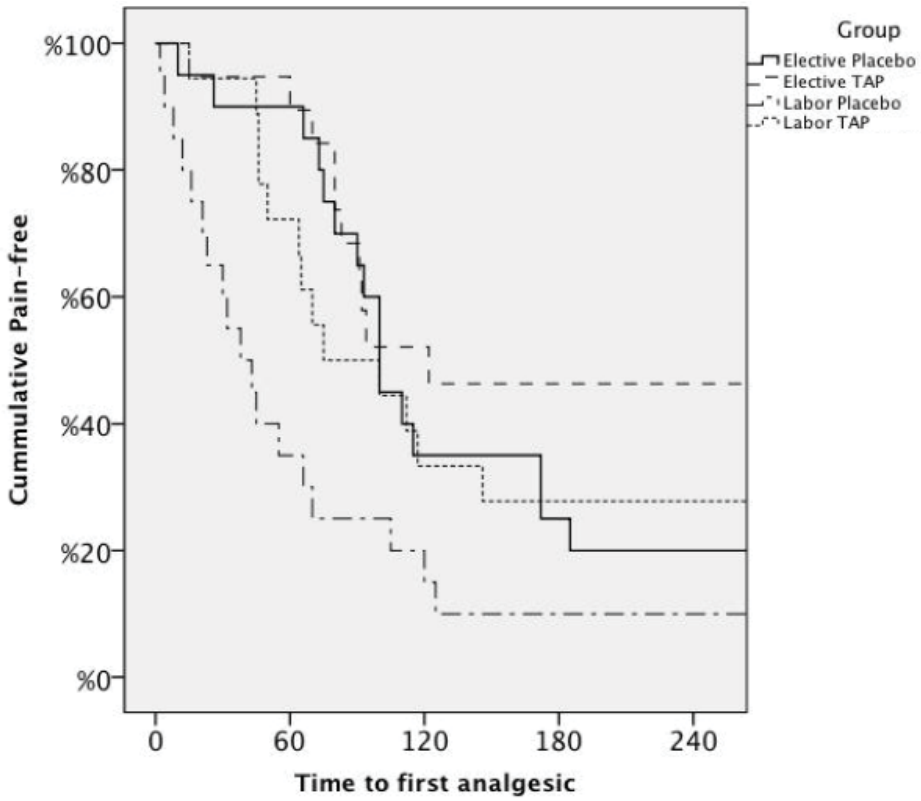
Background: Transversus abdominus plane (TAP) block alone has been demonstrated to be inferior to neuraxial morphine for postoperative pain relief following cesarean section. Additionally, preliminary studies have shown that TAP block as an adjunct to neuraxial morphine for scheduled cesarean does not improve postoperative pain relief. We hypothesized that laboring women who undergo cesarean have increased postoperative pain and the addition of a TAP block to our standard pain regimen would improve analgesia and decrease need for additional pain medications.

Methods: In this single-blinded, randomized controlled trial, 80 women undergoing cesarean section were enrolled to evaluate the added benefit of TAP block following neuraxial morphine. 40 women for elective cesarean and 40 women undergoing cesarean following labor were divided into a placebo group and a TAP group. An observer assessed the pain score and analgesic use over the next 24 hours. Total pain was the sum of all pain scores (area under the curve). The Mann-Whitney U test and the Kaplan Meier survival curve with log-rank analysis were used to analyze the results.

Results: Demographic and obstetric factors were similar within delivery groups. In women who underwent cesarean following labor, TAP block significantly increased median time to supplemental analgesic when compared to placebo (75min vs 38min, p=0.02). Pain scores at 2 hours and Total pain were higher in the Placebo group, and they were more likely to require fentanyl in the PACU (P=0.02). among women undergoing scheduled cesarean, we found no difference for first analgesic (122mins vs 100mins, p=0.46) or need for fentanyl in PACU. Only pain scores at 4 hours were higher in the Placebo group (P<0.01). Among all placebo subjects, laboring women were more likely to have higher pain scores, earlier first analgesic, required more intraoperative supplementation, and received fentanyl in the PACU (P<0.5 for all) compared to scheduled cesarean. These were not statistically different among the TAP subjects.

Conclusion: The addition of a TAP block to the standard neuraxial morphine effectively reduced postoperative pain in women who underwent cesarean following labor, but not in women who underwent elective cesarean section. Laboring women who received a TAP block had similar pain control to scheduled cesarean women.

Additional Files:



Abstract O1 4

Peripartum Subclinical Myocardial Ischemia Using Troponin T- an Observational Pilot Study

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Introduction: The most recent report from the Centre for Maternal and Child Enquiries (CEMACE) on maternal mortality in the United Kingdom found cardiac disease to be the most common cause of death amongst mothers (1). Identifiable risk factors that placed the women who died at greater risk of cardiac disease were common to many of the women. The prevalence of non-fatal myocardial ischemia amongst parturients is unknown. Troponin is the most sensitive biochemical marker of cardiac damage (2). Troponin levels are not elevated during normal pregnancy (2) and are not routinely monitored in the peripartum period. We set out to explore the prevalence of peripartum subclinical ischemia as evaluated by Troponin T levels in parturients measured within 24 hours of delivery.

Method: All women in our institution that gave birth to live infants either vaginally or by cesarean delivery, from June to September 2012, were considered eligible. After consenting to the study, participants were allocated to one of two groups, depending on if they were considered to be at high or low risk of subclinical myocardial ischemia. Inclusion criteria for the high-risk group included the following: Age > 35 years; morbid obesity (BMI >40); smokers; pre-existing hypertension or cardiac disease; severe pre-ecclampsia; HELLP syndrome; a family history of myocardial ischemia; pre-existing type I or II diabetes; post partum hemorrhage requiring transfusion or unplanned hysterectomy; and recent immigrants. All women that did not fulfill these criteria were considered to be at low risk for myocardial damage. Blood samples were collected 8 - 24 hours after delivery on the postnatal ward.

Results: A total of 201 women were approached of which 142 (70.6%) consented to the study. Two were excluded for technical reasons, and 59 declined to participate. Of the 140 included in the analysis, 91 (65%) women were considered at high risk and 49 (35%) at low risk of myocardial strain.

The mean Troponin T results for both the high and low risk groups were within the normal range of < 14 ng/L. Six women (4.3%) had an elevated Troponin T result. Two (2.2%) were from the high risk group, and 4 (8.2%) were from the low risk group. Only one patient experienced cardiovascular symptoms.

Discussion: The prevalence of subclinical myocardial strain in our study was 3.6%. The risk factors for this subclinical myocardial ischemia remain to be identified, as does the management plan following a positive result.

References:

1. Cantwell et al. Saving Mothers' Lives: Reviewing maternal deaths to make motherhood safer: 2006-2008. BJOG 2011 Mar 1;118 Suppl 1:1–203.
2. Shivvers SA, Wians FH, Keffer JH, Ramin SM. Maternal cardiac troponin I levels during normal labor and delivery. Am J Obstet Gynecol. 1999 Jan;180(1 Pt 1):122.

Efficacy of Ultrasound Guided Transversus Abdominis Plane Blocks for Post-Cesarean Section Analgesia: A Double Blind, Dose Comparison, Placebo Controlled Randomized Clinical Trial

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Background: The analgesic benefit of transversus abdominis plane (TAP) blocks for cesarean delivery (CD) pain remains controversial. We compared the analgesic efficacy of two doses of local anaesthetic TAP blocks after (CD).

Methods: Sixty women having CD under standardised spinal anesthesia were randomized to receive ultrasound guided TAP blocks with either high dose ropivacaine (3mg/kg), low dose ropivacaine (1.5 mg/kg) or placebo. Patients received bupivacaine 0.75% (10-12 mg), fentanyl (10 mcg) and morphine (150 mcg) and standard multimodal analgesia. The primary outcome was the difference in pain with movement using a numeric rating scale at 24h. Other outcomes included pain scores at 6, 12, 36, 48, 72 hours and at 6 and 12 weeks as well as time to first request for analgesics, opioid consumption, adverse effects, quality of recovery, and satisfaction.

Results: There were no differences between groups in the primary outcome. Mean (SD) pain scores with movement at 24 h were: high dose ropivacaine 3.6 (1.5), low dose ropivacaine 4.6 (2.1) and placebo 4.1 (1.7). With respect to secondary outcomes, the mean (SD) pain scores at 6 h were lower in the high dose group {2.0 (1.8)}, compared to the low dose {3.4 (2.7)} and placebo groups {4.2 (2.0)}, [p=0.009]. Pain scores at 12 h were also lower in the high dose group {2.2 (2.0)} compared to the low dose group {4.1 (2.7)} and placebo group {4.0 (1.3)} [p=0.011]. There was no difference in other outcomes between groups.

Conclusions: Neither high dose nor low dose TAP blocks as part of multimodal analgesia inclusive of intrathecal morphine improved pain scores with movement at 24h after CD when compared to placebo TAP blocks. However, high dose TAP blocks may improve pain scores up to 12h after CD.

Abstract O1 6

Complications of Continuous Intrathecal Catheters in Obstetric Patients

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Our institution takes care of a significant number of high risk obstetric patients. Therefore, it is a common practice to place intrathecal (IT) catheters in these patients (morbidly obesity, significant pulmonary/cardiac disease, difficult epidural catheter placement), or following accidental dural puncture (ADP).

After IRB approval, the medical records of all obstetric patients undergoing IT catheter placements from 2001 to 2012 were retrospectively identified from the Anesthesiology Quality Database and Medical records. The intrathecal catheters were placed for vaginal or cesarean delivery using 17G Tuohy needle and 20 G epidural catheters.

Results: A total of 761 patients had Intrathecal (IT) catheter placements during the study period. This included 110 intentional IT catheter placements and 651 accidental dural punctures (ADP group). Out of the 651 catheters, 634 catheters were placed intrathecally after noticing the dural punctures. The rest of the catheters (17) were presumed to be placed epidurally and later discovered to be intrathecal.

Over half (51%) of the 111 intentional catheters were placed due to morbid obesity (BMI 38-81 kg/m2). About 25% were placed following difficult epidural catheter placements or failed epidural catheters. The reason was not documented in 8% of patients (9). The rest of the catheters (17%) were placed in patients with significant cardiac, pulmonary disease, or anatomical abnormalities involving the spine.

Catheter Failures: A total of 45 IT catheters failed in this study. Therefore, the overall failure rate of IT catheters was 5.9% (45/761). The failure rate was 7.1 % in the intentional group (8) and 5.7% in the ADP group (37).

Respiratory Problems: Four patients in the ADP group had high block requiring intubation and ventilation.

Post dural puncture headache (PDPH): There were 312 patients (40.9%) who developed PDPH. Out of these 99 patients (31%) required epidural blood patch treatment. Therefore the epidural blood patch incidence was 13% (99/761).

Neurological problems: There were no cases of meningitis, arachnoiditis, cauda equina syndrome or epidural hematoma identified in this series. However, three patients from the ADP group did present with postpartum headache initially attributed to PDPH, but they were later diagnosed with neurological conditions unrelated to IT catheter placement.

Discussion: Intrathecal catheters are infrequently used in the obstetric patients due to fear of complications such as post dural puncture headache (PDPH), or more severe complications such as infection and neurological damage. However, no infections or neurological damage occurred in this series. Since IT catheter use can be an attractive option for parturients with certain comorbities, the relative risk of PDPH, which is a treatable condition, should be weighed against the many advantages of this neuraxial technique.

Clinical Forum 1: "Evolving Practices"

A Balanced View of the Use of General Anesthesia for Cesarean Delivery

Joy L. Hawkins, M.D.

Objectives:

1. Review the recent literature on complications of airway management.
2. Understand methods to predict and prevent airway complications.
3. Improve maternal and neonatal outcomes by reviewing the risks and benefits of regional versus general anesthesia on a case-by-case basis.

Summary: There will be clinical situations in an obstetric anesthesia practice where general anesthesia is the most appropriate choice and *should* be used. For example umbilical cord prolapse or hemorrhage with hemodynamic instability require emergent provision of surgical anesthesia. In these cases general anesthesia should not be avoided; the maternal mortality rate is only about 6.5 per million general anesthetics – a remarkable safety record.[1] Recent reports have shown that the incidence of failed intubation has been remarkably similar since first reported in 1985 (1:238-1:280). What *has* changed is that maternal mortalities are exceedingly rare in modern practice.[2] This probably relates to our use of difficult airway algorithms and rescue devices such as the laryngeal mask airway. In the ASA Closed Claims Project database, all cases of difficult intubation in obstetric patients resulting in liability occurred before 1999.[3]

A review of anesthesia-related complications associated with cesarean delivery found general anesthesia was more likely to be used when ASA status was ≥ 4 and the decision-to-delivery interval was < 15 minutes - our sickest patients and most emergent cases.[4] Yet even in these worst case scenarios, obstetric anesthesia is remarkably safe. As our obstetric patients become older and have additional co-morbidities, it is likely we will have more clinical situations where neuraxial anesthesia is relatively or absolutely contraindicated. Some examples might be a parturient with a recent thrombus or a mechanical heart valve who cannot be off anti-coagulation, women with a cardiac lesion that is preload-dependent such as pulmonary hypertension, or a morbidly obese woman who cannot lay supine on the operating room table. We can reassure these parturients we have the skills to provide their general anesthetic safely.

We try to provide neuraxial anesthesia for our obstetric patients whenever possible, but that may lead us to err on the side of inappropriately delaying induction of general anesthesia. The most recent ASA Closed Claims analysis found that when anesthesia delay was alleged in cases of newborn death or brain damage, one factor was inappropriately prolonged attempts to establish a neuraxial anesthetic.[5] Obstetric anesthesiologists also get sued for "minor" complaints such as emotional distress or pain during surgery. These cases are often related to an inadequate neuraxial block and the anesthesiologist's reluctance to convert to a general anesthetic. This is a disservice to the patient and may make her reluctant to have a regional anesthetic for surgery in the future.

Will general anesthesia become a common choice for elective obstetric anesthetics? No, because our patients and obstetricians prefer neuraxial techniques, and regional anesthesia has many benefits for the mother and newborn. General anesthesia should be neither widely used nor consistently avoided. When choosing the anesthetic for a cesarean delivery, we should be making individual assessments based on the patient's history, her preferences, and the immediate clinical situation rather than using a blanket approach of neuraxial anesthesia for every patient. Most women and most obstetricians will prefer neuraxial blocks, but both regional and general anesthesia can be safely provided if common sense and evidence-based medicine in the form of practice guidelines are used.

Key Points:

1. Adhere to basic safety principles whether providing general or regional anesthesia; maternal complications can occur with either technique.
2. There are emergent clinical situations when general anesthesia may be preferable for cesarean delivery. Evaluate on a case-by-case basis and do not cause unnecessary delays in delivery.
3. In the future, we are likely to see more maternal co-morbidities that make neuraxial techniques relatively or absolutely contraindicated.

References:

(Endnotes)

1 Obstet Gynecol 2011;117:69-74
2 Int J Obstet Anesth 2008;17:292-7
3 Anesthesiology 2009;110:131-9
4 Obstet Gynecol 2005;106:281-7
5 Anesthesiology 2009;110:8-9

Clinical Forum 1: "Evolving Practices"

Analgesia for External Cephalic Version

Carolyn Weiniger, M.D., B.Ch.

Objectives:

The objectives of this presentation are to review

1. The rationale for performing external cephalic version
2. Evidence regarding use of analgesia/anesthesia for external cephalic version
3. External cephalic version and analgesia; should it be universal policy?
4. Cost-effectiveness of analgesia for external cephalic version

Introduction:

Vaginal delivery of a fetus in a non-vertex (breech) presentation is currently discouraged for perceived reasons of fetal safety, hence the widespread use of cesarean delivery for breech presentation. This is not ideal, as vaginal delivery of a fetus in vertex presentation is associated with lower maternal and fetal morbidity than is cesarean delivery. Furthermore, pregnancies
after cesarean delivery expose mother and fetus to additional risks of uterine rupture, urgent repeat cesarean delivery, and abnormal placentation including placenta percreta. (1-5) Successful external cephalic version (ECV) performed prior to delivery will enable attempted vaginal delivery.

Increasing the success of external cephalic version:

If the outcome considered is successful external cephalic version, there are various parameters associated with increased success including gestational age, position of placenta, use of analgesia (6). If the outcome to be considered is actual vaginal delivery, successful ECV does not guarantee this, although the chances are very high. (7)

Neuraxial techniques and external cephalic version:

Neuraxial anesthesia has been demonstrated to increase the success rate of ECV. Analgesia (for example a mini-dose spinal) has not been consistently shown to be effective. The complications are minimal although studies are not large enough to demonstrate harm if this technique were to be routinely applied for all ECV procedures. (6, 8-11).

Mandatory external cephalic version?

Cesarean delivery is a foregone conclusion in most cases when the fetus is breech presenting, with current practice. Citing fear of failure, pain or logistical issues, ECV is not routinely offered or accepted by all women. (12,13) Furthermore, there may be contraindications to performing ECV. (14) Thus despite evidence that successful ECV significantly raises the chance of successful vaginal delivery, it is not applied uniformly as a measure of reducing the CD rate when the fetal presentation is breech.

Cost:

Previous data calculating costs of ECV prior to normal delivery, showed a cost benefit over cesarean delivery for an expected ECV success rate of 50%. (15,16)

Key points:

1. Successful external cephalic version enables women with a breech presenting fetus to attempt vaginal delivery.
2. Following successful ECV, women will have a high chance of successful vaginal delivery.
3. Several adjuncts are described to improve ECV success rates. One of the most effective is neuraxial analgesia/anesthesia.
4. Obstacles, including logistics and fear impede universal implementation of ECV performance in women without risk factors for the procedure.
5. External cephalic version is cost effective compared with automatic CD for the breech presenting fetus when the expected success rate of ECV is above 50%

References

1. ACOG Committee on Obstetric Practice. ACOG Committee Opinion No. 340. Mode of term singleton breech delivery. Obstet Gynecol 2006; 108: 235-7.
2. Jackson N, Paterson-Brown S. Physical sequelae of caesarean section. Best Pract Res Clin Obstet Gynecol 2001; 15: 49-61.
3. Kolas T, Saugstad OD, Daltveit AK, Nilsen ST, Oian P. Planned cesarean versus planned vaginal delivery at term: comparison of newborn infant outcomes. Am J Obstet Gynecol 2006; 195: 1538-43.
4. Silver RM, Landon MB, Rouse DJ et al. National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. Maternal morbidity associated with multiple repeat cesarean deliveries. Obstet Gynecol 2006; 107: 1226-32.
5. Kennare R, Tucker G, Heard A, Chan A. Risks of adverse outcomes in the next birth after a first cesarean delivery. Obstet Gynecol 2007; 109: 270-6.
6. Cluver C, Hofmeyr GJ, Gyte GM, Sinclair M. Interventions for helping to turn term breech babies to head first presentation when using external cephalic version. Cochrane Database Syst Rev. 2012 Jan 18;1:CD000184. Review.
7. Bogner G, Xu F, Simbrunner C, Bacherer A, Reisenberger K. Single-institute experience, management, success rate, and outcome after external cephalic version at term. Int J Gynaecol Obstet 2012 ;116(2):134-7.
8. Weiniger CF, Ginosar Y, Elchalal U, Sela HY, Weissman C, Ezra Y. Randomized controlled trial of external cephalic version in term multiparae with or without spinal analgesia. Br J Anaesth 2010;104:613-8.
9. Sullivan JT, Grobman WA, Bauchat JR et al. A randomized controlled trial of the effect of combined spinal-epidural analgesia on the success of external cephalic verison for breech presentation. Int J Obstet Anesth 2009;18: 328-34.
10. Weiniger CF, Ginosar Y, Elchalal U, Sharon E, Nokrian M, Ezra Y. External cephalic version for breech presentation with or without spinal analgesia in nulliparous women at term: a randomized controlled trial. Obstet Gynecol 2007; 110: 1343-50.
11. Sultan P, Carvalho B. Neuraxial blockade for external cephalic version: a systematic review. Int J Obstet Anesth. 2011 ;20(4):299-306.
12. Yogev Y, Horowitz E, Ben-Haroush A, Chen R, Kaplan B. Changing attitudes toward mode of delivery and external cephalic version in breech presentations. Int J Gynaecol Obstet 2002; 79(3): 221-4.
13. Caukwell S, Joels LA, Kyle PM, Mills MS. Women's attitudes towards management of breech presentation at term. J Obstet Gynaecol 2002; 22(5): 486-8.
14. Rosman AN, Guijt A, Vlemmix F, Rijnders M, Mol BW, Kok M. Contraindications for external cephalic version in breech position at term: a systematic review. Acta Obstet Gynecol Scand. 2012 Sep 19. doi: 10.1111/aogs.12011. [Epub ahead of print]
15. James M, Hunt K, Burr R, Johanson R. A decision analytical cost analysis of offering ECV in a UK district general hospital. BMC Health Serv Res. 2001;1:6
16. Tan JM, Macario A, Carvalho B, Druzin ML, El-Sayed YY. Cost-effectiveness of external cephalic version for term breech presentation. BMC Pregnancy Childbirth 201021;10:3.

Clinical Forum 1: "Evolving Practices"

Internal Iliac Artery Balloon Occlusion for Placenta Accreta

Ashley M. Tonidandel, M.D., M.S.

Objectives:

1. Discuss the indications for interventional radiology involvement in cases of placental abnormalities
2. Consider the potential risks and benefits of internal iliac artery balloon occlusion
3. Review anesthetic considerations for placenta accreta

Summary: The incidence of placenta accreta is rising in parallel with the cesarean delivery rate, and now occurs in an estimated 1 in 533 pregnancies.[1] Maternal morbidity is substantially higher for parturients with accreta, including risk of ureteral injury, pulmonary embolism, intensive care unit (ICU) admission, and need for reoperation.[2] Blood loss during delivery for these patients can average 3,000-5,000 mL, with 40% requiring more than 10 units of packed red cells.1 Optimal management strategies for placenta accreta vary by institution and circumstance, but should generally include planned preterm cesarean hysterectomy without attempted placenta removal. The most recent ACOG committee opinion published in July 2012 also recommends prophylactic antibiotics with repeat dosing every 2-3 hours or with 1,500 mL of blood loss and preoperative placement of ureteral stents to help prevent inadvertent urinary tract injury.1 Antepartum transfer to a multidisciplinary care center is suggested if possible based on a large retrospective cohort study showing improved outcomes compared to standard obstetric care. Multidisciplinary tertiary care centers were defined as institutions with 24 hour in-house obstetricians, anesthesiologists, fully stocked blood banks, immediate availability of a gynecologic oncologist, and interventional radiology.[3]

The specific role of interventional radiology in the management of placenta accreta is still controversial. Typically, when used preoperatively, interventional radiologists will place occlusive balloon catheters in the internal iliac arteries with the goal of decreasing blood flow to the uterus. Theoretically, inflation of the balloons after delivery allows surgery to be performed under more controlled circumstances with less profuse hemorrhage. Case studies suggested that this strategy could safely reduce intraoperative blood loss and transfusion requirements.[4] Unfortunately, these results have yet to be duplicated in prospective trials, and larger case-controlled studies have described no benefit. For example, Shrivastava and colleagues retrospectively compared 19 subjects that had balloon catheters plus hysterectomy with 50 subjects that underwent hysterectomy alone. Estimated blood loss, operative time, and length of stay were not statistically different between groups, with both groups averaging at least 8 units of blood.[5] Pelvic collateral vessels may vary widely from patient to patient and likely contribute to reduced utility of balloon occlusion for some individuals. Significant complications from temporary balloon catheters are also surfacing in the literature, including acute limb ischemia, arterial thromboses, and pseudoaneurysm formation.[6] Currently, ACOG believes that "current evidence is insufficient to make a firm recommendation on the use of balloon catheter occlusion…, but individual situations may warrant their use."1 Examples of such situations include extensive organ involvement or the desire to preserve fertility.

The future of interventional radiology for routine cases of accreta is unclear, but current practice dictates that anesthesiologists be prepared to manage the unique challenges of abnormal placentation. The timing and decision to use regional or general (or a combination), can be debated with vigor and validity from both sides.[7] Invasive monitoring with arterial lines may be indicated, and central access may be considered to assess volume status and allow for massive resuscitation if peripheral access is not adequate. The blood bank should be alerted of the potential for massive hemorrhage, and a massive transfusion protocol should be followed, with packed cells and thawed plasma readily available. Cell salvage systems may also be an option at some institutions.1 The location of the cesarean section should be decided, with some institutions preferring to perform the actual delivery in an interventional radiology suite if adequate resources for surgery, neonatal care, and trauma resuscitation are available.[8] For the increasing number of women with abnormal placentation, successful outcomes will require an individualized, multidisciplinary team approach with a shared mental model. As with other obstetric crises, checklists, team meetings, and simulated "rehearsals" are likely to identify system problems and improve communication among team members to optimally manage patients with placenta accreta.

1. ACOG Committee Opinion Number 529: Placenta Accreta. *Obstetrics & Gynecology* July 2012;120:207-11.
2. Silver RM et al. Maternal morbidity associated with multiple repeat cesarean deliveries. *Obstetrics & Gynecology* 2006;107:1226-32.
3. Eller AG et al. Maternal morbidity in cases of placenta accreta managed by a multidisciplinary care team compared with standard obstetric care. *Obstetrics & Gynecology* 2011;117:331-7.
4. Tan CH et al. Perioperative endovascular internal iliac artery occlusion balloon placement in management of placenta accreta. *American Journal of Roentgenology* 2007;189:1158-63.
5. Shrivastava V et al. Case-control comparison of cesarean hysterectomy with and without prophylactic placement of intravascular balloon catheters for placenta accreta. *American Journal of Obstetrics & Gynecology* 2007;197:402.e1-5.
6. Greenberg JI et al. Prophylactic balloon occlusion of the internal iliac arteries to treat abnormal placentation: a cautionary case. *American Journal of Obstetrics & Gynecology* 2007;197:470.e1-4.
7. Fuller AJ et al. Epidural anesthesia for elective cesarean delivery with intraoperative arterial occlusion balloon catheter placement. *Anesthesia & Analgesia* 2006;102:585-7.
8. O'Rourke N et al. Cesarean delivery in the interventional radiology suite: A novel approach to obstetric hemostasis. *Anesthesia & Analgesia* 2007;104:1193-4.

Program Material

Friday, April 26, 2013

Best Paper Session
Moderator: Jill M. Mhyre, M.D.

What's New in OB?
The Obstetrician's Perspective: Obstetrical Directions in the Near Future
Introduction: Vilma E. Ortiz, M.D.
Speaker: Michael Greene, M.D.

What's New in OB Medicine?
The Cardiologist's Perspective: Peripartum Cardiomyopathy
Introduction: John T. Sullivan, M.D., M.B.A
Speaker: Dennis McNamara, M.D.

Best Paper Session
Moderator: Jill M. Mhyre, M.D.

Abstract BP 1

Role of Hypertension Genetic Factors in Susceptibility to Preeclampsia

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Hooman Mirzakhani, M.D. - Massachusetts General Hospital - Boston, MA
Kathryn Gray, M.D., Ph.D. - Brigham and Women's Hospital - Boston, MA
Vesela Kovacheva, M.D. - Brigham and Women's Hospital - Boston, MA
Brendan Keating, Ph.D. - University of Pennsylvania - Philadelphia, PA
Richa Saxena, Ph.D. - Massachusetts General Hospital - Boston, MA

Introduction: Hypertension is a diagnostic feature of preeclampsia. Preeclampsia is also associated with a substantially elevated risk for essential hypertension in later life.

Several large, genome-wide association studies (GWAS) have identified single nucleotide polymorphisms (SNPs) that are associated with essential hypertension or blood pressure levels. In contrast, despite its strong heritable component, there are no genetic variants that have been robustly associated with preeclampsia.

In an effort to shed light on the genetic basis for preeclampsia and to better understand the shared liability to preeclampsia and essential hypertension, we sought to define the association between preeclampsia and SNPs implicated in essential hypertension or blood pressure levels in pregnant patients of European ancestry.

Methods: We employed a case-control design using samples from 315 preeclamptic patients and 470 control women with completed pregnancies that did not develop preeclampsia, drawn from sample collections from 7 U.S. academic medical centers. Subjects were genotyped on a cardiovascular gene-centric SNP array containing ~2,000 loci selected based on prior genetic studies of cardiovascular diseases and on pathways expected to be important in cardiovascular disease.

SNPs from 29 independent loci associated with hypertension or blood pressure levels at P<1x10-7 were identified from the National Human Genome Research Institute GWAS catalog; there were 25 SNPs with direct genotypes or proxies with r2>0.8 in HapMap CEU contained on our SNP array. These were analyzed for association with preeclampsia.

Single-SNP genetic association testing was completed using logistic regression, assuming additive effects for each risk allele present, and included principal components in the model to account for population structure. Statistical significance was judged as a Bonferroni-corrected P<0.002 to account for multiple testing.

Results: One of the 25 SNPs analyzed demonstrated a study-wide significant association with preeclampsia (rs1173743; P=0.00078, Padj=0.002). The hypertension risk allele at this locus was associated with an increased risk of preeclampsia (OR: 1.45, 95% confidence interval 1.16-1.76). The variant resides upstream of the gene NPR3, Natriuretic peptide receptor C/guanylate cyclase C, which is a receptor responsible for clearing circulating atrial natriuretic factor.

Conclusion: The association between preeclampsia and rs1173743 may provide insight into the shared predisposition to preeclampsia and essential hypertension. This finding needs to be replicated and its biological basis elucidated.

Abstract BP 2

Noninfectious Inflammatory Fever Causes Fetal Microglial Activation

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James Marchand, Ph.D. - Tufts University School of Medicine - Boston, MA
Zainab Almeer, M.B.,B.S. - Tufts University School of Medicine - Boston, MA
Roman Schumann, M.D. - Tufts University School of Medicine - Boston, MA

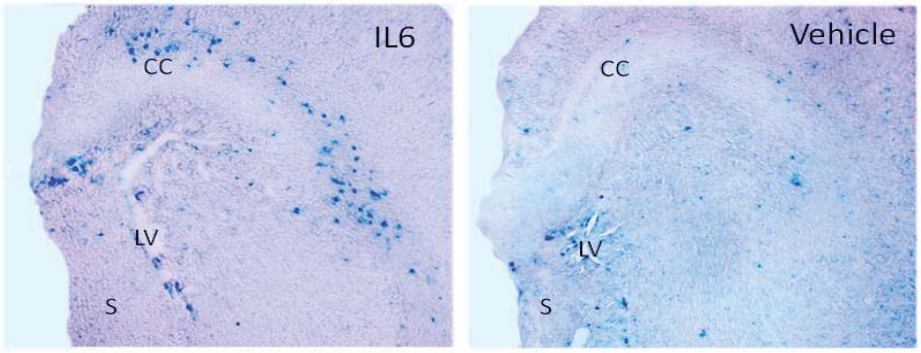
Introduction: Up to 1/3 of parturients with epidural analgesia develop clinical fever, compared to those without it, with a relative risk of 3.34.(1) The etiology remains unclear, but appears to be inflammatory but not infectious.(2) Maternal inflammatory fever has been associated with neurologic injury, but animal models have consistently employed intrauterine infection. We developed a noninfectious inflammatory fever model in near-term pregnant rats and examined the effect on the fetal brain.

Methods: Pregnant Sprague Dawley rats received three injections on gestational day 20 (GD20; term=21-22) of IL-6 (1 μg, n=3; or 1, 1.5,and 2.5 μg, IM, n=4) or vehicle (n=4), at 2 h intervals. Core temperature was monitored at 30 min intervals, from 1 h prior to 2 h after the injections. 24 h after the first injection, dams were deeply anesthetized, fetuses delivered by cesarean, and fetal brains (IL-6, n=3; vehicle, n=2) were removed and processed for immunohistochemistry. Sections were processed using antibodies specific to the apoptosis marker, caspase-3, and for activated microglia (aMGlia), ED1. For each brain, sections were processed at three levels of the lateral ventricle (LV): septal (Spt), dorsal hippocampus (DHp) and ventral hippocampus (VHp). Labeled cells surrounding the LV and within the overlying corpus callosum (CC) were counted. Differences in temperature between treatments were compared by repeated measures MANOVA, and labeled cells by t test.

Results: Both IL-6 regimens increased temperature in both constant and escalating dose groups, with no difference between IL-6 groups (p=.75), which were pooled and were significantly higher than vehicle (p=.0192). 24 h after induction of fever, the fetal brains in both Vehicle and IL6 groups showed few caspase-3 labeled apoptotic cells surrounding the LV or within the overlying CC. In contrast, in the IL-6 group aMGlia were densely localized around the LV and within the CC (see Figure). Counts of aMGlia in the IL-6 group were significantly higher compared to the vehicle group, at all three levels of the LV: Spt, P=.028; DHp, P=.052; and VHp, P=.0052.

Discussion: IL-6 produced moderate fever in near-term pregnant rats and resulted in microglial activation in their fetuses. This model may be a useful one for studying epidural analgesia-associated maternal fever and its potential consequences.

1. Cochrane Database Syst Rev 2011, CD0000331.
2. Obstet Gynecol 2011; 117:588.



Activated Microglia in GD21 Fetal Brains (blue labeled cells, coronal section, right hemisphere). IL6 – dam injected with IL6 on GD20. Vehicle – dam injected with vehicle solution on GD20.
LV – lateral ventricle, CC – corpus callosum, S - septum

Abstract BP 3

Obstetrical Anesthesia Workforce Survey: 30 Year Update

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Ray Choi, B.S. - University of Colorado - Aurora, CO
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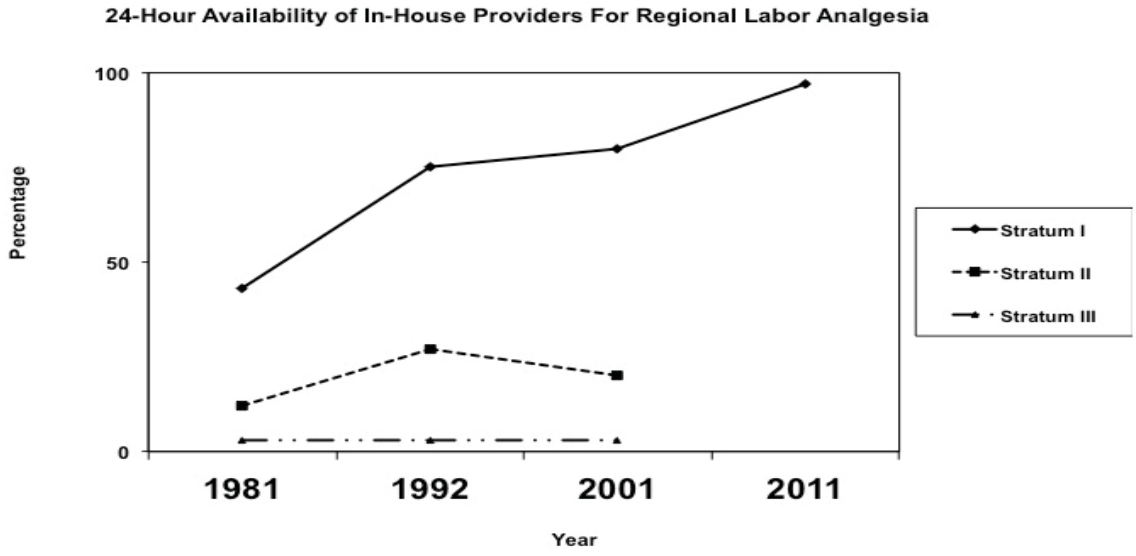
Background: Surveys investigating the obstetrical anesthesia workforce were conducted in 1981, 1992 and 2001 to characterize and understand obstetrical anesthesia practice. The thirty-year update of this survey was conducted in 2012. Anesthesia providers from hospitals in the United States were surveyed to identify the number and types of providers, services, and methods used to provide obstetric anesthesia.

Methods: Using the American Hospital Association Annual Survey of Hospitals, a randomized stratified sample of hospitals was generated based on number of births per year and U.S. census region. Strata were defined as: Stratum I ≥ 1,500 births, Stratum II ≥ 500-1,499 births, Stratum III < 500 births. A total of 341 Stratum I, 440 Stratum II, and 415 Stratum III hospitals were identified. Phone calls were placed to each hospital to obtain contact information for the anesthesia group providing obstetrical services. Providers were personally contacted via phone by a physician to obtain email contact information. Electronic questionnaires (Survey Monkey) were sent via email.

Results: Data collection for Stratum I hospitals is complete, with the other Strata to follow. Of the hospitals and providers contacted, 56% provided accurate contact information and 12% declined to participate. The response rate was 45% from those who provided contact information and 25% overall. Initial results from Strata I responses show administration of regional labor analgesia has increased compared to 2001 and is available 24 hours per day at 100% of Strata I hospitals, with 97% of providers in-house. PCEA use in Strata I hospitals was 35% in 2001 and is now approximately 84%. Independent nurse anesthetists provided obstetrical anesthesia services in 4.5% of hospitals, which is increased from 2001. While 93% of Strata I hospitals allow postpartum tubal ligations, 22% state that inadequate staffing interferes with provision of anesthesia for these cases either always or at off-hours.

Conclusion: In the 10 years since the last survey, there have been some significant changes in how hospitals provide obstetric anesthesia. Additionally, the ubiquitous use of technology has changed survey techniques since 2001, with email being the primary method for data collection. Obstetric anesthesia surveys continue to provide useful information about the practice of obstetric anesthesia.

References: Anesthesiology 2005;103:645-653; Anesthesiology 1997;87:135–43; Anesthesiology 1986;65:298–3



Abstract BP 4

Measuring Performance of a Continuous Quality Improvement Program Designed to Reduce Maternal Mortality in a Regional Referral Institution in Ghana

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Medge Owen, M.D. - Wake Forest School of Medicine - Winston-Salem, NC
Adeyemi Olufolabi, M.D., FRCA - Duke University Medical Center - Durham,

Background: Quality improvement (QI) programs are becoming increasingly common within health care settings, including maternity services. Despite descriptions of QI programs, few provide solid evidence of benefit, especially in resource poor settings.1-3 From 2007-2011, Kybele and the Ghana Health service partnered to reduce maternal and perinatal mortality in a large regional hospital. A continuous QI program was developed based on analysis of patient care processes. A variety of improvement activities were grouped into personnel, quality-communication and system-management based "bundles".4 The aim of this study was to measure the performance of the QI program and to determine which activities were most important in improving operational capacity and health outcomes.

Materials and Methods: Ninety-seven improvement activities were stratified into the three bundles (personnel 27 activities; quality-communication 34 activities; system-management 36 activities). Implementation for each activity was scored tri-annually for 5 yrs by Kybele-GHS representatives as 0% (no implementation), 25% (minimal), 50% (moderate), 75% (majority), 100% (full implementation). Mean implementation scores and risk-adjusted maternal mortality ratios were calculated and included in a linear regression analysis to determine which factors were associated with improvements.

Results: At program end, 27 activities were fully implemented, 64 were partially implemented and 6 were not implemented. The average overall implementation rate was 72%; the average implementation rate for each bundle was: personnel 71%, quality-communication 70%, system-management 75%. Despite a 55% increase in patient admission and a four-fold increase in high risk cases, stillbirth was reduced by 52% and the maternal mortality ratio (MMR) was reduced by 23%. Case fatality rates for hemorrhage and hypertensive disorders were reduced by 89% and 65%, respectively, and an estimated 224 maternal deaths were averted (Table). In the regression analysis, personnel ($p<0.05$) and quality-communication ($p<0.05$) activity bundles were associated with the number of maternal deaths averted.

Conclusion: Maternal and perinatal mortality can be reduced in low resource settings. Quality improvement efforts are urgently needed to strengthen healthcare delivery.

Reference: 1)Br Med J 2008;336(7659):1491–4 2)Jt Comm J Qual Saf 2003;29(2):85–93 3)Int J Qual Hlth Care 2010;22(4):237–43 4)Int J Gynecol Obstet 2012;116:17-21

Table: Performance Analysis and Number of Maternal Deaths Averted

Parameter	2006 (baseline)	2007	2008	2009	2010	2011
Total delivery	4793	6049	7465	8230	8133	9357
Prevalence obstetric hemorrhage (%)	0.7	0.89	1.33	3.88	4.22	5.18
Prevalence hypertensive disorders (%)	4.5	5.31	7.78	12.10	12.68	14.53
Composite Prevalence (CP)	5.2	6.2	9.11	15.98	16.9	19.71
Risk Adjusted Mortality Index	1.0	1.1	1.8	3.2	2.9	3.3
Estimated MMR (EMMR)	479	533	686	1052	1102	1250
Observed MMR (OMMR)	479	496	388	328	380	380
Performance=EMMR-OMMR	-	37	298	724	722	870
Number of Maternal deaths averted	-	2	22	60	59	81

Abstract BP 5

Carbetocin at Cesarean delivery for Labor Arrest: A Randomised Controlled Trial to Determine ED90.

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Mrinalini Balki, M.D. - Mount Sinai Hospital, University of Toronto. - Toronto, Ontario

Introduction: In 2009, the Society of Obstetricians and Gynecologists of Canada recommended a bolus dose of carbetocin 100mcg IV at elective cesarean delivery (CD) to be used instead of oxytocin infusion for prevention of PPH (1). A recent dose-finding study has determined the ED90 of carbetocin at elective CD to be only 14.8mcg (95%CI 13.7-15.8) (personal communication). Similar to what has been observed with oxytocin (2), it is expected that the ED90 of carbetocin in women who have undergone labor will be higher, secondary to oxytocin receptor desensitization, but this has yet to be studied. The purpose of this study was to establish the ED90 of carbetocin at CD for labor arrest.

Method: We conducted a prospective, double-blind, randomized dose-finding study of carbetocin using a biased coin up-and-down sequential allocation designed to cluster doses near ED90. Inclusion criteria were women with no other risk factors for PPH undergoing CD for labor arrest under epidural anesthesia, having received at least 4h of oxytocin infusion. The first patient received 20mcg IV Carbetocin, and the subsequent doses were determined by randomization with increments or decrements of 20mcg, up to a maximum of 140mcg. Uterine tone was assessed by the obstetrician, and rated as satisfactory, unsatisfactory or indeterminate. The primary outcome was the need for additional uterotonics during CD. Secondary outcomes included estimated blood loss and adverse effects.

Results: 23 patients out of the proposed 40 have been recruited. Patient demographics, obstetric and intraoperative data as well as adverse effects are shown in Table 1. 70% of patients responded successfully to the blinded carbetocin dose within the range of 20–140mcg. 30% patients required the use of additional uterotonics during the CD. The average estimated blood loss was 1043 (494) mL. Hypotension was seen in 39% of patients.

Discussion: Only 70% patients had adequate uterine tone in response to carbetocin, suggesting that the ED90 of carbetocin at CD for labor arrest may be higher than that at elective CD. This implies that the oxytocin-induced desensitization phenomenon may also affect the response to carbetocin. The incidence of hypotension is similar to that seen in previous studies using lower doses of Carbetocin given as a bolus, suggesting that possibly the speed of administration may affect the incidence of hypotension.

References:

1)JOGC 2009;235:980-993
2)Obstet Gynecol 2006;107:45-5

Table 1. Patient Demographic and obstetric data, outcome measures and adverse effects.

Patient Demographics		**Outcome Measures**	
Age (years)	33.4 (5.0)	Satisfactory uterine contraction	16 (69.6%)
Weight (kg)	81.5 (17.6)	Need for additional uterotonics	7 (30.4%)
Height (cm)	163.1 (9.0)	Phenylephrine post delivery (mg)	0.2 (0.3)
Gravida	1 (1-5)	Estimated blood loss (mL)	1043 (494)
Para	0 (0-2)		
Gestational age (weeks)	39.8 (1.3)	**Adverse Effects**	**N (%)**
		Hypotension	9 (39.1)
		Hypertension	4 (17.4)
Obstetric Data		Tachycardia	10 (43.5)
Primary Cesarean delivery	23 (100%)	Bradycardia	0 (0)
Dilatation (cm)	6 (2-10)	Dysrhythmias	0 (0)
Descent (station)	-1 (-3-1)	Nausea	6 (26.1)
Failure to dilate	18 (78.3%)	Vomiting	3 (13.0)
Failure to descend	4 (17.4%)	Chest Pain	0 (0)
Fetal distress	1 (4.3%)	Abdominal Pain	0 (0)
Duration of oxytocin infusion (hrs)	13.3 (5.6)	Shortness of Breath	1 (4.3)
Total oxytocin administered (mU)	5763 (3997)	Headache	1 (4.3)
Maximum oxytocin infusion rate (mU/min)	15 (4-32)	Flushing	1 (4.3)
		Dizziness	1 (4.3)

Values expressed as N(%), Mean (SD) or Median (Range)

Abstract BP 6

Impact of Neuraxial Labor Analgesia on Oxytocin Augmentation and Postpartum Hemorrhage - A Report From No Pain Labor N' Delivery in China

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Lingqun Hu, M.D. - Northwestern University Feinberg School of Medicine - Chicago, Illinois
Francis S. Stellaccio, M.D. - Stony Brook University School of Medicine, State University of New York at Stony Brook Health Science Center - Stony Brook, New York
Tianna J Xia, BA (Bachelor of Arts) - Case Western Reserve University - Dublin, Ohio
Roger R. Dzwonczyk, MS, PE - The Ohio State University Wexner Medical Center - Columbus, Ohio

Introduction: There is a concern in the Chinese obstetric community that neuraxial labor analgesia (NA) may be associated with postpartum hemorrhage (PPH) due to desensitization of oxytocin receptors caused by a possible increase in oxytocin augmentation during labor. No Pain Labor N' Delivery (NPLD) was launched at the 2nd Affiliated Hospital of Wenzhou Medical College in 2010. The NA rate increased from 0% to 57%, the vaginal delivery rate increased and cesarean delivery (CD) rate decreased by 3.5%, and there was no change in the intrapartum CD rate. The aim of this impact study was to evaluate the impact of NA on oxytocin augmentation and PPH in a single Chinese academic center.

Methods: Data were collected from medical record review and from several hospital databases (01/2009-06/2011). The study period was divided into two phases, baseline (01/2009-06/2009, NA = 0%) and post (06/2010-06/2011, anesthesia service 24/7, NA >50%). NA was used only in the first stage of labor in low-risk laboring parturients; oxytocin augmentation or postpartum oxytocin was administered based on clinical judgment. Prophylactic intrauterine oxytocin 20 IU was administrated to CD patients. The packed red blood cell (PRBC) transfusion protocol was based on current ASA guidelines. Comparisons were made between the baseline and the post phases; outcomes included rate of oxytocin augmentation, postpartum oxytocin, PPH, transfusion, and hysterectomy. Chi-Square or Student's t-test was used to determine statistical difference with alpha = 0.01.

Results: Among 15,415 deliveries, in the vaginal delivery patients of the post phase, the oxytocin augmentation rate increased by 17.6%, and the rates of postpartum oxytocin and PRBC administration decreased by 17.8%, and 1.5% respectively. The median oxytocin augmentation dose was 2.5 IU. No difference was found in the rate of PPH and average EBL of PPH patients for either vaginal delivery or CD, the average postpartum oxytocin dose and rate of PRBC administrated CD patients, nor overall PRBC transfused and hysterectomy rate.

Conclusions: Our data suggests that the increase in low dose intrapartum oxytocin augmentation observed after a marked increase in the rate of NA in the 1st stage of labor had no negative impact on PPH.

What's New in OB?
The Obstetrician's Perspective: Obstetrical Directions in the Near Future
Speaker: Michael Greene, M.D.

Objectives:
Following this presentation, the attendee will be able to:

1. Describe the evolution of thought regarding the relationships between thrombophilias and risks for obstetrical complications;
2. Counsel patients about the current evidence regarding the association between thrombophilias and obstetrical complications and recommended treatment;
3. Describe recent developments in non-invasive screening for fetal aneuploidy;
4. Describe recent developments in high-resolution assessment of fetal genomic abnormalities.

Summary:
Thrombophilias are broadly categorized into two groups: acquired and hereditary. By definition, all are associated with increased risks for venous thromboembolic events, and this is particularly true during the puerperium.

There is no doubt the acquired thrombophilias, characterized by the presence of anti-phospholipid antibodies (aPL), are associated with increased risks for a variety of adverse outcomes of pregnancy including early (embryonic) spontaneous abortion, later (fetal) spontaneous abortion, preeclampsia, and intrauterine growth restriction. Laboratory criteria for the diagnosis of the antiphospholipid syndrome (APS) include the presence of any of only three aPL (lupus anticoagulant, anticardiolipin (IgG or IgM), or anti-β2-glycoprotein I (IgG or IgM)) above specified minimum titers on at least two occasions separated by a minimum of 12 weeks. Clinical criteria for the APS include a personal (not family) history of a vascular thrombosis or any of several adverse pregnancy outcomes. There is consensus that women with APS and a history of a thrombotic event should be anticoagulated during pregnancy and the puerperium to avoid a recurrent thrombosis. Despite early enthusiasm from un-controlled trials, it is much less clear that anticoagulation with aspirin, heparin, or both reduces the risk of recurrence for adverse outcomes of pregnancy, and current official recommendations are that treatment "should be considered."

There are a number of inherited thrombophilias, but those most prevalent, most thrombogenic, and best studied include factor V Leiden, prothrombin G20,210A, protein C deficiency, protein S deficiency, antithrombin deficiency and two common mutations in the methylenetetrahydrofolate reductase (MTHFR) gene. Despite early reports of associations between some of these mutations and adverse outcomes of pregnancy, there are no clear causal links between any of these mutations and any adverse outcomes of pregnancy. Thus, anticoagulation is indicated during pregnancy only to prevent first occurrence or recurrence of thrombotic complications based upon the specific mutation and the patient's personal history and not to prevent adverse outcomes of pregnancy.

Prenatal diagnosis was first introduced in the 1960s with one simple option: invasive amniocentesis for diagnostic karyotype. Early karyotypes had a resolution that could detect addition or loss of nothing smaller than hundreds of millions of DNA base pairs and entailed a procedure related risk of miscarriage. Banding techniques applied to standard cytogenetic analyses could detect addition or deletion of three to ten million base pairs. Recently, array comparative genomic hybridization (aCGH) or "microarray" analysis, which is capable of detecting copy number variants of a few hundred thousand base pairs, was applied to more than 4,000 standard prenatal diagnosis samples obtained invasively. That higher resolution technique found copy number variants in 6% of anatomically abnormal fetuses with "normal" karyotypes by modern cytogenetic analysis.

Due to the procedure related risk of loss, invasive prenatal diagnosis has been offered only to women at highest *a priori* risk for aneuploidy – those 35 years of age or older or with sonographically abnormal fetuses. Highly sensitive non-invasive screening (>90% detection of aneuploidy) using high resolution ultrasound examinations and various combinations of maternal serum markers offered an attractive, but non-diagnostic, miscarriage risk free alternative to invasive testing. These no-risk screens were offered to, and became very popular with, all pregnant women regardless of *a priori* risk. Recognition that as early as the first trimester there are measurable quantities of cell free fetal DNA (cffDNA) in the maternal circulation has led to non-invasive prenatal diagnosis of Rh positive fetuses in Rh negative women and fetuses affected with single gene disorders. Recently, the entire sequence of a fetal genome has been determined non-invasively from cffDNA. The presence of cffDNA has also resulted in a modern "gold rush" to commercialize non-invasive prenatal screening for aneuploidy.

References:

1. American College of Obstetricians and Gynecologists Committee on Genetics. Committee Opinion No. 545: Noninvasive prenatal testing for fetal aneuploidy. Obstet Gynecol. 2012 Dec;120(6):1532-4.
2. Committee on Practice Bulletins—Obstetrics, American College of Obstetricians and Gynecologists. Practice Bulletin No. 132: Antiphospholipid syndrome. Obstet Gynecol. 2012 Dec;120(6):1514-21.
3. Fan HC, Gu W, Wang J, Blumenfeld YJ, El-Sayed YY, Quake SR. Non-invasive prenatal measurement of the fetal genome. Nature. 2012 Jul 19;487(7407):320-4.
4. Lockwood C, Wendel G; Committee on Practice Bulletins— Obstetrics. Practice bulletin no. 124: inherited thrombophilias in pregnancy. Obstet Gynecol. 2011 Sep;118(3):730-40.
5. Lockshin MD, Kim M, Laskin CA, Guerra M, Branch DW, Merrill J, Petri M, Porter TF, Sammaritano L, Stephenson MD, Buyon J, Salmon JE. Prediction of adverse pregnancy outcome by the presence of lupus anticoagulant, but not anticardiolipin antibody, in patients with antiphospholipid antibodies. Arthritis Rheum. 2012 Jul;64(7):2311-8.
6. Talkowski ME, Ordulu Z, Pillalamarri V, Benson CB, Blumenthal I, Connolly S, Hanscom C, Hussain N, Pereira S, Picker J, Rosenfeld JA, Shaffer LG, Wilkins-Haug LE, Gusella JF, Morton CC. Clinical diagnosis by whole-genome sequencing of a prenatal sample. N Engl J Med. 2012 Dec 6;367(23):2226-32.
7. Wapner RJ, Martin CL, Levy B, Ballif BC, Eng CM, Zachary JM, Savage M, Platt LD, Saltzman D, Grobman WA, Klugman S, Scholl T, Simpson JL, McCall K, Aggarwal VS, Bunke B, Nahum O, Patel A, Lamb AN, Thom EA, Beaudet AL, Ledbetter DH, Shaffer LG, Jackson L. Chromosomal microarray versus karyotyping for prenatal diagnosis. N Engl J Med. 2012 Dec 6;367(23):2175-84.

What's New in OB Medicine?
The Cardiologist's Perspective: Peripartum Cardiomyopathy
Speaker: Dennis McNamara, M.D.

Objectives:
The objectives of this presentation are to review:

1. Current strategies for the management of peripartum cardiomyopathy (PPCM)
2. Worldwide regional differences in prevalence and outcomes in PPCM
3. Recent trials of innovative therapies and the implications for current management

Summary:
Incidence and Etiology: Peripartum Cardiomyopathy (PPCM), a dilated cardiomyopathy presenting in the last month of pregnancy or the first few months postpartum, is a rare complication which remains a major cause of maternal morbidity and mortality. Estimates of the incidence of PPCM in the United States range from 1 in 1400 to 1 in 4000 live births. Worldwide a much greater incidence is evident in parts of Africa and Haiti, where the rate may be as high as 1 in 300 births. This likely reflects a genomic predisposition in women of African ancestry, as rates of PPCM in the United States are much higher in blacks than whites. In addition to race, risk factors for PPCM include hypertension, maternal age, and multi-parity. The etiology remains uncertain and parallels other forms of primary non-ischemic cardiomyopathy. An autoimmune pathogenesis is suspected for a subset, and it is increasing recognized that genetic etiologies also play a significant role.

Presentation and Evaluation: Frequently the presenting symptoms are those of congestion and fluid retention, with shortness of breadth and chest discomfort or tightness, or occasionally lower extremity edema. Compensatory tachycardia may be the only sign of compromised cardiac function. For early post partum women, an emergency room visit for cough, shortness of breadth, and possible pneumonia frequently leads to the diagnosis as a chest x-ray provides evidence of heart failure and cardiomegaly. Electrocardiogram findings are generally nonspecific. An echocardiogram is the most important diagnostic test and in PPCM will demonstrate left ventricular dilation and a decreased left ventricular ejection fraction in the absence of structural heart disease.

Therapy: Medical therapy is focused on the treatment of heart failure. ACE inhibitors and beta receptor antagonists should be used in all patients with an LVEF < 40%. Loop diuretics should be used to treat symptoms of fluid overload or congestion. Aldosterone antagonists may be added in more symptomatic patients and to limit hypokalemia in subjects on loop diuretics.

Myocardial Recovery and Outcomes: Approximately half of women with PPCM have dramatic recovery of left ventricular function and achieve a normal LVEF within 6 months of presentation. One quarter of women have less complete recovery which leaves them with some degree of cardiomyopathy, while the remaining subjects have little to no improvement in their LVEF. Given the potential for improvement, every effort should be made to allow women time for LV recovery before committing them to advanced therapies such as ICDs, transplantation or LVAD. Overall the rate of death or transplantation the first year after presentation remains high at approximately 5% in North America and is unfortunately significantly higher in parts of Haiti and Africa where PPCM is more endemic.

Bromocriptine and Prolactin: Despite the high rate of recovery on heart failure therapy, nearly half of women are left with some degree of cardiomyopathy and there is clearly a need for additional innovative therapies. Bromocriptine as treatment for PPCM has been investigated in animal models and in a small 20 patient study in South Africa. However, its efficacy has not been established and a European randomized trial is now underway.

Risk of subsequent pregnancy: For women who recover completely and have a normal LVEF, a subsequent pregnancy still carries a 20% risk of recurrence and a decline in LVEF. Risks are much greater for women who did not normalize their LVEF and for these women with persistent cardiomyopathy subsequent pregnancy is clearly contraindicated.

Peripartum Cardiomyopathy Network (PCN): A North American network was established in 2009 to serve as a resource for clinicians caring for women with PPCM and to facilitate multi-center investigations of this disorder. The first NHLBI funded investigation of immune activation and myocardial recovery, *Investigations of Pregnancy Associated Cardiomyopathy* or IPAC completed enrollment in 2012 with results expected by the fall of 2013.

References

1. Elkayam U. Clinical Characteristics of Peripartum Cardiomyopathy in the United States: Diagnosis, Prognosis, and Management. Journal of the American College of Cardiology. 2011;58(7):659-70.
2. Gleicher N, Elkayam U. Peripartum cardiomyopathy, an autoimmune manifestation of allograft rejection? Autoimmun Rev. 2009 Mar;8(5):384-7. Epub 2008 Dec 16.
3. van Spaendonck-Zwarts KY, van Tintelen JP, van Veldhuisen DJ, van der Werf R, Jongbloed JD, Paulus WJ, Dooijes D, van den Berg MP. Peripartum cardiomyopathy as a part of familial dilated cardiomyopathy. Circulation. 2010 May 25;121(20):2169-75. Epub 2010 May 10.
4. Gentry MB, Dias JK, Luis A, Patel R, Thornton J, Reed GL. African-American women have a higher risk for developing peripartum cardiomyopathy. Journal of the American College of Cardiology. 2010;55(7):654-9.
5. Goland S, Bitar F, Modi K, Safirstein J, Ro A, Mirocha J, et al. Evaluation of the Clinical Relevance of Baseline Left Ventricular Ejection Fraction as a Predictor of Recovery or Persistence of Severe Dysfunction in Women in the United States With Peripartum Cardiomyopathy. Journal of Cardiac Failure. 2011;17(5):426-30.
6. Elkayam U, Tummala PP, Rao K, et al. Maternal and fetal outcomes of subsequent pregnancies in women with peripartum cardiomyopathy. *The New England journal of medicine.* May 24 2001;344(21):1567-1571.
7. Sliwa K, Blauwet L, Tibazarwa K, et al. Evaluation of bromocriptine in the treatment of acute severe peripartum cadriomyoapthy. A proof-of-concept pilot study. Circulation 2010;121:1465-1473.

Program Material

Saturday, April 27, 2013

Oral Presentation 2
Moderator: Wendy Teoh, M.B.B.S, FANZCA

Special Lecturer: The Neonatologist's Perspective - The Challenge of Premature Births in Puerto Rico: Why Are So Many Born So Soon in Paradise?*
Introduction: Barbara M. Scavone, M.D.
Speaker: José Cordero, M.D.

Gerard W. Ostheimer Lecture: What's New in OB Anesthesia?
Introduction: Alex Butwick, M.B.B.S., FRCA, MS
Speaker: Arvind Palanisamy, M.D., FRCA

Fred Hehre Lecture: Passion
Introduction: Pamela Flood, M.D.
Speaker: Richard Smiley, M.D., Ph.D.

International Outreach Committee Panel
Moderator: Ashraf Habib, M.D., B.Ch., M.Sc., FRCA
Speakers: Medge D. Owen, M.D.; Emmanuel K. Srofenyoh, M.D.; Cynthia A. Wong, M.D.

Research Hour - Epidural Fever
Moderator: Scott Segal, M.D., MHCM
Speakers: Laura Goetzl, M.D.; Michael A. Froelich, M.D., MS

Oral Presentation 2
Moderator: Wendy Teoh, M.B.B.S, FANZCA

Abstract O2 1

Methylergonovine Maleate and the Risk of Myocardial Ischemia and Infarction

Brian T. Bateman, M.D. - Harvard Medical School - Boston, MA
Krista F. Huybrechts, MS, Ph.D. - Harvard Medical School - Boston, MA
Sonia Hernandez-Diaz, M.D., DrPH - Harvard School of Public Health - Boston, MA
Jun Liu, MS - Harvard Medical School - Boston, MA
Jeffery F. Ecker, M.D. - Massachusetts General Hospital - Boston, MA
Jerry Avorn, M.D. - Harvard Medical School - Boston, MA

Background: Methylergonovine maleate (Methergine) is a semi-synthetic ergot alkaloid that is commonly used to treat uterine atony. In 2012, based on spontaneous reports, the U.S. Food and Drug Administration identified a "potential signal of serious risk/new safety information" regarding myocardial ischemia and infarction associated with methylergonovine-induced vasospasm(1). We therefore examined the risk of acute coronary syndrome (ACS) and acute myocardial infarction (AMI) associated with methylergonovine use in a large database of inpatient delivery admissions in the United States.

Methods: We conducted a retrospective cohort study using data from the Premier Perspective Database, and identified 2,233,630 women hospitalized for delivery between 2007 and 2011 (approximately one-seventh of all U.S. deliveries during this period). Exposure was defined by a charge code for methylergonovine. Study outcomes included acute coronary syndrome (ACS) and acute myocardial infarction (AMI) defined using validated diagnostic codes. Propensity score matching with a fixed 1:1 ratio was used to address potential confounding caused by differences between those exposed and unexposed to methylergonovine in demographic characteristics, obstetrical/medical conditions, markers of the presence, etiology, and severity of obstetric hemorrhage, and characteristics of the hospital at which delivery occurred.

Results: Methylergonovine was administered to 139,617 (6.3%) patients. Overall, 6 patients exposed to methylergonovine (0.004%) and 52 patients unexposed to methylergonovine (0.002%) had an ACS. Four patients exposed to methylergonovine (0.003%) and 44 patients in the unexposed group (0.002%) had an AMI. After propensity score matching, the relative risk for ACS associated with methylergonovine exposure was 1.67 (95% CI 0.40 – 6.97) and the risk difference was 1.44 per 100,000 patients (95% CI -2.56, 5.45); the relative risk for AMI associated with methylergonovine exposure was 1.00 (95% CI 0.20 – 4.95) and the risk difference was 0.00 per 100,000 patients (95% CI -3.47, 3.47). None of the cardiac events in the methylergonovine group resulted in in-hospital death.

Conclusion: Despite studying a very large proportion of U.S. deliveries, we did not find a statistically significant increase in the risk of ACS or AMI in women receiving methylergonovine compared with those who did not; estimates were increased only modestly or not at all. The upper limit of the 95% confidence interval of our analysis suggests that treatment with methylergonovine would result in no more than 5 additional cases of ACS and 3 additional cases of AMI per 100,000 exposed patients. Clinicians must balance this very small potential increase in absolute risk with the established benefit of methylergonovine in treating uterine atony.

1.http://www.fda.gov/Drugs/GuidanceComplianceRegulatoryInformation/Surveillance/AdverseDrugEffects/ucm307608.htm,

Abstract O2 2

Pharmacokinetic Modeling and Placental Transfer of Cefazolin Administered Prior to Cesarean Delivery

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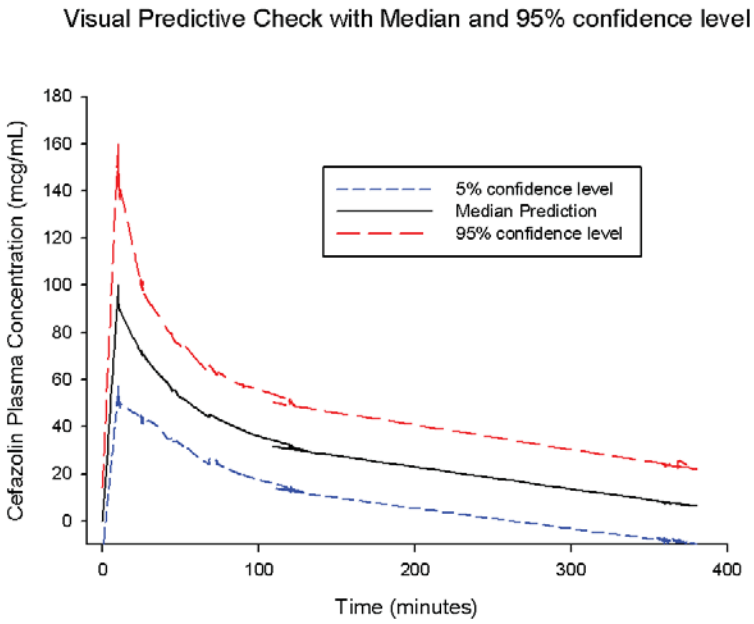
Background: Prophylactic antibiotics reduce febrile morbidity, wound infection, and endometritis following cesarean delivery (CD).(1) The pharmacokinetic profile and compartment modeling of cefazolin administered prior to CD is however incompletely understood. We aimed to determine the pharmacokinetic profile, therapeutic duration and placental transfer of cefazolin administered prior to CD.

Methods: After IRB approval, 20 women undergoing elective CD were enrolled. Maternal plasma concentrations of cefazolin were determined from blood samples taken prior to administration of 1 g cefazolin, 10 min and 25 min following administration, at delivery (MV), and 2 h and 6 h post-delivery. Pharmacokinetics were analyzed via a population approach with mixed-effects modeling using Phoenix (Certara LP). 1- 2- and 3-compartmental models were evaluated with the likelihood ratio test at $\alpha = 0.01$ to discriminate between alternative hierarchical models and diagnostic goodness-of-fit plots for model building and selection. A visual predictive check (VPC) was used to evaluate how well the model predicted the distribution of cefazolin concentrations. Simulation was performed using 1000 replications with characteristics taken from studied patients. The therapeutic duration, defined as the time that plasma cefazolin levels exceeded a minimum inhibitory concentration (MIC) of 8 mcg/mL, was determined.(2) Umbilical venous (UV) cefazolin plasma concentrations at delivery were also measured, and UV/MV ratios were determined.

Results: All 20 parturients completed the study. The mean (SD) age of women studied was 33 (5) years and median (IQR) BMI was 30 (28-31). The best fit to the data was with a 2-compartment model. Pharmacokinetic data VPC plot is shown in the Figure. The observed values of cefazolin concentration were within 95% predicted quartiles in a 2-compartment model. The therapeutic duration of 1g cefazolin (MIC > 8mcg/mL) was 3 hours. The mean (SD) UV/MV cefazolin concentration ratio was 0.49 (0.28).

Conclusion: A 2-compartment model can be used to predict plasma cefazolin levels in parturients undergoing elective CD. Based on the therapeutic duration and MIC, cefazolin should be re-dosed every 3 hours. Cefazolin readily crosses the placenta with a UV/MV ratio of 0.49.

References
1. Smaill FM. Cochrane Database Syst Rev 2010: CD007482.
2. 2007 Document M100-S17 (ISBN 1-56238-625-5). Clinical Laboratory Standards Institute, Wayne, PA.



ED90 of Third Stage Labor Oxytocin Infusion for Parturients Undergoing Cesarean Delivery for Labor Dystocia

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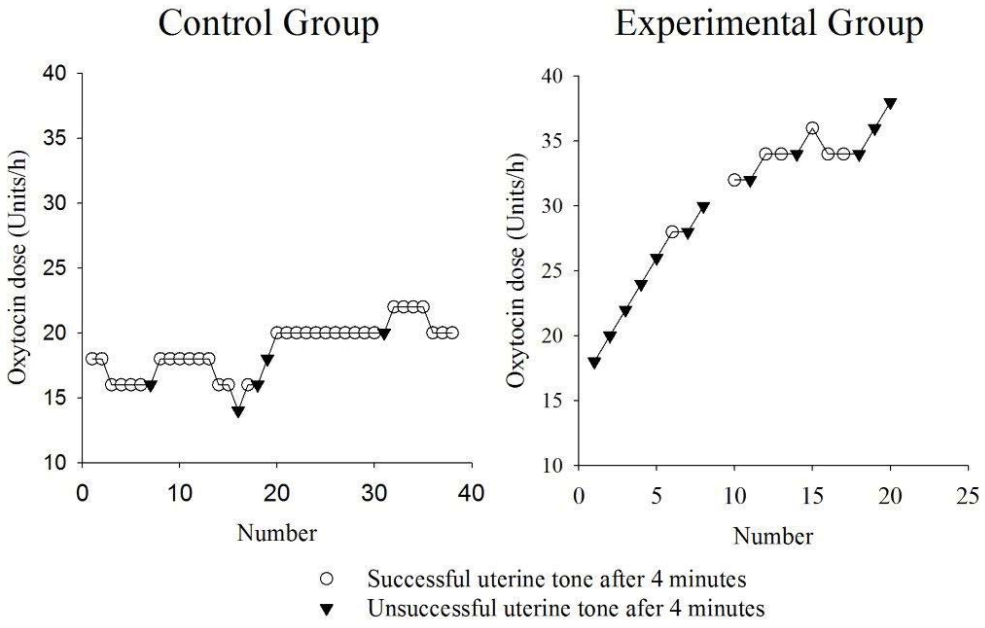
Background: Previous studies have found the ED90 for oxytocin infusion to prevent uterine atony in non-laboring women undergoing elective cesarean delivery (CD) to be 15 to 21 IU/h [1,2]. We hypothesized that laboring parturients receiving intrapartum oxytocin, who then undergo CD for labor dystocia, will have a higher ED90 compare to a non-laboring parturients.

Method: Inclusion criteria included non-obese, ASA 2 parturients who required intrapartum CD after peripartum exposure to oxytocin under epidural anesthesia (experimental) or elective CD under spinal anesthesia (control). The first subject in each group started with an infusion rate of oxytocin 18 IU/h. At 4 minutes, the obstetrician, who was blinded to the oxytocin dose, assessed the uterine tone as adequate or not. The dose for the next subject was based on the response of the preceding subject. If the initial subject had inadequate uterine tone, the oxytocin infusion rate was increased by 2 IU/h for the next subject. If the subject had adequate uterine tone, the next subject either received a lower dose by 2 IU/h (chance 1/10) or the same dose (chance 9/10). Biased coin allocation was determined by drawing black and white marbles (ratio 1:9) out of an opaque bag prior to initiation of the study and concealing the allocation in sequentially numbered opaque envelops. The primary outcome was successful uterine tone at 4 minutes and any time after. Secondary outcomes were need for additional uterotonic, estimated blood loss and postpartum hemoglobin values.

Results: The estimated ED90 in the experimental group was 49 IU / h (95% confidence interval [CI] 38-70 IU / h) compared to 19 IU / h (95% confidence interval [CI] 17-32 IU / h) in the control group, $P < 0.001$. 47% of the subjects in the experimental group required additional uterotonic versus 2.6% in the control group, $P < 0.001$. The mean (± SD) estimated blood loss were 1115 ± 502 mL and 700 ± 238 mL in the experimental and control group respectively, $P < 0.001$.

Conclusion: The ED90 for oxytocin infusion during the third stage of labor is significantly higher in parturients receiving intrapartum oxytocin administration who require CD for labor dystocia compared with parturients undergoing elective CD. These results are consistent with previous reports of oxytocin resistance, which may further increase the risk of postpartum hemorrhage in this patient population.

1 George RB. Can J Anesth 2010
2 Carvalho JC. Obstet Gynecol 2004



Abstract O2 4

Neuraxial Analgesia Does Not Alter Cerebrovascular Hemodynamics In Laboring Women With Preeclampsia

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Teelkien R. Van Veen, BS - Baylor College of Medicine - Houston, Texas
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Introduction: Hypertensive diseases of pregnancy have been associated with catastrophic cerebrovascular consequences and death, likely related to disturbances of normal cerebral hemodynamics. Data is limited regarding the effects of neuraxial anesthetic techniques on cerebral hemodynamics. In this study, transcranial Doppler ultrasound (TCD) was used to estimate these effects in laboring women with preeclampsia.

Methods: In this prospective cohort study of pregnant women, we performed power M-mode maternal transcranial Doppler (TCD) assessment of the middle cerebral artery (MCA) on women with preeclampsia who received neuraxial labor analgesia (epidural and combined spinal-epidural techniques) and compared them to healthy control subjects. TCD assessments were made prior to and at 30, 60, and 120 minutes after initiation of neuraxial analgesia. Systolic (PSV) and diastolic (M.D.V) velocities, pulsatility (PI) and resistance (RI) indices, along with resistance-area-product (RAP), cerebral flow index (CFI), and cerebral perfusion pressure (CPP) were calculated. Analysis was performed using Fisher's exact, student t-test, and repeated measures ANOVA.

Results: A total of 43 cases were enrolled and underwent maternal MCA TCD examination. Maternal demographics did not differ between the two groups. When compared to controls (n=35), women with preeclampsia (n=8) had higher baseline (systolic & diastolic) blood pressure (143 + 23 vs. 120 + 13 mmHg, p=0.002), and lower heart rates (70 + 26 vs. 82 +12 beats per minute, p=0.04). Although women with preeclampsia demonstrated higher CPP (62.2 + 15.6 vs. 57.4 + 12.9 mmHg, p=0.9) and lower CFI (34.8 + 11.8 vs. 38.3 + 11.7, p=0.9), overall, neuraxial anesthesia administration was not associated with any significant intra or inter-group changes in the cerebral resistance indices, flow index, perfusion pressure, or maternal autoregulation indices.

Conclusion: Neuraxial anesthesia during labor does not appear to alter cerebral hemodynamics in women with preeclampsia nor their normotensive healthy counterparts. Future studies are needed in high risk pregnancies with potential intracerebral vasculopathy.

Key References:

Belfort MA, Varner MW, Dizon-Townson DS, et al. Cerebral perfusion pressure, and not cerebral blood flow, may be the critical determinant of intracranial injury in preeclampsia: a new hypothesis. Am J Obstet Gynecol 2002; 187: 626-34.
Belfort MA, Allred J, and Dildy G. Magnesium sulfate decreases cerebral perfusion pressure in preeclampsia. Hypertension in Pregnancy 2008; 27: 315-327.

Thromboelastographic Study to Assess Age-related Coagulation Profile Differences in Parturients Undergoing Elective Cesarean Delivery

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Background: Epidemiologic studies indicate that women of advanced maternal age (AMA) are at increased risk of postpartum venous thromboembolism (VTE). (1,2) However, it is uncertain whether these differential risk profiles are explained by differences in the peripartum coagulation profile of AMA women compared to non-AMA women. The aim of this prospective study was to compare the peripartum coagulation profiles of AMA women (age >35 y) vs. non-AMA women (age ≤35 y) undergoing elective cesarean delivery (CD).

Methods: After IRB approval, we enrolled 46 healthy term parturients undergoing scheduled CD with neuraxial anesthesia. AMA and non-AMA women were recruited using block randomization. Kaolin-activated thromboelastography (TEG) and laboratory coagulation parameters (PT, APTT, platelets, fibrinogen) were compared between groups prior to CD and on postoperative days (POD) 1 and 3. Longitudinal analyses of individual TEG and laboratory coagulation indices were performed using a linear mixed-effects regression model (using SAS PROC MIXED) with study group and time as fixed effects; possible interaction of these factors were also examined. Data are presented as mean (SD), median [IQR]; P<0.05 as statistically significant.

Results: TEG and laboratory data prior to surgery and on POD 1 and 3 are presented in the Table. Based on individual models, no significant between-group differences were observed for any TEG or laboratory coagulation parameter at any time point. We found a significant time-effect overall for specific TEG parameters: MA (P<0.001), G (P<0.001), CL30 (P=0.004), and laboratory parameters: PT, APTT, platelets, fibrinogen (P<0.001 respectively). No time x group interaction was observed for any TEG or laboratory coagulation parameter.

Conclusion: Based on the TEG and laboratory coagulation data in this study, healthy AMA women have similar peripartum coagulation profiles as healthy non-AMA women undergoing elective CD. Temporal-related changes in fibrinogen concentration and platelet count may influence maximal clot formation during the early period after elective CD. Future mechanistic and etiologic studies are needed to fully investigate the pathophysiology of postpartum VTE in AMA women.

Refs: (1) Ann Intern Med 2005 2005;143:697-706. (2) Br J Haematol 2012;156:366-73.

Table. Thromboelastographic and Laboratory Hematologic / Coagulation indices prior to Cesarean Delivery and Postoperative Days 1 and 3

	Prior to Surgery		Postoperative Day 1		Postoperative Day 3	
	AMA group	Non-AMA group	AMA group	Non-AMA group	AMA group	Non-AMA group
R time (min)	8.1 (2.6)	6.9 (2.7)	7.9 (1.6)	7.8 (2.7)	8.1 (3.1)	7.7 (2.9)
K time (min)	2.2 (0.7)	2.5 (0.8)	2.1 (0.6)	2.2 (0.6)	2.4 (1.0)	2.0 (0.8)
Alpha angle (°)	58.7 (8.7)	55.9 (10.3)	55.3 (11.3)	58.3 (6.5)	57.9 (11.0)	60.0 (9.5)
MA (mm)	72.8 (3.6)	71.7 (2.9)	69.4 (5.9)	69.4 (3.6)	72.0 (8.4)	73.4 (4.7)
G (dynes/sec)	13.7 (2.5)	12.9 (1.8)	11.9 (3.0)	11.6 (2.0)	14.3 (5.9)	14.3 (3.0)
CL 30 (%)	99.5 [98 – 100]	99.8 [99.1 – 100]	96.4 [93.1 – 98.6]	97.4 [96.1 – 99.5]	98.1 [94.2 – 99.2]	97.6 [96.4 – 98.1]
PLTs (x10^9/L)	215 (46)	215 (74)	187 (40)	176 (51)	227 (32)	234 (70)
PT (s)	13.0 (0.5)	13.0 (0.6)	13.6 (0.5)	13.7 (0.6)	13.2 (0.6)	13.2 (0.4)
APTT (s)	27.2 (2.5)	26.6 (1.9)	31.0 (2.5)	30.2 (2.8)	31.7 (2.5)	30.1 (2.9)
INR (s)	1.0 (0.1)	1.0 (0.1)	1.1 (0.1)	1.1 (0.1)	1.1 (0.1)	1.1 (0.1)
Fibrinogen (mg/dl)	552 (69)	531 (75.4)	488 (78)	461 (72)	622 (83)	577 (84)

Data presented as mean (SD); median [IQR]
AMA = Advanced maternal age (> 35 y); Non-AMA = No advanced maternal age (≤ 35 y)
R time = reaction time (normal range = 4-8 min), K time = clot formation time (normal range = 0-4 min), MA = maximum amplitude (normal range = 54-72 mm), G = shear elastic modulus (normal range = 6.0-13.2 K), CL 30 = clot lysis at 30 minutes after MA (normal range = 92-100%), PLT = platelet count, PT = prothrombin time, APTT = activated partial thromboplastin time

Gerard W. Ostheimer Lecture: What's New in OB Anesthesia?
Speaker: Arvind Palanisamy, M.D., FRCA

Notes: _____

The Gerald W. Ostheimer Lecture: 2013 Annual SOAP Meeting

What's New in Obstetric Anesthesia? 2012

Arvind Palanisamy, M.B.B.S., M.D., F.R.C.A

Assistant Professor of Anaesthesia

Brigham and Women's Hospital

Harvard Medical School

Objectives:

The primary objectives of this review are to discuss the key papers published from January 01, 2012 to December 31, 2012, which have major scientific and clinical relevance to practicing obstetric anesthesiologists. Relevant topics in this review will originate from published research in the fields of obstetric anesthesia, anesthesiology, obstetrics, perinatology, pediatrics, epidemiology, developmental neuroscience, and affiliated specialties (internal medicine, surgery, pathology).

Methods:

Approximately 100 journals (listed at the end) published in the English language will be reviewed from January 2012 to December 2012 for the purposes of sourcing articles for this review. The journals will be chosen based on a number of factors: scientific/clinical relevance to

the fields of obstetric anesthesia and perinatology, prior Ostheimer journal lists, journal impact factor, and scientific evaluation by the presenter. In addition, other electronic and media sources will be used to supplement the primary search including: Pubmed, SciVerse Scopus, Obstetric Anesthesia Digest, MDLinx, Obstetric and Gynecologic Survey, Journal of Women's Health, electronic RSS feeds including: http://tinyurl.com/ob-anes-feed. After identifying suitable articles with a preliminary search, a systematic approach incorporating checklists will be used as a method for assessing the scientific quality for four types of research: systematic reviews; randomized controlled trials, observational studies (including studies with nonexperimental/quasi-experimental designs with or without control or comparison groups), and investigations of diagnostic tests/monitoring devices. Each study will be evaluated using criteria previously described by the Research Triangle Institute (RTI)-University of North Carolina for the US Agency for Healthcare Research and Quality (AHRQ) (West S, King V, Carey TS, et al. Systems to Rate the Strength of Scientific Evidence. Evidence Report/Technology Assessment No. 47 (AHRQ Publication No. 02-E016. Rockville, MD: April 2002; URL: http://www.thecre.com/pdf/ahrq-system-strength.pdf). Specific domains will be used in the criteria for evaluating four types of system to grade the quality of individual studies (see Table below). Level of evidence for each article will also be estimated using the most recent guidelines from the Oxford Centre for Evidence-Based Medicine (Howick J et al; Centre for Evidence Based Medicine, Oxford, UK: URL: http://www.cebm.net/index.aspx? o=5653).

Each article selected for the final syllabus will be categorized into a specific topic area (to be submitted later). Categories will be determined based on important research topics of interest which offer new clinical or research perspectives, challenge current practice paradigms or

describe novel / new techniques or scientific approaches for advancing clinical care. Relevant correspondence associated with each article selected for the syllabus, such as editorials, letters of response, commentary articles, will also be added to the final syllabus. In addition, a select number of high caliber journal articles (such as editorials; review articles; commentary or opinion-based articles), and important peer and non-peer reviewed publications from established regional, national or international organizations related to maternal health [such as Centre for Maternal and Child Enquiries - United Kingdom) will also be included. Because of time constraints, case reports, unaccompanied letters of correspondence, and articles from non-index linked journals will not be included in the final version of the syllabus:

Table. Domains evaluated in each study type to assess scientific quality for the syllabus for the Ostheimer Lecture.

Systemic Reviews	**Randomized Controlled trials**	**Observational studies**	**Diagnostic tests/ Device studies**
Study question	Study question	Study question	Study population
Search strategy	Study population	Study population	Adequate description of test/device
Inclusion and exclusion criteria	Randomization	Compatibility of subjects	Appropriate reference standard
Interventions	Blinding	Exposure or intervention	Blinded comparison of test or standard
Outcomes	Interventions	Outcome measures	Avoidance of verification bias
Data extraction	Outcomes	Statistical analyses	
Study quality and validity	Statistical Analyses	Results	
Data synthesis and analysis	Results	Discussion	
Results	Discussion	Funding or sponsorship	
Discussion	Funding or sponsorship		
Funding or sponsorship			

LIST OF JOURNALS

Anesthesia, Intensive Care, Pain Journals

Acta Anaesthesia Scandinavica

Anaesthesia

Anesthesiology

Anesthesia & Analgesia

Anesthesia and Intensive Care

Anesthesiology Clinics of North America

British Journal of Anaesthesia

Canadian Journal of Anaesthesia

Critical Care medicine

Current Opinion in Anesthesiology

European Journal of Anaesthesiology

European journal of Pain

International Anesthesiology Clinics

International Journal of Obstetric Anesthesia

Journal of Clinical Anesthesia

Journal of Pain

Pain

Regional Anesthesia and Pain Medicine

Obstetric Journals

Acta Obstetrica et Gynecologica Scandinavica

American Journal of Maternal/Child Nursing

American Journal of Obstetrics and Gynecology

The Australian and New Zealand Journal of Obstetrics and Gynaecology

Birth

British Journal of Obstetrics and Gynecology (BJOG)

Clinical Obstetrics and Gynecology

Current Opinion in Obstetrics and Gynecology

European Journal of Obstetrics & Gynecology & Reproductive biology

Fertility and Sterility

Gynecologic and Obstetric Investigation

International Journal of Gynecology and Obstetrics

Journal of Maternal-Fetal and Neonatal medicine

Journal of Midwifery and Women's Health

Journal of Women’s Health

Obstetrical and Gynecological Survey

Obstetrics and Gynecology

Obstetrics and Gynecology Clinics of North America

Pregnancy

Placenta

Perinatology and Pediatric Journals

American Journal of Perinatology

BMC Pediatrics

Early Human Development

Journal of Paediatrics and Child Health

Journal of Pediatrics

Journal of Perinatology

Pediatrics

General Medicine Journals

American Journal of Epidemiology

Annals of Internal Medicine

Blood

British Medical Journal

Chest

Circulation

European Heart Journal

Heart

Intensive Care Medicine

Journal of American College of Cardiology

Journal of Clinical Epidemiology

Journal of the American Medical Association

Journal of Thrombosis and Hemostasis

Lancet

Morbidity and Mortality Weekly Report

New England Journal of Medicine

Nature -Medicine

PNAS - Proceedings of National Academy of Sciences of USA

Resuscitation

Science

Thrombosis Research

Transfusion

Health Services Research Journals

Health Affairs

Quality and Safety in Health Care

Developmental Neurobiology Journals

Developmental Neurobiology

Neural Development

International Journal of Developmental Neuroscience

Fred Hehre Lecture: Passion
Speaker: Richard Smiley, M.D., Ph.D.

Objectives:

At the conclusion of this presentation the participants will be able to:

1. List factors that contribute to success and accomplishment in obstetric anesthesia;
2. Discuss ethical and medicolegal issues regarding how we educate trainees and practice obstetric anesthesia in the academic setting; and
3. List 2 or 3 areas of research that are appropriate for obstetric anesthesiologists to pursue over the next decade.

Summary:

In this presentation, I will discuss how I came to my “passion” for obstetric anesthesia. I will discuss the attributes that seem critical for a successful and enjoyable career in obstetric anesthesia, particularly in an academic setting; the themes will be Passion, Effort, Integrity and Knowledge, illustrated by cases and other stories. I will outline the dramatic changes that have occurred in our field over my time in the subspeciality over the past 20 years, emphasizing how research BY OBSTETRIC ANESTHESIOLOGISTS has been the cause of most of these positive changes. Finally, there will be some discussion of what the opportunities and challenges in our field will likely be over the next two decades, in both the clinical and scientific arenas.

International Outreach Committee Panel

Speakers: Medge D. Owen, M.D.; Emmanuel K. Srofenyoh, M.D.; Cynthia A. Wong, M.D.

Can International Outreach Produce Sustained Change?

Medge Owen, M.D.

Learning Objectives:

1. Better understand global childbirth and anesthesia conditions
2. Recognize challenges and elements that are required to produce change in low resource settings
3. Identify avenues for involvement in medical training efforts abroad

Maternal mortality is considered a basic health indicator that reflects the overall adequacy of a country's healthcare system. Maternal mortality has dramatically decreased in industrialized nations, but this has not occurred in many low and middle income countries. The MMR is < 25/100,000 in North America, Australia and UK, 500/100,000 in sub-Saharan Africa, and 1100/100,000 in Chad. This disparity results in a range of lifetime risk of maternal death of 1 in 3800 in industrialized countries compared to 1 in 15 in Chad! Over the past two decades, the absolute numbers of maternal deaths have declined from 543,000 in 1990 to approximately 287,000 in 2010. Gross underestimates of maternal death, however, are likely in countries where death rates are the highest due to poorly developed data collection and death registration systems.

The lack of resources to properly conduct cesarean delivery compounds the mortality problem. Emergency cesarean section is one of the most common surgical procedures conducted worldwide, although capabilities to perform it are frequently insufficient. Obstetric anesthesia as a sub-specialty does not exist in many countries, yet hospitals within most countries treat life threatening obstetric complications that require surgery, including obstructed labor, ruptured uterus, eclampsia, and hemorrhage. In Asia and Africa, anesthesia may be administered by the surgeon or inadequately trained non-physician providers working alone. For this reason, it is not surprising that perioperative maternal mortality rates are estimated to be as high as 1-2%. Anesthesia significantly contributes to maternal mortality and is associated with as many as 3-9 % of hospital-based maternal deaths each year in developing countries. Considering the high number of maternal deaths in many of those countries, the impact of anesthesia is real. In developed countries, anesthesia providers are leaders in resuscitation and intensive care for patients in peril. In many low-income nations, this skill set is not integral to anesthetic training and anesthesia providers are often scarce, which undoubtedly increases mortality.

A multitude of organizations send individuals and/or teams to work in underserved areas to help provide surgery and anesthesia. Global health programs are also emerging within many academic departments across the US, Canada and UK. It is important to identify where groups are working to encourage collaboration and reduce redundancy. It is hoped that research efforts associated with these partnerships can help quantitate the global anesthesia crisis and define best practices in reducing surgical, maternal and newborn mortality. Many public health oriented initiatives strive to improve emergency obstetrical services, yet often don't include a model of safe anesthesia care. Trained anesthesia providers, working individually or collectively through organizations, need to play a stronger role in education and advocacy within the global health arena. It is possible to strengthen health systems and improve worldwide standards of care when multidisciplinary, culturally appropriate programs are jointly designed.

Key References

1. Hogan, Foreman, Naghavi, Ahn, Wang, Makela, Lopez, Lozano, Murray . Maternal mortality for 181 countries, 1980-2008: a systematic analysis of progress towards Millennium Development Goal 5. Lancet 2010;375:1609-23.
2. WHO, UNICEF, UNFPA, The World Bank. Trends in maternal mortality 1990-2010: estimates developed by WHO, UNICEF, UNFPA and The World Bank. Geneva: World Health Organization 2012. 2010; Available from: http:// http://www.unfpa.org/webdav/site/global/shared/documents/publications/2012/Trends_in_maternal_mortality_A4-1.pdf
3. Kwawukume EY. Caesarean section in developing countries. Best Practice & Research Clinical Obstetrics & Gynecology 2001;15:165-78.
4. Clyburn P, Morris S, Hall J. Anaesthesia and safe motherhood. Anaesthesia 2007;62:21-5.
5. Walker IA, Wilson IH. Anaesthesia in developing countries-a risk for patients. Lancet 2008;371:968-9.
6. Schnittger T. Regional anaesthesia in developing countries. Anaesthesia 2007;62:44-7.
7. Dyer RA, Reed AR, James JF. Obstetric anaesthesia in low-resource settings. Best Practice & Research in Clinical Obstetrics and Gynaecology 2010; 24:401-12.
8. Enohumah KO, Imarengiaye CO. Factors associated with anesthesia-related maternal mortality in a tertiary hospital in Nigeria. Acta Anaesthesiol Scand 2006;50:206-10.
9. Srofenyoh E, Ivester T, Engmann C, Olufolabi A, Bookman L, Owen. Advancing obstetric and neonatal care in a regional hospital in Ghana via continuous quality improvement. Int J Gynecol Obstet 2012;116,17-21.

The Challenges for the Improvement of Obstetric Care in Africa

Emmanuel K. Srofenyoh, M.D., FWACS

Learning Objectives:

1. The state of maternal health in Africa.
2. The challenges of obstetric care in Africa.
3. The way forwards for Africa.

Introduction

The issue of the unacceptably high maternal and perinatal mortality and morbidity in developing countries has remained an unrelenting challenge to major world bodies and advocates over the past decades and threatened to remain so over decades to come. Over the past years a lot of donor dollars moved to developing countries and some modest gains has been made leading to a reduction in the world's burden of maternal mortalities but where? Pregnancy and childbirth are still among the leading causes of death and disability for girls and women in developing countries.

Maternal deaths are the greatest health inequity of the 21st century. Ninety-nine percent of maternal deaths occur in developing countries. The BIG question to ask is why the Dollar investment into maternal health in Africa is not yielding the

necessary dividend rapidly. And what are the challenges militating against efforts to improve obstetric care in Africa.

State of affairs

Maternal mortality ratio is high and progress is painfully slow. Though Ghana has made some value stand high. MMR estimate was 471 per 100,000 (Maternal Health survey 2007). Who using 2008 data estimated 350 per 100,000. Institutional MMR is worsening in most countries. African women has the worst life time risk of death due to pregnancy related causes. Africa has the highest rate of abortion-related deaths of any region. The World Health Organization (WHO) estimates that 4.2 million unsafe abortions take place in Africa each year. Consequently, about 80 women die from unsafe abortions every day and nearly 30,000 die every year. Unsafe abortion accounts for 12% of all deaths from complications of pregnancy and childbirth in the region [1]. Still birth rate, Low birth weight, IMF, and NNMR are all high mainly because of poor obstetric care.

What are the challenges?

The challenges include low status of women indicated by Limited Access to Education, Economic Opportunities, to land inheritance, Limited Participation in Governance, High poverty levels, Poor health-seeking behaviours, Low risk perception and under utilisation of existing services and harmful traditional practices. Others include High School Drop Out Rate, Lack of life and livelihood Skills, Limited access to Adolescent Friendly Services.

Health System challenges include Poor access to emergency obstetric care EMONC, Absence of Essential Newborn care programs, Weak referral systems and services (poor roads, lack of transport, inadequate communications,), Weak advocacy, *Inadequate funding (Low funding, Poor prioritisation and targeting), and* Human resource numbers and skills.

Conclusion

We know what matters most for maternal and new born mortality reduction. These include skilled care during pregnancy, childbirth and post partum/post natal period, access to emergency obstetric and newborn care (EmONC), and access to family planning. What is lacking are the strategies by which these services can be delivered.

Other countries have been able reduce MMR over short periods of time. Africa can also make progress if the right strategies are used.

Key References

1. World Health Organization, *Unsafe abortion: Global and regional estimates of incidence of unsafe abortion and associated mortality in 2000,* 4th Ed. (Geneva: WHO, 2004), available at: http://www.who.int/reproductive-health/publications/unsafe_abortion_estimates_04/index.html

Research Hour - Epidural Fever

Speakers: Laura Goetzl, M.D.; Michael A. Froelich, M.D., MS

Objectives:
The objectives of this presentation are to review

1. Etiology and incidence of intrapartum fever
2. The relationship between epidural analgesia and intrapartum fever
3. The potential adverse fetal/neonatal effects of fever

Summary:
Epidural analgesia is highly associated with intrapartum fever.
The risk of fever increases with increasing duration of exposure.
Nulliparous patients are at the highest risk: 13-33%.
More cervical examinations are not to blame.

No evidence for:

- Thermoregulatory etiology
  "Overheated Labor Rooms"

Temperature response is not uniform:

- Most women do not have an increase in temperature following epidural analgesia.
- A subset of women responds to epidural analgesia with an immediate and significant increase in temperature.

Risk of fever is highly associated with underlying maternal inflammation.

Research this year continued to support the dominant theory for epidural related fever: activation of underlying non-infectious maternal inflammation.

- Placental neutrophilic inflammation is common, especially in febrile women.
- The majority of intrapartum fever is associated with culture-negative placental and fetal inflammation.
- Prophylactic treatments aimed at infectious etiologies (antibiotics) proved ineffective in reducing either maternal fever or placental inflammation.
- Prophylactic treatments aimed at inflammation (corticosteroids) are effective, but have risks.

Despite the lack of infection, the fetus is being exposed to potential risk factors:

- Hyperthermia
- Inflammation (FIRS)

Neonatal brain injury (encephalopathy):

- Is increased in infants born to febrile women.
- The combination of fever and hypoxia results in a significant risk of injury.

Proactive obstetric management of labor that shortens the first or second stage is associated with a decreased risk of intrapartum fever.

New directions: Epidural dexamethasone may reduce maternal hyperthermia and fetal exposure to inflammation without increasing neonatal risks of infection, however larger randomized trials are needed.

Program Material

Sunday, April 28, 2013

Pro-Con Debate: General Anesthesia is the Technique of Choice for Suspected Placenta Accreta
Moderator: David Bogod, M.B.B.S., FRCA, LLM
Pro: Yaakov (Jake) Beilin, M.D.
Con: John A. Thomas, M.D.

Clinical Forum 2: "Obstetric Emergencies"
Moderator: Maya S. Suresh, M.D.

The Obstetric Airway
P. Allan Klock, M.D.

Maternal Cardiopulmonary Arrest
Sharon Einav, M.D.

Pro-Con Debate: General Anesthesia is the Technique of Choice for Suspected Placenta Accreta

Pro: Yaakov (Jake) Beilin, M.D.

Objectives:

At the conclusion of this activity the participant will be able to:

1. List the risk factors for placenta accreta and classify the different types of abnormal uterine placentation;

2. Identify all of the additional resources (e.g., oncologic surgeon, massive transfusion protocol, interventional radiology, etc.) that should be available for women with presumed placenta accreta; and

3. Formulate a comprehensive anesthetic plan for the parturient with suspected placenta accreta.

Summary:
Maternal mortality has increased in the United States from approximately 7 per 100,000 live births in 1996 to 13.3 in 2006. In 2010 The Joint Commission issues a sentinel alert entitled, "Preventing deaths during and after pregnancy." Peripartum hemorrhage is one of the three leading causes of maternal mortality along with thromboembolism and hypertensive disorders of pregnancy.
The etiology of peripartum hemorrhage includes placenta previa, placenta abruption and placenta accreta. In particular, the incidence of placenta accreta has increased. The most likely explanation for the increase in placenta accreta is the rise in the cesarean delivery rate. The cesarean delivery rate in the United States has increased from roughly 21% in 1997 to 35% in 2010 and appears to be increasing further. Diagnoses of placenta accreta can be difficult since imaging modalities including sonography and MRI are associated with false negative results.

The key to a successful outcome is team work and coordination of care with the obstetricians, gynecology/oncology surgeons, blood bank, and interventional radiology. Anesthesia management of the patient at risk for hemorrhage includes placement of large bore IV access and arterial line and aggressive replacement of blood and blood products. A rapid transfusion protocol should be available and has been shown in trauma patients to be associated with improved outcomes including decreased incidence of mortality, pneumonia, pulmonary failure, and sepsis. The anesthetic technique, neuraxial vs. general anesthesia, as the preferred anesthetic for placenta accreta is an area of controversy and will be the topic of today's debate.

Key points:

1. Maternal mortality is increasing and maternal hemorrhage is a common etiology.
2. Teamwork and preparation is the key to a successful outcome
3. The use of a massive transfusion protocols may improve outcome.

Key References:

1. Kidney DD, Nguyen AM, Ahdoot D, et al. Prophylactic perioperative hypogastric artery balloon occlusion in abnormal placentation. Magn Reson Imaging. 1999;17:965-71.
2. Berg CJ, Chang J, Callaghan WM, Whitehead SJ. Pregnancy-related mortality in the United States, 1991-1997. Obstet Gynecol. 2003;101:289-96
3. Miller DA, Chollet JA, Goodwin TM. Clinical risk factors for placenta previa-placenta accreta. Am J Obstet Gynecol. 1997;177:210-4.
4. Maldjian C, Adam R, Pelosi M, et al. MRI appearance of placenta percreta and placenta accreta. Magn Reson Imaging. 1999;17:965-71.
5. Flood KM, Said S, Geary M, et al. Changing trends in peripartum hysterectomy over the last 4 decades. Am J Obstet Gynecol. 2009;200:632.e1-6.
6. Ferrara A, MacArthur JD, Wright HK, Modlin IM, McMillen MA. Hypothermia and acidosis worsen coagulopathy in the patient requiring massive transfusion. Am J Surg 1990;160:515-8.
7. Duchesne JC, Islam TM, Stuke L, et al. Hemostatic resuscitation during surgery improves survival in patients with traumatic-induced coagulopathy. J Trauma 2009;67:33-7.
8. Borgman MA, Spinella PC, Perkins JG, et al. The ratio of blood products transfused affects mortality in patients receiving massive transfusions at a combat support hospital. J Trauma. 2007;63:805-13.
9. Zink KA, Sambasivan CN, Holcomb JB, Chisholm G, Schreiber MA. A high ratio of plasma and platelets to packed red blood cells in the first 6 hours of massive transfusion improves outcomes in a large multicenter study. Am J Surg 2009;197:565-70.
10. Lilker SJ, Meyer RA, Downey KN, Macarthur AJ. Anesthetic considerations for placenta accreta. Int J Obstet Anesth. 2011 Oct;20(4):288-92

Pro-Con Debate: General Anesthesia is the Technique of Choice for Suspected Placenta Accreta

Con: John A. Thomas, M.D.

Objectives:

The objectives of this presentation are to review

1) Trends in the incidence of abnormal placentation and its anesthetic implications
2) Latest inovations in the treatment and surgical approach for placenta accreta
3) How patient criteria and availability of resources best guide care in placenta accreta
4) Anesthetic choices and how they effect management of parturients with placenta accreta

Summary: Placenta accreta can be a serious pregnancy complication, which has important anesthetic implications. It is one of the leading causes of peripartum hemorrhage and is the most common indication for peripartum hysterectomy. The incidence of abnormal placental adherence (including placenta accreta) is increasing secondary to a rising cesarean section rate. The risk is particularly high in those patients with placenta previa and a history of previous cesarean section. Traditionally management of placenta accreta has been complicated by inadequate methods of prenatal diagnosis, a limited number of recommended interventions for prevention of complications, and a general lack of preparation for management of the complications. Management of placenta accreta has evolved substantially in the last decade through better diagnostic tools, improved surgical and interventional radiologic treatments, as well as established recommendations for treatment of complications. Although, the best anesthetic choice for patients with placenta accreta remains controversial both regional and general anesthesia have been used safely. Judgment as to the best anesthetic technique in placenta accreta should be based on patient criteria, availability of resources, multidisciplinary goals, and patient desires.

Key Points:

- Placenta accreta is a potentially serious complication of pregnancy requiring multidisciplinary consultation and preparation.
- The management of cesarean section for placenta accreta has changed over the last decade and the introduction of various practice changes has improved outcomes and options for anesthetic management.
- Anesthesia for cesarean section in placenta previa remains controversial and no specific anesthetic technique is indicated for all patients. Under appropriate circumstances both regional and general anesthesia can be used safely for these patients.

References:

1) Garmi G, Salim R. Epidemiology, etiology, diagnosis, and management of placenta accreta. *Obstet Gynecol Int.* 2012; 2012:873929. Epub 2012 May 7.
2) Lilker SJ, Meyer RA, Downey KN, Macarthur. Anesthetic considerations for placenta accreta. *International Journal of Obstetric Anesthesia* (2011) 20, 288–292.
3) Kuczkowski KM. A review of current anesthetic concerns and concepts for cesarean hysterectomy. *Current Opinion in Obstetrics and Gynecology* 2011, 23:401–407.
4) Snegovskikh D, Clebone A, Norwitz E. Anesthetic management of patients with placenta accreta and resuscitation strategies for associated massive hemorrhage. *Curr Opin Anaesthesiol.* 2011 Jun;24(3):274-81.
5) American College of Obstetricians and Gynecologists Committee on Obstetric Practice. Committee opinion no. 529: Placenta Accreta. Obstet Gynecol. 2012 Jul;120(1):207-11.

Clinical Forum 2: “Obstetric Emergencies”

Maternal Cardiopulmonary Arrest

Sharon Einav, M.D.

Objectives

1. To review the causes of maternal cardiac arrest, current recommendations for maternal resuscitation and perimortem cesarian delivery
2. To understand the basis, logic and sources (or lack thereof) for these recommendations and to critically review the published literature on perimortem caesarian delivery
3. To suggest organizational and staff management strategies relevant to the perioperative setting in general and obstetric resuscitation

Summary: Maternal death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration or site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management. The frequency of cardiac arrest in pregnancy is rising and is currently 1:20,000-1:30,000 maternities. This is due to a mix of causes including maternal ageing, increasing numbers of induced pregnancies and advances in medicine enabling maternal survival to late pregnancy despite severe underlying illness. The causes of maternal arrest can be either direct or indirect, but are either way altogether different from the causes of cardiac arrest in other adult populations. Despite this the AHA guidelines first included maternal resuscitation in 1992 and these are currently comprised of only 5 pages, and it took almost 20 years (2011) until the RCOG published their first guidelines on maternal collapse in pregnancy. Current AHA recommendations for maternal resuscitation are uncommitted regarding patient positioning, hand placement during chest compression and defibrillation but are very clear regarding the potential benefit of perimortem caesarian delivery (PMCD) within 4-5 minutes. This situation has been caused by the existence of hypotheses regarding the physiological effects of CPR during literature and the lack of supportive literature. The data supporting PMCD come from two papers written by the same author, one of which included mostly cases from the 19th century (i.e. before modern CPR). However, data extracted from the 80 published papers on PMCD shows better outcomes that are better than expected (>50% survival). Thes outcomes are described although the 4-5 minute time frame generally remains unmet, thus publication bias seems a major issue as well. Cognitive dissonance likely delays both situation recognition and the response to maternal collapse. Treatment recommendations should thus include a low admission threshold to a highly monitored area for pregnant women with cardio-respiratory decompensation. During collapse, good overall performance of resuscitation should be emphasized, preparations for PMCD should be performed in parallel and PMCD should be performed on location.

Key Points:

- There are major differences between maternal cardiac arrest and other adult cardiac arrest that remain unaddressed in current AHA guidelines.
- The current lack of prospective databases hinders the study maternal cardiac arrest and resuscitation
- The published literature on PMCD includes 80 papers and these show outcomes that are better than expected (>50% survival) although the 4-5 minute time frame generally remains unmet
- Maternal and neonatal outcome can both be improved by good overall performance of maternal resuscitation, thus no resuscitative action should be withheld due to the presence of the fetus.
- Preparations for PMCD must be initiated at the moment of maternal collapse if PMCD is to be performed within a reasonable time frame, and PMCD should be performed on location.

References:

1. Lewis G, ed. Saving mothers’ lives: reviewing maternal deaths to make motherhood safer—2003–2005. The Seventh Report on Confidential Enquiries into Maternal Deaths in the United Kingdom. London: CEMACH. 2007.
2. Vanden Hoek TL, Morrison LJ, Shuster M, Donnino M, Sinz E, Lavonas E J, Jeejeebhoy FM, Gabrielli A. Part 12: Cardiac Arrest in Special Situations: 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2010;122:S829-S861
3. Katz VL, Dotters DJ, Droegemueller W. Perimortem cesarean delivery. Obstet Gynecol. 1986 Oct;68(4):571-6.
4. Katz V, Balderston K, DeFreest M. Perimortem cesarean delivery: were our assumptions correct? Am J Obstet Gynecol. 2005 Jun;192(6):1916-21.
5. Einav S, Kaufman N, Sela HY. Maternal cardiac arrest and perimortem caesarean delivery: evidence or expert-based? Resuscitation. 2012 Oct;83(10):1191-200.

Abstract T 1

Prophylactic Ephedrine to Reduce Fetal Bradycardia After Combined Spinal Epidural Labor Analgesia: A Randomized Double Blind Placebo-Controlled Study

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Background: The combined spinal epidural (CSE) technique is increasingly popular for labor analgesia because of its rapid onset and superior first stage analgesia compared with epidural analgesia. However, increased risk for early profound fetal bradycardia (EPFB) following CSE is a concern. At our hospital, a previous study documented a rate of 8% EPFB. Various factors are implicated but the cause is unknown. Ephedrine administration prior to CSE or epidural analgesia may help reduce the risk of EPFB, but the literature shows mixed results. This study compares prophylactic intravenous (IV) ephedrine vs. placebo on the incidence of early profound fetal bradycardia following CSE labor analgesia.

Methods: In this randomized, double blind, placebo controlled trial, healthy term parturients requesting labor analgesia were randomly assigned to CSE in a sitting position followed immediately by IV study drug (taken from a sealed opaque envelope that was prepared by pharmacy): one ml of either 10mg ephedrine (EPH) or normal saline (NS). All patients received a 500ml co-load of Ringers Lactate solution and were placed in a lateral position after CSE placement. Blood pressure (BP), fetal heart rate (FHR) and uterine contraction pattern were recorded for 30 minutes post CSE placement. Standard protocols for supplemental ephedrine administration were used and documented for treatment of maternal hypotension and/or early profound fetal bradycardia within 30 minutes after CSE. Preliminary data were analyzed using ANOVA (means), Chi Square (rates), or simple effects (group difference over time) tests using SPSS 18.02. For all tests, α was set at 0.05.
A priori power analysis determined that 600 subjects are needed to show a 50% reduction in the 8% expected incidence of EPFB.

Results: To date we have studied 174 NS and 169 EPH patients, with no significant differences between groups in terms of age, gestational age, BMI, parity, cervical dilatation, type and length of labor, pain score and dose of IV fentanyl at time of CSE. The use of supplemental ephedrine during the study period was significantly lower in the EPH group (16% EPH vs. 30% NS; p=0.002). However, mean total ephedrine dose (study plus supplemental dosing) was higher in the EPH group (12.2mg EPH vs. 3.8mg NS; p <0.005). Interestingly, there was a lower than expected incidence of EPFB in both groups, with no significant difference between groups (3.6% EPH vs. 4.1% NS; p=0.811). There was no significant difference between groups in uterine tachysystole rate after CSE. Simple effects analysis showed no difference between groups in mean FHR before and after CSE, but significant differences in mean maternal systolic pressures after CSE (119.8 pre/112.8 post EPH vs. 120.8 pre/106.2 post NS; F=28.57, p<.05). Labor outcomes were similar between groups.

Conclusions: To date, this study indicates that prophylactic intravenous ephedrine does not influence the rate of EPFB after CSE in la

Abstract T 2

Multivariate Analysis of Factors Associated with Maternal Temperature After Cesarean Delivery

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Brendan Carvalho, M.B.B.Ch., FRCA, M.D.Ch. - Stanford University School of Medicine - Stanford, California

Background: Perioperative hypothermia can lead to important adverse outcomes e.g., blood loss, wound infection, and delayed recovery.(1,2) The influence of neuraxial anesthesia (NA), obstetric, and perioperative factors on maternal temperature (MT) after cesarean delivery (CD) has not been adequately elucidated. The aims of this retrospective cohort study were to assess the incidence of hypothermia and identify factors associated with post-CD MT after NA.

Methods: After IRB approval, data was abstracted from the medical records of 225 women who underwent CD in 2011 with NA and without perioperative warming. Based on prior research and biologic plausibility, demographic, obstetric, and perioperative factors that were considered as potential predictors for post-CD MT included: maternal age, BMI, gestational age, surgical duration, total estimated blood loss, intraoperative fluids, phenylephrine dose, chorioamnionitis, singleton/multiple gestation, gestational diabetes, mode of NA (single shot spinal, combined spinal-epidural, epidural top-up), presence/absence of labor pre-CD. We performed multiple linear regression with backward variable selection to identify factors associated with post-CD MT (probability-to-retain=0.05). Presence/absence of labor was retained in the final model. Data presented as n (%), mean (SD), median [IQR]; P <0.05 as statistically significant.

Results: Mean post-CD MT was 36.6 (0.3)°C. The incidence of post-CD hypothermia (MT≤ 36°C) was 2.2%. Demographic, obstetric and perioperative data are presented in Table 1. Spinal-based anesthetic techniques were associated with a decrease in post-CD MT vs. epidural 'top-ups'(Table 2). No other demographic, obstetric, surgical or perioperative factors were significantly associated with MT.

Discussion: The low incidence of post-CD hypothermia suggests that perioperative warming may not be necessary in all patients undergoing CD with NA. In our multivariate model, mode of NA was the only factor independently associated with post-CD MT. This finding is supported by prior research indicating that core temperatures are lower after spinal anesthesia compared to epidural anesthesia.(2) However, mode of NA only accounted for 20% of the variance in post-CD MT in our study. To better identify women who will benefit from perioperative warming, future studies are required to refine predictive factors for post-CD hypothermia.
REFS: (1) Anesthesiology 2008;109:318-38 (2) Reg Anesth Pain Med 1998;23:418-23.

Table 1. Patient Characteristics, Anesthetic and Perioperative Data

	n=225
Maternal age (y)	33(6)
BMI*	31(6)
Type of pregnancy	
Singleton	210 (93%)
Mulitple gestation	15 (7%)
Parity	1 [0 – 1]
Gestational Diabetes	62 (28%)
Chorioamnionitis	7 (3%)
Labor prior to CD	104 (46%)
Gestational Age (wks)	39 [37 – 39]
Duration of surgery (min)*	105 (30)
Mode of Anesthesia:	
Single-shot spinal	117 (52%)
CSE	57 (25%)
Epidural top-up	51 (23%)
Total dose of phenylephrine (mcg)*	400 [100 – 750]
Colloid (ml)	439 (231)
Crystalloid (ml)	1476 (686)
EBL (ml)*	758 (203)

Data presented as n (%), mean (SD), median [IQR],
BMI = Body mass index; CD = Cesarean Delivery; CSE = combined spinal-epidural; EBL = Total estimated blood loss

- Data missing for 1 patient

Table 2. Multivariate linear regression model with patient temperature on admission to the post-anesthesia recovery unit as the dependent variable.

	Regression coefficient	Standard Error	P value
Intercept	36.7	0.05	
Labor prior to Cesarean delivery (No labor = referent group)	0.03	0.4	0.40
Mode of anesthesia:			
Single shot spinal	- 0.27	0.05	<0.001
CSE	- 0.23	0.05	<0.001
(Epidural top up =referent group)			

CSE = combined spinal epidural
Whole model P <0.0001; R^2 = 0.20; Adjusted R^2 = 0.19

Abstract T 3

Stroke in Obstetric Patients: a Series of 34 Cases

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Background: Stroke, a leading cause of maternal morbidity and mortality, is implicated in at least 6.3% of maternal deaths in the US and 10% of all maternal deaths in the UK. Although pregnancy-related stroke (PRS) appears to be increasing, there are few data on its risk factors, presentation, and outcomes.

Methods: We conducted a billing data query and identified 34 patients with PRS from Massachusetts General Hospital (2000-2011). Pre-specified data elements were collected from patients' medical records including demographics, co-morbidities, presentation, clinical trajectory, and outcomes.

Results: Sixteen patients (17 events) suffered acute ischemic stroke. Subtypes included cardioembolic (8), cryptogenic (6), and arterial dissections (3). Risk factors included patent foramen ovale (6), diabetes mellitus (3), prothrombotic mutations (3), central venous sinus thrombosis (1), and hypertension (4). Five acute ischemic stroke patients had preeclampsia; four were severe. Half (8/16) of the ischemic stroke patients came to medical attention > 4.5 hrs after symptom onset, outside of the traditional window for intravenous tissue plasminogen activator treatment; none received this therapy. Presenting symptoms included headache (10), focal neurologic deficits (11), and aphasia (6). Nine occurred in the antenatal period and six occurred postpartum. One death occurred in this group, and six were discharged to rehabilitation facilities. Hemorrhagic stroke occurred in 18 patients with intracerebral hemorrhage (7) and/or subarachnoid hemorrhage (11) (2 aneurysms, 2 arteriovenous malformations, and 1 posterior reversible encephalopathy syndrome). The overall median presenting blood pressure was 144/84 (7 had SBP>150 mmHg, 3 had DBP>105mmHg). 4/18 hemorrhagic stroke patients had preeclampsia, and median presenting blood pressure was 160/77. The majority (13/18) of these patients presented in the postpartum period. Headache severity and frequency were higher in this cohort compared to ischemic stroke. Hemorrhagic stroke patients had longer average intensive care unit and overall lengths of hospital stay (6.8d vs. 3.5d and 14d vs. 11d, respectively). There were no deaths in the hemorrhagic group.

Conclusion: Our review of 34 patients with PRS suggested importance for earlier diagnosis and consideration of thrombolytic therapy in obstetric patients with ischemic stroke. Hemorrhagic stroke patients demonstrated a propensity for post-partum presentation. Median presenting blood pressure in patients with hemorrhagic stroke was 144/84 and 160/77 in those with co-existing preeclampsia. Prompt recognition and treatment of PRS could potentially reduce the incidence of such cases.

References:

1. Berg CJ, et al. Pregnancy-related mortality in the United States, 1998 to 2005. Obstet Gynecol 2010;116:1302-1309
2. De Keyser, et al. Intravenous Alteplase for Stroke: Beyond the Guidelines and in Particular Clinical Situations. Stroke 2007;38:2612-8

Abstract T 4

Methylnatrexone to Prevent Intrathecal Morphine-Induced Pruritis After Cesarean Delivery

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Background: Intrathecal (IT) morphine provides excellent and prolonged analgesia following cesarean delivery (CD) however it causes pruritis in over two-thirds of women.(1) N-methylnatrexone bromide, a tertiary derivative of naltrexone, is a peripherally-acting μ-opioid antagonist that does not cross the blood brain barrier, and is FDA-approved to treat opioid-induced constipation. (2) The aim of the study was to assess the effectiveness of subcutaneous methlynatrexone in preventing IT morphine-induced pruritis after CD. We hypothesize that this novel indication for methylnaltrexone will reduce pruritis without adversely affecting post-operative pain.

Methods: A total of 130 women undergoing elective CD are currently being enrolled in this randomized control, double-blinded, multicenter study. All patients receive a standard spinal of hyperbaric bupivacaine12 mg, fentanyl 15 mcg, and morphine 100 mcg. Patients are randomized to receive either a subcutaneous injection of methylnatrexone 12 mg (0.6 ml) or normal saline (0.6 ml) immediately post-delivery. Pruritis, nausea and pain scores are recorded at 2, 4, 8, 12 and 24 h post-study drug. Analgesic, anti-emetics, and anti-pruritics use are calculated for 24 h study period. Overall satisfaction and quality of postoperative recovery are also measured. The primary outcomes are worst pruritis score and the area under the curve pruritis scores for 0-24 h. Naloxone and ondansetron are available to treat pruritis and nausea/vomiting respectively.

Results: At time of abstract submission, we have enrolled 82 of 130 patients in this ongoing study. To avoid unblinding and diminishing the statistical power of the final analysis, we present only descriptive data for the study cohort. 75 (92%) experienced pruritis, and 18 (22%) required treatment for pruritis. The worst pruritis score distribution is outlined in the Figure. 30 (37%). Patients also complained of nausea/vomiting post-CD.

Conclusion: Final unblinded and inferential statistical analysis for this ongoing study will be available for presentation at the upcoming SOAP meeting. If methylnatrexone is effective, this study will provide a viable therapeutic option for a very troublesome side effect, and if ineffective, results will provide valuable mechanistic insight demonstrating that IT opioid-induced pruritis is a centrally, not peripherally, mediated phenomenon.

References:
1. Anaesthesia. 2007; 62(7):672-6.
2. J Pharmacol Exp Ther. 2002; 300(1):118-23.

Abstract T 5

Cost Benefit Analysis of External Cephalic Version

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Yuval Weiss, M.D. - Hadassah Hebrew University Medical Center - Jersualem, Israel
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Background: External cephalic version (ECV) may enable vaginal delivery of the breech presenting fetus. However, ECV is infrequently performed. Currently 98% of breech babies are delivered by cesarean delivery. One potential factor limiting ECV is the success rate, which may be below 50%. By using neuraxial analgesia/anesthesia this success rate can be significantly increased. We calculated the costs for ECV under spinal analgesia versus elective cesarean delivery for breech presentation.

Methods: In a tertiary hospital we costed three variables; manpower, disposables, and fixed costs for these delivery management options; ECV, ECV plus spinal analgesia, vaginal delivery and cesarean delivery. Total procedure costs were compared for possible delivery pathways. Data for manpower were received from management payroll, for fixed costs by calculating cost/lifetime usage rate and for disposables using micro-costing of purchasing costs to our institution in 2008, 1US$=4New Israeli Shekel.

Results: Cesarean delivery was the most expensive option (8751 NIS), whereas vaginal delivery following successful ECV under spinal analgesia costs 3,941 NIS. ECV alone costs 720 NIS, ECV plus spinal analgesia costs 1040 NIS. The highest individual costs for vaginal delivery, cesarean section and ECV were for manpower. Expensive fixed costs for cesarean delivery included operating room trays and postnatal hospitalization (minimum 3 days). When considering rates of ECV success with and without analgesia together with expected cesarean delivery rates, spinal plus ECV pathway is less costly due to lower expected cesarean delivery rate and its lower associated costs. A policy of spinal analgesia for ECV with successful vaginal delivery saved almost 600 NIS per delivery, Figure 1.

Conclusions: Encouraging ECV practice, with spinal analgesia for breech presenting term pregnancy has cost benefit compared with performing elective cesarean delivery for all breech presentation. Use of spinal analgesia is cost beneficial due to increased ECV success rates, reducing the expected cesarean delivery rate subsequent to ECV failure.

Analgesia for 2nd Trimester Termination of Pregnancy: A Randomized Controlled Trial of Intravenous Versus Epidural Patient Controlled Analgesia

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Introduction: Termination of pregnancy (TOP) in the 2nd trimester is indicated for fetal genetic anomalies or fetal disease incompatible with life. Little is published regarding optimal analgesia for medical uterine evacuation initiated by synthetic prostaglandins. In some institutions there is increased utilization of epidural analgesia (1), whilst in others intravenous analgesia is most commonly used (2). To date, there are no randomized controlled trials comparing the efficacy of intravenous (IVPCA) versus epidural (PCEA) patient controlled analgesia. We set out to compare the efficacy of the two modalities, using a validated postoperative recovery assessment tool, the Quality of Recovery-40 (QoR-40) scale.

Methods: All women admitted to our institution for 2nd trimester TOP from June 2012 to January 2013 were invited to participate, and those recruited were randomized to receive either IVPCA with fentanyl or PCEA with bupivacaine, with the option to crossover between groups if dissatisfied. The QoR-40 questionnaire was administered pre-procedure; just prior to hospital discharge; and 24 hours post discharge (QoR scores 1, 2, and 3 respectively). Our primary outcome was the QoR-40 aggregate score, with a minimum score of 40 indicating poor recovery, and a maximum score of 200 indicating ideal recovery. Secondary outcomes included duration of procedure, patient's overall satisfaction and pain scores (VAS 0-10), side effects and obstetrical complications.

Results: 72 women were approached, 35 declined and 4 were ineligible; 33 agreed to participate. There were no significant differences in patient demographics or duration of procedure between the groups. The QoR aggregate scores at different assessment times, patient satisfaction and maximum pain scores were similar in both groups (Table 1). Two patients (11.7%) of the IVPCA group crossed over to the PCEA group, whilst none from the PCEA group changed to IVPCA. A total of 11 (36.7%) women required surgical intervention for retained products of conception, with similar incidence in both groups.

Conclusion: IVPCA and PCEA provide similar quality of recovery and similar overall patient satisfaction for women undergoing 2nd trimester TOP. Both methods of pain relief appear to offer a satisfactory degree of analgesia for the procedure, despite a trend towards lower maximal pain scores in the epidural group.

References: 1) Int J Obstet Anesth 2007; 16:383-4; 2) Can J Anesth 2003; 50: 1039–1046.

Additional Files:

Table 1: Patients' outcomes

Variable	IVPCA (n = 17)	PCEA (n = 13)
QoR score 1 (/200)	160.4 ± 20.1	169.8 ± 14.3
QoR score 2 (/200)	152.0 ± 15.9	161.1 ± 21.3
QoR score 3 (/200)	164.8 ± 16.2	171.4 ± 19.6
Overall satisfaction (/10)	6.9 ± 2.7	7.5 ± 2.9
Maximum pain score (/10)	6.9 ± 1.9	4.7 ± 1.5
Retained products of conception	7 (41)	4 (31)
Patients requiring D&C	6 (35)	4 (31)
General anesthesia for D&C	3 (50)	1 (25)
Regional anesthesia for D&C	3 (50)	3 (75)
Blood transfusion	1 (6)	1 (8)

Results are mean ± standard deviation or n (%)
D&C: dilatation and curettage

Abstract T 7

A Modified Delphi Method to Create a Scoring System for Performance in Maternal Cardiac Arrest

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Background: Maternal cardiac arrest is a rare but often fatal emergency. Studies have found clinicians to be poor at resuscitating pregnant patients(1,2). Beyond the American Heart Association guidelines(3) no accepted tool exists to assess the performance of practitioners managing these patients. Therefore, the authors used a modified Delphi method to capture expert judgment to create a checklist of tasks practitioners should perform during the first five minutes of a maternal cardiac arrest(4). The authors' objective was to create a weighted scoring system that could be used to quantitatively measure proper practitioner performance during such emergencies.

Methods: After reviewing the literature and pooling internal clinician opinions, the authors created a list of tasks thought to be essential for management of maternal cardiac arrest. The list was then distributed to seven recognized experts including obstetricians, anesthesiologists, and nurses to render judgments related to appropriate management of maternal cardiac arrest. Within each round, experts ranked tasks on a scale from 1 through 5 (1 least important and 5 most important). Experts could also suggest items to add, delete, or change. Medians were calculated based on experts' ratings and consensus was defined a priori as 80% exact agreement.

Results: The initial list contained 41 tasks. Three rounds were required to achieve consensus resulting in a checklist of 45 tasks, 28 of them with 80% exact agreement. Round One had a total of 41 items, and included 5 items with 80% exact agreement with rating of "3" or above, 13 without 80% exact agreement that were rated as "3" or above, and 23 items without a majority consensus. Eight items were suggested to be added by experts. Results from Round Two included 24 items with 80% exact agreement that were rated as "3" or above, 13 items rated as "3" or above but without 80% exact agreement, 1 item that 80% of experts decided to remove, and 11 items without majority consensus. Two items were suggested to be added. Round Three results included 28 items with 80% exact agreement and 17 items rated as "3" or above without 80% exact agreement. One item was removed from the checklist and no consensus was reached on four items.

Conclusion: The modified Delphi technique is a valuable tool to obtain consensus among experts and was used in this study to identify the appropriate management of a maternal cardiac arrest. After numerous modifications, edits, deletions and additions that improved the authors' original list of tasks, the process resulted in a weighted scoring system that can be used to objectively assess performance. This new weighted scoring system may have applications for education and research of the management of a maternal cardiac arrest.

1. Berkendstadt H. Anesth Analg 2012;115:1122–6.
2. Lipman SS. Am J Obstet Gynecol 2010;203:179.e1-5.
3. Vanden Hoek TL. Circ 2010;122:S829-61.
4. Clayton MJ. Ed Psych 1997;17(4):373-86.

Abstract T 8

A New Non-Invasive Technique to Estimate Cardiac Output (esCCO) in Pregnant Patients: Comparison with Dye Dilution Cardiac Output

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Background: Estimated continuous cardiac output (esCCO) using pulse wave transit time (PWTT) is a novel non-invasive technology. This method requires only 3 basic forms of monitoring (electrocardiogram, pulse oximetory wave, and non-invasive arterial blood pressure measurement), and does not require any additional sensors. Previously, it has shown a close correlation with intermittent thermodilution cardiac output in the non-pregnant population. We evaluated the efficacy of esCCO in pregnant patients in this preliminary study.

Methods: After REB approval and written informed consent, we recruited 19 healthy parturients in this study. All subjects were between 18 and 45 years of age, and their gestational ages were between 37 and 41 weeks. All women were singleton and not in labor. Participants were asked to rest with left lateral tilt position. ECG, pulse oxymetry wave, non-invasive blood pressure, and PWTT were obtained. The data were transmitted to a personal computer to calculate esCCO. During esCCO measurement, intermittent dye-dilution cardiac output (DDCO) was measured three times every three minutes using indocyanine green (ICG) by the dye dentitogram analyzer (DDG 2001; Nihon Koden Inc., Tokyo, Japan). We evaluated esCCO against DDCO with correlation analysis and Bland and Altman analysis.

Results: We obtained 50 datasets in 19 cases. The analysis results show a correlation coefficient of 0.39 (p=0.006), a bias (mean difference between esCCO and DDGO) of 0.22 L/min, and a precision (1 SD) of 1.55 L/min.

Discussion and Conclusion: esCCO is a new non-invasive technology to estimate cardiac output continuously. We compared the efficacy esCCO with DDCO in 19 patients. esCCO can be used for pregnant patients as well as for non-pregnant patients.

Reference: Anesth Analg 2012; 115: 82-6

Abstract T 9

Programmed Intermittent Epidural Bolus Analgesia for Labour: A Comparison of Two Regimens

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Introduction: Manipulation of the programmed intermittent epidural bolus (PIB) time interval and injection volume can reduce local anaesthetic (LA) consumption without decreasing patient satisfaction [1]. We adjusted the volume and PIB interval to evaluate the effect on LA consumption, using novel technology that delivers both PIB and patient controlled epidural analgesia (PCEA) boluses of low dose epidural mixture (LDM), consisting of 0.1% bupivacaine with 2μg/ml fentanyl at a high flow rate.

Methods: A regimen of 8ml PIB with 45 minutes bolus interval and PCEA 5ml, for breakthrough pain, with 20 minutes lockout (PIB 8/45) was evaluated over a three month period. The regimen was then revised to 5ml PIB with 60 minutes bolus interval and 5ml PCEA with 20 minutes lockout (PIB 5/60). This regimen was evaluated over two months. Pain and motor block were assessed throughout labour and patients were followed up after delivery. The primary outcome measure was LA consumption, while secondary outcomes included motor block, pain scores (0-10) and patient satisfaction. Patients were considered to have a motor block if they had little or no leg movement. Maternal satisfaction was considered adequate if it was reported as 'good', 'very good' or 'excellent'.

Results: Data were evaluated from 86 parturients using PIB 8/45 and 49 parturients using PIB 5/60. Please see table.

Discussion: Our results show that the PIB 5/60 regimen significantly reduced total anaesthetic consumption but had no effect on motor block. Patient satisfaction remained the same in both groups, despite an increase in PCEA use. Our study suggests that further work is required to investigate other factors that may contribute to motor block, such as bupivacaine concentration in the LDM and epidural flow rate.

Reference:

1. Wong CA, McCarthy RJ, Hewlett B. The effect of manipulation of programmed intermittent bolus time interval on total drug use on labor analgesia: a randomized controlled trial. Anesthesia & Analgesia 2011; 112: 904-11.

Table 1. Comparison of the two PIB with PCEA regimens.

	PIB 8/45	PIB 5/60	*P* value
Bupivacaine (mg/hr)	13.2 (3.26)	10.5 (3.86)	0.000045
Motor block	40/68 {59%}	27/38 {71%}	0.2937
Time to motor block (min)	330 [233-375]	380 [293-634]	0.181977
PCEA demands per hour	0.55 [0.13-1.18]	1.27 [0.65-1.82]	0.000079
PCEA delivered per hour	0.30 [0.12-0.62]	0.67 [0.48-1.09]	0.000003
Pain score (0-10)	0 [0-1]	0.4 [0.0-2.0]	0.016887
Spontaneous delivery	33/86 {38%}	17/49 {35%}	0.647916
Instrumental delivery	30/86 {35%}	21/49 {43%}	0.647916
Satisfaction adequate	65/68 {96%}	36/39 {92%}	0.6661

Data are presented as mean (SD), median [interquartile range] and count {%}

Abstract T 10

An Impact Study of No Pain Labor N' Delivery on Labor Analgesia Rate and Obstetric Outcomes in a Chinese Academic Hospital

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Introduction: Labor analgesia pain management varies widely in China with <1% of women receiving neuraxial analgesia (NA). The No Pain Labor N' Delivery (NPLD) cooperative program was launched in China in 2008. We have previously reported a positive impact, including a lower cesarean delivery rate, of initiating an NA service in a community maternity hospital. In the current study we report the impact of NPLD on NA rate and obstetric practice in an academic center.

Methods: This study reports outcomes from The Second Hospital of Wenzhou Medical College between Jan 2009 and June 2011. The staffing of obstetric service remained constant. The NA service started in July 2009 (Mon-Fri 0800-1730) and became 24/7 on May 2010. Prior to initiation of the service no pharmacologic pain management was used during labor. NPLD training was conducted in June 2010. Clinical outcomes included the mode of delivery (primary outcome), total number of obstetric clinic visits, obstetric admissions, total deliveries, indications for cesarean delivery (CD), and traumatic vaginal deliveries (episiotomies and third-fourth degree lacerations). The study period was divided into 3 phases, baseline(1/2009–6/2009), phase-in(7/2009–5/2010), post-NPLD(6/2010–6/2011). Data were compared between the baseline and the post-NPLD phases and between the early post-NPLD(6/2010–8/2010) and late post-NPLD(4/2011–6/2011). Data were analyzed using □2 and t-test. P < 0.01 was considered significant.

Results: There were 15,415 deliveries in the study period. Outcomes are shown in the Table. There was a significant increase in NA rate, overall deliveries, vaginal deliveries, clinic visits and admissions along with decreases in the rates of the overall CD, non-medically indicated CD, and traumatic vaginal deliveries between the baseline and the post-NPLD periods. The rates of forceps deliveries and intrapartum CD deliveries remained unchanged. Analysis of early versus late post-NPLD periods demonstrated sustained clinical outcomes for one year after the NPLD program.

Conclusion: Following NPLD, NA increased and the rates of CD and traumatic vaginal childbirths decreased without an increase in operative deliveries in both modes. Increases in clinic visits, admissions, and overall deliveries suggest improved efficiency in clinical practice. The outcomes were sustained for at least one year. Our findings suggest that NPLD has changed obstetric practice with improvements in labor and delivery outcomes.

Abstract T 11

Maternal Outcomes in Parturients Supplemented with a High Protein Drink in Labor

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Introduction: Because of a potential risk of aspiration, parturients who receive labor epidural analgesia are frequently subjected to restrictions in oral intake.1,2 These restrictions can be a leading cause of dissatisfaction, which can negatively impact the labor and delivery experience.2-4

Objective: To determine if high protein drink supplementation in labor decreases nausea and emesis and promotes patient satisfaction.

Methods: This prospective, controlled study randomized parturients into two groups post-epidural catheter placement. Group P received a high protein drink with ice chips/water PRN; Group C served as control and received only ice chips/water PRN (Study 1). Incidences of nausea and emesis were measured hourly until delivery, and at 1 hour post-delivery. Parturient satisfaction was measured the following day. A secondary aim used ultrasound (US) to evaluate the rate of gastric emptying (t½) in women who ingested a high protein drink or ice chips/water (Study 2).

Results: 150 patients were recruited (Study 1, Group P = 75; Group C= 75). There were no differences in the overall incidences of nausea (P = 0.38), emesis (P = 1.00) or in the incidences at the measured time periods (MANOVA, P > 0.05). Median patient satisfaction scores were higher in Group P than Group C (P = 0.03). 18 additional patients (Study 2, Group PG = 9; Group CG= 9) were analyzed to determine US gastric emptying t½ rates (PG: 25.56 ± 15.90 min [95% CI: 15.17 – 35.94] compared to CG: 20.00 ± 8.70 min [95% CI: 14.34 - 25.66], P =0.19).

Conclusion: In labor, patient satisfaction is improved with high protein drink supplementation compared to ice chips/water with comparable gastric emptying rates.

References:
1. Anesthesiology Clin N Am 2003;21:87-98.
2. BMJ 2009;338:b784.doi: 10.1136/bmj.b784.
3. J Obstet Gynecol Neonatal Nurs 1999;28:507-12.
4. Cochrane Database Syst Rev 2010;1:CD003930.

Abstract T 12

Why Bolus Epidurals with Bupivacaine?

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Introduction: Labor analgesia often begins with a local anesthetic bolus via epidural catheter. Adverse sequelae of inadvertent intravenous bupivacaine injection (1) lead some to bolus with lidocaine. Does bolus lidocaine associate with quicker pain relief, hypotension, rescue vasopressor administration, or urgent Cesarean section (CS) compared to bupivacaine?

Methods: We analyzed demographic, pre-anesthetic, and outcome data on all labor epidurals over 17 months (9/2007-1/2009). By anesthesiologist choice, patients received 10mL bolus of either 0.25% plain bupivacaine or 2% lidocaine with 1:200,000 epinephrine. Then all patients received ropivacaine 0.125% + fentanyl 2 mcg/ml at 10mL/hr with at most one 10mL bolus every 20 min on demand. Time to achieve pain-free labor was assessed every minute. We recorded non-reassured fetal heart rate, low blood pressure, ephedrine use, and urgent CS within 30 min of bolus.

Results: Of 623 labor epidurals placed, 23 also had intrathecal dosing and were excluded, 159 received bupivacaine bolus, and 441 lidocaine bolus. Groups differed only in mL of preload given (table 1). Time to pain relief was 5 min median (IQR 5-30) for each group. Choice of bolus drug did not associate with hypotension, ephedrine use, non-reassured fetal heart rate, or CS within 30 min of bolus (table 2). No recorded variable predicted any complication by multivariate logistic regression using either the entire cohort, or using a “greedy”-matched propensity scored cohort.

Conclusion: Substituting lidocaine for bupivacaine bolus may not impact clinically the course of labor analgesia. These observational data suggest the need for a randomized controlled double-blind trial.

Reference: (1) Karaca S, Unlüsoy EO. Eur J Anaesthesiol. 2002; 9:616

Abstract T 13

Fentanyl as an Adjunct to Bupivacaine in Spinal Anesthesia to Reduce Intraoperative Nausea During Uterine Exteriorization and Internalization in Elective Cesarean Section

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Nausea and vomiting are primarily regulated by the chemoreceptor trigger zone and vomiting center in the brain. Physiologic changes during pregnancy such as impaired GI motility, incompetent LES, and stomach compression by a gravid uterus, are some of the causes that can predispose these patients to develop nausea and vomiting. Overall, there are many causes of intraoperative nausea and vomiting during cesarean section under regional anesthesia such as: hypotension, increased vagal activity, neuroaxial opioids, surgical stimuli, uterotonic agents, and motion. It is known fact that uterine exteriorization and internalization of the uterus can cause visceral stimulation, mediated by unmyelinated C-fibers, and induce emesis. Our study aim is to evaluate intraoperative nausea during uterine exteriorization and internalization of the uterus with the addition of 0.4cc (20mcg) of fentanyl or the addition of 0.4cc of preservative-free normal saline to 1.2cc (9mg) to 0.75% bupivacaine in spinal anesthesia, in obstetric patients during the elective cesarean delivery. We also assessed the overall nausea and hemodynamic stability. Sixty-eight patients who underwent elective cesarean section were randomly assigned into these two groups. The degree of nausea was recorded at five-minute intervals using the Overall Nausea Scale as well as their vital signs. Results have demonstrated an increased prevalence of nausea during uterine exteriorization and internalization in the saline group (21%) compared to the fentanyl group (8.6%). No significant difference has been observed in recorded vital signs between these groups. Intrathecal fentanyl decreased the incidence of nausea during uterine exteriorization and internalization in a cesarean section. Intrathecal fentanyl enhances analgesia and sensory block and could blunt the visceral stimulation through C-fibers. The decrease of visceral pain may also lead to less nausea during exteriorization and internalization of the uterus.

Abstract T 14

Incidence and Management of Difficulty Advancing Arrow FlexTip Plus® Epidural Catheters

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Introduction: Difficulty advancing an epidural catheter has been reported to occur in 0-7% of epidural placements. Despite the increased use of soft flexible catheters to reduce paresthesias and intravascular catheter placements, the inability to advance these catheters remains undefined. Specifically, the incidence of this problem and effective management strategies has not been described.

Methods: All lumbar epidural catheters placed on the labor floor by participating anesthesiologists (residents, fellows, and staff) were recorded for a 12-week period. Difficulty in advancing the epidural catheter was defined as an inability to advance the catheter beyond the needle tip after obtaining loss-of-resistance. Anesthesiologists recorded every catheter placement and completed an additional data sheet when an inability to advance the epidural catheter occurred.

Results: A total of 1200 epidural catheter placements (982 epidural, 218 combined spinal-epidural) were performed during the study period. There were 54 cases of difficult catheter advancement (4.5%; 95% CI=3.4-5.8%). A total of 108 corrective maneuvers (17 single, 23 double, 8 triple, and 5 quadruple) were performed (Table 1). Difficult catheter advancement occurred in 3.2% of combined spinal-epidural and 4.8% of epidural placements (OR=0.66; 95% CI=0.29 to 1.48; p=0.313). On a scale of 0 to 10, median (Q1, Q3) provider confidence in loss-of-resistance was 9 (7, 10). The incidence of inadvertent dural puncture was 3 in 54 (5.6%) if difficult catheter advancement occurred compared to 9 in 1146 (0.8%) when catheters advanced without difficulty (p=0.014).

Discussion: The inability to advance epidural catheters after the epidural space is identified is a frustrating predicament for obstetric anesthesiologists. We found its incidence when using an Arrow FlexTip Plus® catheter was 4.5%, and it occurred despite high levels of confidence in obtaining loss of resistance. Injecting saline, rotating the needle bevel, and changing the needle angle may be corrective and appear to have little downside. However, re-engaging the ligament and performing a new placement were the most successful corrective maneuvers. Heightened awareness is needed, as an inability to advance the epidural catheter was associated with a higher rate of inadvertent dural puncture.

References:
1. Banwell BR et al. Can J Anaesth 1998.
2. Goyal M. Anaesthesia 2001.
3. Spiegel JE et al. Br J Anaesth 2009.

Table 1
Success rates and complications of maneuvers used to correct an inability to advance Arrow FlexTip Plus® epidural catheters during lumbar epidural placement

Maneuver	Success as first maneuver (%)	Success as subsequent maneuver (%)	Complications
Saline injection	8/41 (20%)	0/1 (0%)	None
Rotation of needle bevel	2/4 (50%)	4/14 (29%)	None
Re-engage ligament	4/4 (100%)	10/13 (77%)	Two inadvertent DP
Advance needle	2/4 (50%)	7/9 (78%)	One inadvertent DP
New placement	1/1 (100%)	10/10 (100%)	None
Reposition patient	N/A	0/4 (0%)	None
Change needle angle	N/A	2/3 (67%)	None

DP = dural puncture

Proposing Formal Clinical Diagnostic Criteria for Post-Epidural PDPH Based on Long-Term Followup From the Canadian PDPH Trial

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Introduction: Advances in management of post-epidural PDPH cannot occur without consistent use of meaningful diagnostic criteria for this outcome in clinical trials. We report on the performance of 2 sets of diagnostic criteria compared within the Canadian PDPH trial (Formal Study Criteria/primary outcome) vs International Headache Society Criteria)(Ref 1). These were judged using an Umpire Reference Test(standardized long-term followup for CSF leakage symptoms)as the clinical gold standard.

Methods: After REB approval and patient consent, this multicenter RCT randomized laboring women to receive a large (≥18g)vs small (19g) epidural needle for labor analgesia. The primary outcome was PDPH based on Study Diagnostic Criteria as adjudicated by a blinded external group of experts within the first 14 days of epidural placement. Experts also adjudicated cases for evidence of PDPH based on IHS criteria. First pass agreement between adjudicators was assessed using kappa followed by a consensus diagnosis if required. A second external independent headache specialist/neurologist, examined all 184 previously adjudicated cases, blinded to needle and previous diagnoses, over the full course of study/clinical followup(maximum 1year) for a diagnosis of symptoms consistent with CSF leakage as an Umpire Reference Test.

Results: 1080 women were recruited. Study criteria demonstrated improved first pass interrater reliability between adjudicators for PDPH diagnosis (Kappa 0.93,95%CI 0.85,1.0) vs IHS Criteria(kappa 0.70, 95% CI 0.49, 0.92). PDPH was diagnosed in 25/184 cases based on Study Criteria vs 16/184 using IHS criteria. Thirty-one/184 of these same cases were diagnosed with CSF leakage based on longterm followup (Umpire Reference Test). Study Criteria demonstrated improved diagnostic performance compared with IHS Criteria against the Umpire Reference Test: Sensitivity 71% (vs 36%),Specificity 98%(vs 97%), NPV 94% (vs 88%), PPV 88% (69%), LR+36 (12,142) (vs LR 10.9 (3.9, 34).

Discussion: Study Criteria demonstrated improved diagnosis of CSF leakage symptoms post-epidural compared with IHS criteria based on long-term patient followup. A significant number of women with post-Epidural PDPH are currently undetected in clinical practice and research. We believe that our clinical diagnostic criteria should be adopted for standardized use in patient care and research.

References: Cephalagia, 24,supp 1, 2004.

Table 1. PDPH Trial DIAGNOSTIC CRITERIA FOR PDPH POST-EPIDURAL
Formal Study Criteria
1.Postural headache or neckache that occurs or worsens within 15minutes of sitting/standing and improves within15minutes of lying down. Symptoms may include visual or auditory symptoms, neck stiffness, tinnitus, diplopia, photophobia, nausea/vomiting
2. Patients may or may not have a recognized dural puncture (after epidural needle placement in the spine)
3. Headache and/or neckache persists at least 24 hours and occurs <14 days of epidural needle placement

Abstract T 16

Continuous Spinal Analgesia for Labor with Infusion of 0.0625% Bupivacaine and 2 μg/mL Fentanyl

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From November 2011 through January 2013, we used an infusion of 0.0625% bupivacaine with 2μg/mL fentanyl via a previously-reported 23-gauge spinal catheter (Wiley, Epimed, Johnstown, NY, Lot No. 12404147) for labor analgesia and delivery in 87 patients. Inclusion criteria were spontaneous term labor with zero or one prior vaginal delivery at cervical dilation of six cm or less without preeclampsia or meconium-stained amniotic fluid. All patients received 2.5 mg of bupivacaine upon catheter insertion followed by a continuous infusion at a rate of 2 mL/hr, with a 1 mL/hr demand bolus every 20 minutes. If cesarean delivery was necessary, 0.5% bupivacaine, up to 30 mg, was given via the catheter along with 20 mcg of fentanyl. Mean arterial blood pressure, body temperature, visual analog scale (VAS) score, Bromage score, number of physician boluses, and number of pump adjustments were recorded. The spinal catheters were kept in place to achieve a minimum indwelling time of 12 hours.

In one patient, threading of the catheter was not successful. In 10 patients, the spinal catheter was removed prior to delivery and exchanged for an epidural catheter, due to catheter kinking or migration. Of the remaining 76 patients, 52 had spontaneous vaginal deliveries, 10 had instrument-assisted vaginal deliveries, and 14 had cesarean deliveries. The average VAS score was 8.93 ± 2.4 at analgesia request, 0.42 ± 1.5 at 30 minutes after insertion, and 1.60 ± 5.4 at complete cervical dilation. The average Bromage score was 6.00 ± 0.0 at analgesia request, 3.42 ± 1.9 at 30 minutes after insertion, and 3.54 ± 2.5 at complete cervical dilation. Use of the spinal catheter was successful in all instrument-assisted deliveries and in all but one cesarean delivery.

The average mean arterial blood pressure decrease was 13.2%. Four patients required 500 mL IV fluid boluses and/or vasopressor support. In 30 patients, physician bolus or pump adjustment was required. Eleven patients had a temperature over 38 °C while the catheter was in place. In two patients the catheter was removed ahead of schedule, one due to operator misunderstanding, the other due to patient complaints of unilateral leg pain. Three patients experienced post dural puncture headaches which were successfully treated with an epidural blood patch. There were no apparent infectious or neurological complications.

We conclude that infusion of 0.0625% bupivacaine with 2 μg/mL fentanyl via a 23-gauge spinal catheter provides adequate labor analgesia and appears effective for both instrument-assisted and cesarean deliveries. With a continuous infusion and a demand dose, most patients can be managed with minimal physician intervention. With a target indwelling time of 12 hours, the incidence of headache is low at 3.95% (3.56% – 4.34% 95% CI). Challenges remain in regard to device failure with the version of the catheter we studied.

Abstract T 17

When is the Performance of a Labor Epidural Technique Considered “Difficult”? Differences Among Anesthesiologists, Nurses, and Patients

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Introduction: The performance of a labor epidural technique is not infrequently noted as being “difficult”, although the interpretation of this term is quite variable. We sought to determine whether procedure duration and difficulty could be predicted in advance, what factors were responsible, and whether anesthesiologists, nurses, and patients had similar impressions.

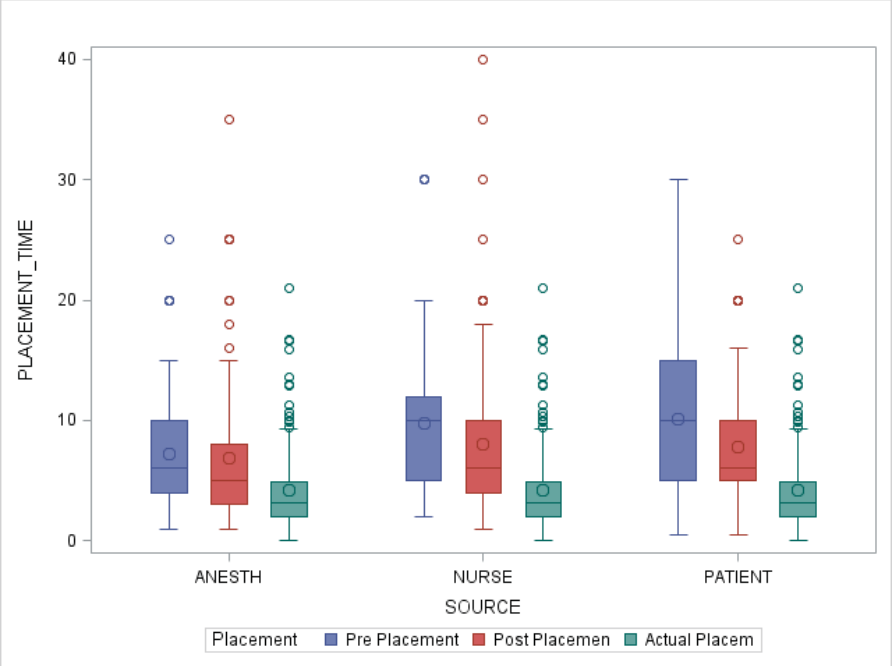
Methods: A total of 140 sets (i.e., an anesthesiologist, nurse and patient) of individuals were asked to complete a questionnaire immediately prior to, and upon completion of, a standardized labor epidural technique. Procedure duration was defined as time from insertion of the needle for local anesthetic deposition to removal of the epidural needle from the skin insertion site; this was timed in seconds by an independent co-investigator. Procedure duration was estimated before and after the epidural technique. Procedure difficulty was also estimated before, and ranked after, the epidural technique with contributing factors indicated. Demographic data for all groups was recorded.

Results: Estimated and actual procedure duration comparisons by group were recorded (Figure 1). For all groups, post-placement ratings of procedure difficulty correlated with actual procedure duration ($p<0.0001$). Mean actual procedure durations for post-placement “difficult” ratings were 8.37, 9.57, and 8.05 minutes for anesthesiologists, nurses, and patients, respectively. Mean actual procedure durations for post-placement “very difficult” ratings were 18.80 and 20.96 minutes for nurses and patients, respectively; anesthesiologists did not use this rating. The leading reasons cited for a “difficult” or “very difficult” ratings by anesthesiologists, nurses, and patients were the actual procedure duration, the number of attempts, and the amount of pain experienced, respectively.

Conclusion: The duration and difficulty associated with the insertion of a labor epidural technique can be estimated. A “difficult” labor epidural technique is associated with procedure duration, but the reasons for this rating differ by group queried. These findings are helpful when discussing expectations for the procedure and defining the meaning of a “difficult” labor epidural technique.

References:
1. Bucklin, et al. Anesthesiology 2005;103:645-653.
5. Faitot, et al. Int J Obstet Anesth 2011;20:124-127.

Figure 1: Placement time comparison across three groups



Abstract T 18

Competency Level for Performing Safe General Anesthesia for Urgent Cesarean Delivery Evaluated with Repeated Simulation Based-Training: Long Term Retention and Frequent Management Mistakes

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Background: The percentage of women undergoing cesarean delivery under general anesthesia (GA) has significantly decreased within the past years, with obvious implications for anesthesia training1. In our institution, residents will perform between 0-3 cesarean deliveries under GA during their training. The goal of this longitudinal trial was to evaluate whether anesthesia residents achieve and retain a competency level considered safe while performing a rapid sequence induction for an urgent cesarean delivery after undergoing focused simulation-based training over an 8-month period. Secondary aim was to identify occurring mistakes in order to improve anesthesia training.

Methods: 24 consecutive 2nd year anesthesia residents (CA-2) underwent simulation-based training to perform a GA for urgent cesarean delivery during 1st (pre-test) & 5th week (post-test) of their total 8-week Ob-anesthesia rotation. In order to evaluate retention, residents were retested after 8 months (post-retention test). Competency level was measured on a 198.5 points containing weighted scaling system, validated as a reliable simulation scoring instrument2. Residents' competency level (mean weighted score, ±SD) and occurring errors were assessed at each testing session. Competency level was compared to that of 6 Ob anesthesia attendings, unfamiliar with the simulation scenario (t-test, $p<0.05$ significant).

Results: Residents' pre-test scores were lower than attendings' scores (135±22 vs 159±11, $p=0.013$), reaching comparable values at 5 weeks (post-test: 159±21) and 8 months (post-retention test: 164±16). At 8 months, residents failed on 12/22 highly weighted tasks and at least 1/7 Ob-anesthesia tasks, such as omitting left uterine displacement, which was missed by 11/24 residents (Table). Several highly weighted tasks were noted to be missed by Ob anesthesia attendings as well.

Conclusion: Following focused theoretical and clinical training and 2 simulation-based sessions, 4 weeks apart, CA-2 residents reached and retained for up to 8 months a competency level comparable to that of the obstetric anesthesia attendings. Several errors and missed tasks were identified that have the potential to improve future residency training and continuous medical education.

1. Anesthesiology 2005;103:645-53
2. Anesthesiology 2006;105:260-

Abstract T 19

Impact of Multi Disciplinary Education on Intrauterine Resuscitation

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Introduction: Effective management of foetal distress is a multi disciplinary effort. There are established resuscitative techniques[1]as well as discussion on more controversial methods[2]. The underlying pathophysiology needs to be understood to implement correct treatment. We carried out multi disciplinary teaching sessions, produced educational posters and distributed action plan cards. Our aim was to promote the underlying pathophysiology in foetal distress and their corrective treatment measures. We audited resuscitative measures that were being used in cases of foetal distress prior to LSCS before and after our intervention.

Methods: Data was collected over a 6 month period from all category 1 and 2 LSCS, where foetal distress was present. We asked: was the mother tilted, were IV fluids running and was oxygen being administered. During the last 8 weeks of the audit cycle we also collected data on the use of syntocinon, we asked if sytocinon had been administered, and there was now the presence of foetal distress, was it still running? We re audited after our education program for a further 6-month period.

Results: See Table 1.

Discussion: Through multi disciplinary teaching we have demonstrated an improvement in knowledge and clinical skills when dealing with intrauterine resuscitation. Placing mothers in a tilted position is a simple and effective maneuver but is still poorly done. In our first audit we only had partial data with regard to the ongoing use of syntocinon during foetal distress and this may have affected our results, as no improvement was seen. Oxygen administration is a moot point within intra uterine resuscitation, our hospital guidelines state oxygen should be “considered” rather than universally administered, but post education it was used more often during foetal distress. In our second audit cycle 11.7% of category 1 LSCS were down graded to category 2 LSCS. This will impact the anaesthetic technique offered to the mother, allowing time for regional anaesthesia thus providing benefits to the mother and foetus.

References

1. Thurlow JA, Kineslla SM. Intrauterine resuscitation: active management of fetal distress. Int J Obstetric Anaesthesia 2002;11:105-116.
2. Simpson KR. Intrauterine resuscitation during labour: should maternal oxygen administration be a first line measure? Seminars in Fetal Neonatal Medicine 2008 Dec;13 (6): 362-7

Resuscitative measure	Pre education (No of cat 1 or 2 LSCS= 94)	Post education (No of cat 1 or 2 LSCS= 151)	
Mother tilted	38.3%	48.3%	χ^2=2.368, p=0.12
IV fluids running	81.9%	90.7%	χ^2=4.072, p=0.04
Oxygen administered	4.3%	11.2%	χ^2=3.625, p=0.057
If syntocinon had been running, was it still running?	7.4%	8.6%	

Abstract T 20

Introduction of an OBstetric Emergency Team (OBET) Response System: Response Dose as a Metric of Successful Implementation

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Background: The goal of rapid response teams (RRTs) is to rapidly recruit life-saving skilled personnel in time to “rescue” patients showing early signs of a trajectory towards cardio-respiratory arrest. Principles underpinning effective RRTs include low threshold for activation and no negative consequences for activators.1 This encourages front-line providers to activate RRS confidently whenever they first suspect patient peril.

Life-threatening problems experienced by parturients are not uncommon and are unique compared to the general hospital population. Timely intervention is often effective. Our unit (4,600 deliv/y)introduced an obstetric emergency team (OBET) system in April 2010, a variant of RRT, designed to activate team responses to obstetric emergencies.1,2 Unlike hospital RRTs, our OBET members consist of the large group of inter-professional personnel who routine collaborate in caring for parturients (obstetrics, nursing, anesthesiology, neonatology, OR technicians). OBET is activated by a single call, and all team members receive an audible alert on their service mobile phones. This study examined the OBET utilization rate using a standard metric for RRT utilization.

Methods: IRB approval was obtained. Monthly OBET usage was obtained from the Dept of Obstetrics quality database. Quarterly OBET “response dose” was calculated, and then adjusted per 1,000 deliveries: 1,000 x [# OBET activations during quarter]/[total deliveries during quarter].

Results: Actual and adjusted OBET response doses are presented [see figure]. The increase was linear from initial months of implementation to present. Quarterly OBET response dosee has risen to 65-75 per 1,000 deliveries. This

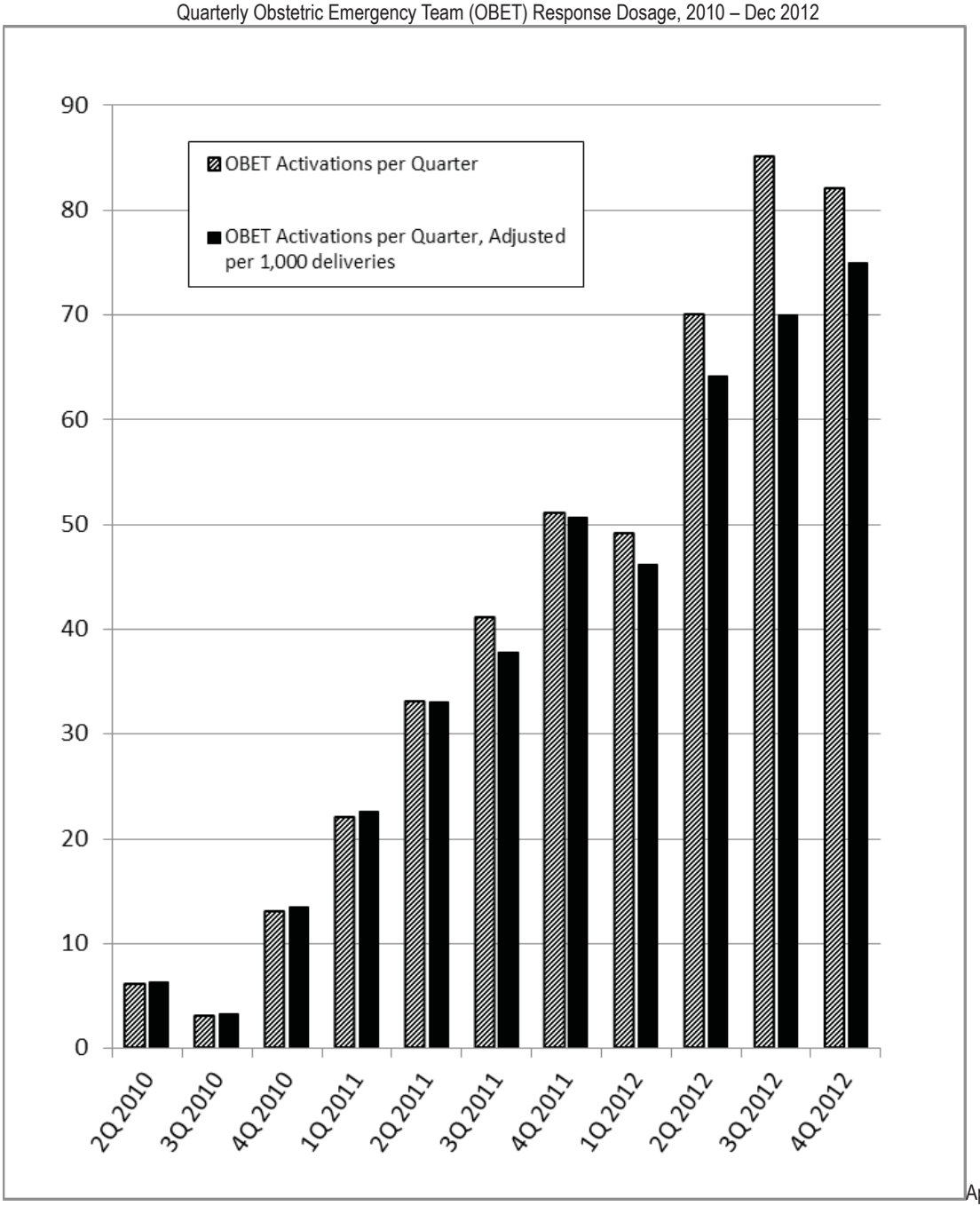
represents an average of nearly one OBET call per day on our unit with 4,600 deliveries per year.

Discussion: A RRT response dose of 25/1,000 admissions represents success for hospital RRTs, while >40/1,000 admissions reflects a “mature academic system”.3 Adverse outcomes have been reported to be inversely related to increasing response dose. 3 The dose representing success for an OBET system is unknown. Our response dose far exceeds that reported for the only two other published OBET systems.1,2 Several unique attributes (cultural, technological, team composition, monitoring/improvement) likely account for this liberal utilization.

Ref: 1) Grosman G. Am J Obstet Gynecol 2008;198:367.e1-7.) Clements C. Nurs Womens Health 2007;11:194-9. 3) Jones D. New Engl J Med 2011;365:139-46.

Additional Files:

Quarterly Obstetric Emergency Team (OBET) Response Dosage, 2010 – Dec 2012



Apr

Abstract T 21

Neuroaxial Blockade and Lumbar Tattoos and Obstetric Anesthisology practices

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Introduction: In recent years tattoos have become increasingly popular, including those located over the lumbar spine of women requesting neuraxial labor analgesia. Some anaesthesiologists have expressed concerns about placing neuraxial blocks through the tattoo pigmented tissue, based on the theoretical concern that tissue coring could lead to arachnoiditis, neuropathies, or epidermoid tumours. (1) Thus far there have been no reported neurological complications. We sought to determine the standard practices of academic obstetric anesthesiology divisions.

Methods: A 7 question Qualtrics® survey was emailed to 121 obstetric anesthesia directors from academic institutions across the United States to characterize practices of neuraxial blockade placement through lumbar tattoos in the setting of obstetric anesthesia. Univariate statistics were used to characterize survey results.

Results: Seventy-six surveys were returned, for a response rate of 63%. While 38% of surveyed division directors (n=29) stated that they would insert neuraxial block at the optimal level regardless of pigmented tissue, 59% (n=45) would alter the neuraxial block position to avoid a tattoo if possible, but insert through a tattoo if necessary. Proposed strategies to avoid tissue coring include: 1) to always use a styletted needle when puncturing the skin with a needle intended for a neuraxial space; and 2) to make a small nick in the skin prior to epidural or spinal needle insertion. One director recommended against neuraxial anesthesia if tattooed skin is unavoidable. Ten percent of responders were aware of instances at their institutions in which a physician refused to place a neuraxial block through a tattoo. No respondents were aware of any complications attributed to neuraxial block placement through a tattoo, but several list the theoretical risks of tissue coring or aesthetic disruption of the tattoo as part of their informed consent discussion.

A Medline search for relevant publications using the keywords: (epidural OR spinal), AND (tattoo), AND (arachnoiditis OR neuropathy OR epidermoid tumor OR complications) did not identify any reports of complications from inserting a neuraxial block needle through a tattoo.

Discussion: Most academic obstetric anesthesiology division directors would place a neuraxial block through a tattoo if necessary; the majority would attempt to avoid any pigmented tissue if possible. The theoretical risks of tissue coring and aesthetic tattoo disruption seem like reasonable topics to include in an informed consent discussion when placement through tattoo pigmented skin is unavoidable.

References:
1. Epidural anaesthesia in three parturients with lumbar tattoos: a review of possible implications. Douglas MJ, Swenerton JE. Can J Anaesth 2002;49:1057-60.
2. Comparing response rates from Web and mail surveys: A meta-analysis. Shih T, Fan X. Field Methods 2008;20: 249-71.

Abstract T 22

Maternal Anesthesia for EXIT Procedure: A Systematic Review of the Literature

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Background: The ex utero intrapartum treatment (EXIT) procedure allows airway establishment for fetuses with life threatening conditions while maintaining placental support. Maternal anesthesia is challenging. Anesthetic goals include uterine relaxation, maintenance of uteroplacental perfusion, and fetal anesthesia. General anesthesia (GA) is often advocated. Recently, there have been reports of the use of regional anesthesia (RA). The aim of this article is to review the literature and compare both techniques with respect to maternal and fetal outcomes.

Methods: Multiple electronic databases were searched using the terms “Ex-utero intrapartum treatment” and “Anesthesia/anaesthesia”. The search was limited to English language. Reference lists of retrieved articles were searched to identify other studies. This review included all reports that described anesthetic techniques as well as maternal and fetal outcomes.

Results: We found a total of 24 reports of 129 patients. Nineteen reports described the use of GA in 120 patients and five reports described RA in nine patients. The most common GA technique was balanced anesthesia with Desflurane. There were 3 reports of the use of total intravenous anesthesia (TIVA). In the RA group, combined spinal epidural (CSE) was used in 8 patients while one patient had a continuous spinal catheter. There were no conversions from RA to GA.
NTG iv was the most common uterine relaxant agent in all RA and TIVA cases. It was used as an adjunct to inhalational agents in 5 cases.

Duration of placental support ranged from 3 to 93 minutes in the GA group and 1 to 21 minutes in the RA group. Fetal monitoring was achieved with pulse oximetry in most cases. Supplemental fetal anesthesia was not commonly required in either GA or RA groups .

Oxytocin was the primary uterotonic in all cases. Additional uterotonics were more often used in the RA group. Six maternal hemorrhages were reported in the GA group and 5 patients required blood transfusions. There were no maternal hemorrhages in the RA group. One patient in the GA group required ICU admission vs. no ICU admissions in the RA group.
There were no maternal or fetal complications due to anesthesia in either group.

Conclusion: GA with inhalational agents is commonly reported for EXIT procedure. RA with CSE appears to be well tolerated. Nitroglycerine iv is often required with both techniques. There have been no reports of maternal hemorrhage or ICU admission with RA.

Abstract T 23

Does Fatigue Affect Experienced Providers' Performance During Obstetric Anesthesia Simulation?

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Intro: Fatigue affects performance, and work hours for physicians in training have been reduced in the last 10 years due to concerns about diminished performance during sleep deprivation.1,2 Little data regarding performance while fatigued is available for experienced physicians, who have no restrictions on duty hours. Obstetric anesthesia cases often occur overnight and many providers work prolonged shifts. We sought to determine whether fatigue affects experienced anesthesiologists' performance during a simulated emergency cesarean delivery under general anesthesia.

Methods: Attending anesthesiologists from a single private practice center were recruited to perform a simulated general anesthetic for emergency cesarean delivery on two separate days, one post-call (FATIGUED state) and one not post-call (RESTED state). Order of simulation completion was randomly assigned. General sleep patterns and fatigue were assessed using the Epworth Sleep and Stanford Sleepiness scales, respectively.3,4 Amount of sleep the night prior to simulation was collected via sleep diary. Simulations were recorded and scored by two blinded attending anesthesiologists using a previously validated scoring tool.5 Hours slept, Stanford sleepiness scale scores, and performance scores in FATIGUED and RESTED groups were compared using the unpaired t–test with P value < 0.05 required to reject the null hypothesis.

Results: Baseline sleep patterns for all participants were normal per the Epworth sleep scale, and no one reported a sleep disorder. Stanford sleepiness scale scores were significantly greater for the FATIGUED versus RESTED group (4.27 vs 1.69, $P < 0.005$). Sleep in the FATIGUED group was significantly reduced compared to RESTED group (2.34 hr vs. 6.85 hr, $P < 0.0001$). Performance between groups was not different based on order of completion ($P = 0.93$), indicating learning between simulations did not bias results. Performance scores were not different between the FATIGUED and RESTED groups (137.6 vs 127, $P = 0.059$).

Discussion: In this study fatigue was not associated with diminished performance during simulated general anesthesia for emergency cesarean delivery. However a trend toward diminished performance was present and our study may have been underpowered to detect it. Therefore we are planning a larger study to address the issue. An alternative explanation is that the decreased performance seen in fatigued resident physicians in previous studies1 is mitigated by experience.

References:

1. Philibert: Sleep. 2005 Nov;28(11):1392
2. http://www.iom.edu/Reports/2008/Resident-Duty-Hours-Enhancing-Sleep-Supervision-and-Safety.aspx.
3. Johns: Sleep. 1991;14 (6): 540
4. Hoddes: Psychophysiology 1972;9:150
5. Scavone: Anesthesiology 2006;105:260

Abstract T 24

Effects of Exogenous Pre-Delivery Oxytocin Dosing on Post-Partum Uterotonic Use

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Background: Prolonged infusion of oxytocin has been has been shown to desensitize the oxytocin receptors on the myometrium.(1, 2) With the increased incidence of post-partum hemorrhage (PPH) mainly from uterine atony (3), what role does the total dose of oxytocin contribute? We analyzed pre-delivery oxytocin exposure using a more sensitive tool, Area Under the Curve (AUC) and postpartum uterotonic use in primigravid women admitted for spontaneous labor and who received oxytocin for augmentation of labor.

Methods: After IRB approval, a manual retrospective medical chart review was performed for calendar year 2008. Inclusion criteria was primigravid women aged >18 years who were admitted with a gestational age >36 weeks for spontaneous labor and received exogenous pre-delivery oxytocin to augment their labor. The dosage rate and time interval of oxytocin administration prior to delivery was used to calculate a total predelivery oxytocin area under the curve (AUC). Patients were then divided into quartiles based on their pre-delivery oxytocin AUC exposure. The patient's medication administration record was also reviewed for use of uterotonics i.e., methylergonovine, misoprostol, or carboprost tromethamine. PPH data was also collected based on the American College of Obstetricians and Gynecologist definition, estimated blood loss greater than 500ml for vaginal delivery or 1000ml for cesarean section, blood transfusion, or a change in hematocrit from pre-delivery to postpartum greater than 10%. Chi-square analysis was done to compare the oxytocin exposure to use of uterotonics, where $p<0.05$ was considered statistically significant.

Results: 228 patients who meet the inclusion criteria and analyzed. Patient demographics were similar among quartiles, however the higher predelivery oxytocin exposure was associated with longer labor. Chi-square analysis showed statistical significance $P<.003$ for higher use of uterotonic use with higher pre-delivery exposure to oxytocin. Quartiles for oxytocin AUC low to high respectively were: 1/57(1.7%), 2/56(3.6%), 5/56 (8.9%), and 11/57(19.3%) The PPH rate was not statistically different amongst the quartiles.

Conclusion: Prolonged exposure to oxytocin has been shown in-vivo to desensitize the oxytocin receptors on the myometrium. We have shown that higher pre-delivery oxytocin AUC exposure increases the need for uterotonic administration, suggesting the phenomenon of greater acute down-regulation of the oxytocin receptors. The anesthesiologist and OB need to be vigilant and commit adequate resources for postpartum uterine atony events in the face of higher dose oxytocin administration.

References:

1. J Reprod Fertil 2000; 120:91-7.
2. Am J Physiol Endocrinol Metab 2011; 300:E468-77.
3. Am J Obstet Gynecol 2010; 202:353 e1-6.

Abstract T 25

Postpartum Hemorrhage Rate – Definition Vs. Reality

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Background: Postpartum hemorrhage (PPH) rates have been increasing, in 1994 the average rate was 2.3% and in 2006 the rate was 2.9%.(1) Most studies that evaluate PPH rates are from national birth registries or billing data, which are often criticized as being inaccurate often underreporting incidences of events.(2, 3) ACOG defines postpartum hemorrhage as estimated blood loss (EBL) > 1000ml for cesarean section (CS), and >500ml for vaginal delivery(VD), or hematocrit(Hct) change >10% in either case.(4) We sought to identify with greater accuracy our institution's PPH according to ACOGs criteria and compare it to the literature.

Methods: After IRB approval, a retrospective chart review was performed for calendar year 2008. Inclusion criteria was primigravid women aged >18 years admitted with gestational age >36 weeks . PPH was screened by Hct change greater than 10% and 20% from the time of admissions until 24 hours postpartum. EBL greater than 1000ml for CS or 500 ml for VD were noted.

Results: 500 patients were analyzed for this study. The criteria of change in hematocrit >10%, produced 42% of patients classified as PPH. Using a stricter definition of PPH of a hematocrit change >20%, the PPH rate was 21%. Only 6.7% of women with PPH by Hct change >10% had EBLs recorded consistent with PPH.

Conclusions: PPH is often quoted (1) as 2.9% while our study found 42%, a significantly higher rate. The EBL as a screening tool for PPH was exceedingly poor. Physician interpretation of the actual medical record resulted in a better understanding of PPH than by ICD-9 coding and provided a more accurate analysis of the data.(2,3) The patients in this study were primigravid and therefore were at a lower risk of PPH. Based on ACOGs definition (>10% Hct change) our incidence of PPH was staggeringly high, which the anesthesiologist and OB should be aware of. Even using a stricter PPH definition of >20% Hct change, the incidence of 21% would be of alarm to all clinicians. Further, improved screening tools should be developed to identify PPH e.g. use of postoperative uterotonics, to ensure patient safety, and healthcare providers should maintain high vigilance to the issue of PPH.

References:

1. Am J Obstet Gynecol 2010; 202:353 e1-6.
2. Pediatrics 2011; 128:323-30.
3. Perspect Health Inf Manag 2011; 8:1b.
4. ACOG Practice Bulletin: Number 76, October 2006: Postpartum hemorrhage.

Abstract T 26

Increased Exogenous Pre-Delivery Oxytocin Exposure and the Relationship to Non-Reassuring Fetal Heart Tracings Prompting Clinical Intervention

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Background: Elective induction of labor, i.e. without a medical indication, has been criticized because of maternal and neonatal sequelae. (1, 2) Non-reassuring fetal heart tracings (NRFHT) is often cited as one of these sequelae. Presumably patients undergoing elective induction of labor are being exposed to higher doses of oxytocin and is the cause of non-reassuring fetal heart tracings. We analyzed pre-delivery oxytocin exposure using a more sensitive tool, Area Under the Curve (AUC) and compared the number of patients who had a non-reassuring fetal heart tracing that prompted healthcare provider intervention in primigravid women.

Methods: After IRB approval, a manual retrospective medical chart review was performed for calendar year 2008. Inclusion criteria was primigravid women aged >18 years admitted with a gestational age >36 weeks undergoing an elective induction, spontaneous labor without pre-delivery exogenous oxytocin exposure, or spontaneous labor augmented with pre-delivery oxytocin administration. The dosage rate and time interval of oxytocin administration prior to delivery was used to calculate a total predelivery oxytocin area under the curve (AUC). Patients were divided into quartiles based on their pre-delivery oxytocin AUC exposure. Healthcare provider intervention for NRFHT included: patient position change, administration of supplemental oxygen, intravenous fluid bolus, decreasing or halting oxytocin administration, transfer of patient to the operating room, use of terbutaline, nitroglycerine, ephedrine, or phenylephrine. The 1st and 4th quartiles of pre-delivery oxytocin exposure were analyzed for the number of patients who had a NRFHT that prompted healthcare provider intervention using Chi-square analysis with $p<0.05$ being statistically significant.

Results: Demographic data was not statistically different between groups. Higher oxytocin exposure was associated with more NRFHT provider intervention by chi-square analysis, P=0.0006 with lowest vs highest AUC oxytocin quartiles 29/95(30.5%) and 53/94(56.4%) patients.

Conclusion: Total oxytocin administration by AUC has an impact on NRFHT requiring prompt healthcare interventions. Increased oxytocin AUC puts increased demands on healthcare providers, from monitoring fetal heart tracings more vigilantly to assembling the obstetricians, operating room staff, and anesthesiologist to transport the patient to the operating room for a potential crash cesarean section. Higher oxytocin use puts the mom and fetus at risk for healthcare interventions and potentially may decrease maternal satisfaction and increase costs.

References:

1. Caughey AB, Sundaram V, Kaimal AJ, et al. Systematic review: elective induction of labor versus expectant management of pregnancy. Ann Intern Med 2009; 151:252-63, W53-63.
2. Moore LE, Rayburn WF. Elective induction of labor. Clin Obstet Gynecol 2006; 49:698-704.

Abstract T 27

Teaching the Lumbar Epidural Technique to Millennial Learners: The Impact of an Educational Video

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Background: A resident's first rotation in obstetric anesthesia provides an intensive learning opportunity for the epidural technique. Current instruction of residents at our institution involves didactic sessions, demonstration of epidural technique by senior staff, and staff supervision during epidural placements. A recent audit reported that only 33% of trainees felt that they received adequate training before their first attempt(1). The use of multimedia such as point-of-view video has been advocated for enhancing curriculum among millennial learners(2). Video has been used to evaluate resident performance of the epidural technique(3), but the use of an institution-specific video to teach lumbar epidural placement has not been validated.

Methods: We created an institution-specific video demonstrating the lumbar epidural technique. After IRB approval, anesthesia residents in their first obstetric anesthesia rotation were randomized to either routine orientation (control group) or routine orientation and video exposure (video group). All residents completed a pre-test to assess their baseline knowledge and a post-test to assess change in knowledge at the end of the rotation. Participants also logged epidural placements throughout the month detailing the number of attempts, whether assistance was required, and if the patient had adequate analgesia (VAS<3) 30-60 minutes after placement. Learning curves were calculated based on placements over time against success rate, with success defined as no assistance required, <3 attempts, or VAS<3. All residents completed a post-study questionnaire about the quality of education received and which educational tools were most beneficial.

Results: Three of 25 subjects per group have been recruited to date; enrollment is ongoing. Interim analysis showed no significant differences in pre- and post-test scores between groups. While not significant ($p \geq 0.05$), learning curve comparison suggested a higher incidence of success in initial epidural placement in the video group (70% video group, 30% control group) and a trend toward higher success rates beyond the fifth lumbar epidural placement in the video group. Survey of which educational tool was most helpful demonstrated that those in the control group valued direct observation of an attending, while those in the video group preferred the video.

Conclusion: Multimedia is increasingly favored among residents, who have been termed "millennial learners" for their facility with electronic devices and desire for interactive education. Our preliminary results suggest that an educational video of the lumbar epidural technique is a valuable learning tool. Further analysis will determine whether the suggested trend toward earlier success in performing the technique is a real effect.

1. Watterson LM et al. Anesth Intensive Care 2007;35(1):38-45.
2. Chu LF et al. Best Prac Res Clin Anaesth 2012;26:33-53.
3. Birnbach DJ et al. Anesthesiology 2002;96(1)5-9.

Abstract T 28

The Influence of Posture on the Effectiveness of Local Anesthetics of Clinical Dose for Epidural Labor Analgesia

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Introduction: Sacral nerve block (S2-S4) is necessary to control pain during second labor stage. Epidural injection of local anesthetics with supine position leads to the spread of analgesia in the cephalad direction. This may inhibit contraction of the uterus and restrict the use of local anesthetics. The optimal situation is efficient sacral nerve block without the spread of analgesia in the cephalad direction. We hypothesized that extended sitting after local anesthesia would prevent the spread of analgesia in the cephalad direction.

Method: Following IRB approval and informed consent, 24 parturients scheduled for epidural labor anesthesia were enrolled in this prospective study. The patients were divided into 2 groups; sitting position for 30min (Sit 30) and supine position for 30min (Sup 30) after epidural dose. An epidural catheter was inserted at L3/4. Epidural injection was performed with 0.06% levobupivacaine which contains 2μg/ml fentanyl 60min after test dose with 2% lidocaine 3ml as sitting position. We confirmed analgesic area by pin-prick test 30 min after epidural injection. Measurement was taken up to S2. A case of unilateral block was defined as a negative pin-prick test on less than 3 analgesic segments. Statistical analysis was performed using Tukey-kramer test for demographic data and Scheffe test for analgesia. $P<0.05$ was considered statistically significant.

Results: Two patients in Sit 30 group and one patient in Sup 30 group were excluded as unilateral block. Demographic data was similar in each group. There was less spread of analgesia in the cephalad direction in Sit 30 compared to Sup 30. There was no significant difference in the spread of analgesia in the caudad direction among the groups. Analgesic segments of Sit 30 were significantly narrow while Sup 30 analgesic segments were significantly wide. [figiure1]

Discussion: Several studies suggest that posture has no significant effect on the analgesic level1,2. In our study, extended sitting after local anesthesia prevented the spread of analgesia in the cephalad direction. However, this effect was limited when sitting time was short. Changing posture from sitting to supine position may result in wider spread of analgesia.

Conclusion: Supine position may result in superior and wider spread of local anesthetics of clinical dose for epidural labor analgesia.

References: 1. Br J Anaesth 1983;55(4):303-7, 2. Int J Obstet Anesth 1993;2(3):134-6

Abstract T 29

Optimal Bupivacaine Spinal for Cervical Cerclage: Effect on Ambulation, Urination, PACU Time and Pain Control

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Introduction: Cervical incompetence is thought to cause as many as 20-25% of miscarriages in the second trimester. Cervical cerclages are performed in about 4.4 per 1000 live births. Historically, many practitioners administered subarachnoid lidocaine for cerclages. Because of the increased risk of transient neurologic symptoms (TNS)[1] other local anesthetics have been studied. Previous studies [2] show that bupivacaine is a suitable alternative to lidocaine for cervical cerclage. There is little data comparing the effectiveness and side effects of differing doses of spinal bupivacaine in women undergoing cervical cerclage. Our study evaluated low vs. high dose bupivacaine spinals and their side-effects.

Methods: This was a retrospective chart review. Cerclage cases were identified using our computerized anesthesia system. We reviewed all patient charts from our institution for women who underwent cervical cerclage between February 2011 to November 2012 (n=119). Patient groups were divided by dosing of intrathecal bupivacaine. We compared low dose (≤10mg) to high dose (>10mg) bupivacaine, looking at differences in time to ambulation, urination and recovery in the PACU. We also compared first time to request pain medication and maximum visual acuity score (VAS) in the PACU. Statistical analysis included chi square, Fisher's exact test and Student's t-test, as indicated. $P< 0.05$ was significant.

Results: To date we have identified 61 patient who received spinal bupivacaine for cerclage. Forty-one patients received low dose (5.25-10mg) and 20 patients received high dose (11.25-15mg). There was a significant difference in time to ambulation (3.08 ± 0.82 hrs. vs 4.26 ± 1.04 hrs. p=0.0002), time to void (3.52 ± 0.87 hrs. vs. 4.69 ± 1.4 hrs. p=0.0097) and PACU time (3.71 ± 1.46 hrs. vs. 4.9 ± 1.36 hrs. p=0.0032) with longer times being associated with the high dose bupivacaine group. There was no significant difference in first time to request pain medication or max VAS in the PACU between the groups.

Discussion: While intrathecal bupivacaine is a useful alternative to lidocaine as an anesthetic for cervical cerclage, differing doses of bupivacaine have not been compared in this patient population. Our data demonstrate that low dose bupivacaine spinals are superior to high dose with the advantage of earlier ambulation and urination and shorter PACU time, while providing equal pain control.

References:
1. Anesth Analg 2005;100:1811-6
2. Anesth Analg 2003;97:56-61

Abstract T 30

Development of a Collaborative Continuous Quality Improvement Team to Improve Maternal and Newborn Health in Northern Ghana

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Introduction: Maternal mortality remains a challenge in Africa. The WHO identified "quality of health services" as a key component in improving outcomes in maternal and newborn mortality. Sixty percent of maternal deaths in Ghana can occur within hospitals. It is imperative to improve maternal and perinatal care by strengthening healthcare institutions. Kybele, a US-based NGO and Tamale Teaching Hospital (TTH) began a collaborative Maternal and Newborn Health Quality Improvement Committee (MNHQI). TTH is a tertiary health care and medical education hospital in the northern region of Ghana. The aim of this project is to provide evidence regarding the feasibility, sustainability and effectiveness of implementing a hospital-based QI collaboration for obstetric and neonatal care in a low-resource country.

Methods: In 2011, TTH had 6,759 live births, stillborn rate of 56 per 1,000 live births, and a maternal mortality rate of 695 per 100,000 live births. The proposed implementation model follows key tenets of quality improvement, and incorporates a multidisciplinary approach, high-level sponsorship, measurement, feedback, leadership and teamwork coaching, training including QI training, and a focus on patients and systems. The model will be customized to the context and resources of the Ghana Health Service. Primary outcomes will include maternal and perinatal mortality, and case fatality rates (CFRs) for hemorrhage and hypertensive disorders, achieved through the creation of timely, effective (evidence based), efficient interventions. Subsequent interventions will address patient centeredness and equity. Data will be collected via manual abstraction and tested data collection records created by the committee. The MNHQI Committee consists representatives from various aspects of maternal and newborn care. The committee acts at arms-length from hospital administration. The committee reports directly to the CEO and Director of Nursing at TTH. A series of visits to TTH included development of the MNHQI Committee, QI training, a "personal vision for positive change" interview, and leadership teaching.

Discussion: CQI is an approach to core process based problems that has worked successfully in health care and industrial settings in western countries to achieve and maintain adequate quality, but its successful implementation requires significant investment of time, resources, and team participation. This approach should assure the quality of important services in a health facility and enable them to respond to core processes of a system. Kybele and TTH have successfully created the MNHQI Committee as of January 2013. Initial training and leadership building has been completed. The first QI project for this committee will be improved latency for STAT pharmacy orders for maternal and newborn wards. Future plans include a leadership forum for all committee members and a large scale QI project to reduce "decision to incision" time for cesarean births.

Abstract T 31

Physical Stability of Propofol-Ketamine Mixture Used For Inadequate Neuraxial Anesthesia During Cesarean Section

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Background: Administering propofol and ketamine mixed in the same syringe is gaining popularity as a supplemental sedative and analgesic for inadequate neuraxial anesthesia during cesarean sections (1). Propofol-Ketamine mixture is believed to provide both sedation and analgesia, with less unwanted side effects such as injection pain, and cardiovascular and respiratory depression due to the opposing effects of each drug (2). However, propofol is formulated as an emulsion. Propofol's labeling cautions against mixing with other drugs prior to administration because of the potential instability of the emulsion. We have previously shown no visual and chemical incompatibility of the propofol-ketamine mixture (3). However, a physicochemical compatibility study of propofol-lidocaine mixture suggests that the addition of lidocaine to propofol results in coalescence of oil droplets (≥ 5000 nm) with potential risk of pulmonary embolism (4).
The purpose of this study is to detect change in the size of oil droplets in the propofol-ketamine mixture (1:1).

Methods: 20 ml of Propofol (1%, TEVA, North Wales, PA) and 2 ml of ketamine HCl (10%, Hospira, Lake Forest, IL) were mixed in 30 ml plastic syringe. Propofol alone was drawn up separately and used as control. Aliquots of the mixture were taken at different time-points (0, 60, 120, 240, 300, 360 minutes), and droplet size was measured. The droplet size was determined by photon correlation spectroscopy using Zetasizer Nano ZS Zen3600 (Malvern Instruments Inc., Westborough, MA, USA). The measurements were obtained using a He-Ne laser of 633 nm and the droplet size analysis data were evaluated using volume distribution.

Results: The mean oil droplets size of the mixture did not change significantly (≤ 200 nm). See Figure 1.
Conclusions: The addition of ketamine to propofol did not result in significant change of the oil droplets size. The propofol-ketamine mixture used in clinical practice is stable and may not pose risk of pulmonary embolism.

References:
1. Calimaran A, et al. A1336. ASA 2008.
2. Camu F, et al. Best Pract Res Clin Anaesthesiol. 2002;16:475-488.
3. Calimaran A, et al. A694. ASA 2008.
4. Masaki Y, et al. Anesth Analg. 2003;97:1646-51.

Abstract T 32

Evaluating Analgesic Disparities in Hispanic Parturients: A Qualitative Analysis

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Introduction: A racial/ethnic disparity in neuraxial labor analgesia use exists. Hispanic patients are less likely than white patients to anticipate and use neuraxial analgesia. The objective of this qualitative study was to evaluate what sources of information are used and which factors most influence analgesic decision-making in Hispanic parturients.

Methods: An expert panel developed a semi-structured interview guide. Using stratified purposeful sampling, three groups of Hispanic parturients were interviewed on post-partum day 1: those who wanted/used neuraxial analgesia, those who initially did not want but ultimately used neuraxial analgesia, and those who did not want/did not use neuraxial analgesia. Interviews were conducted in English or Spanish based on the patient's language preference. Interviews were conducted until thematic saturation was achieved. Transcripts were transcribed verbatim. Responses were analyzed using content analysis. Two Spanish-speaking obstetric anesthesiologists developed an initial coding scheme, and the coding schemes were compared. A final coding scheme was developed and applied to all transcripts. Inter-rater reliability was 100%. Descriptive statistics were used to characterize counts and percentages.

Results: A total of 18 participants were interviewed: 5 wanted/used neuraxial analgesia, 11 initially did not want but ultimately used neuraxial analgesia, and 2 did not want or use neuraxial analgesia.

The two most commonly used sources of information were obstetric providers (83%) and friends/family (89%); with patients relying more heavily on information from obstetric providers in their decision-making. All patients were seen by an anesthesiologist intrapartum, but trust in the anesthesiologist varied. When asked if trust in their anesthesiologists affected their analgesic decision making, a representative statement was, "I didn't know my anesthesiologist."

All participants were asked about the risks of neuraxial analgesia, and over half the patients cited permanent back pain and paralysis as potential complications. These were the predominant reasons cited for not initially intending to use neuraxial analgesia in the group of patients who ultimately decided to use it intrapartum. All of these patients also stated that their change in attitude was caused by pain, and some specifically noted that their concerns had been alleviated through intrapartum discussions with their providers. Eighty-three percent of patients stated that they would like to have information on labor analgesia given to them during their pregnancy.

Conclusions: Despite having spoken to their obstetric providers and anesthesiologists, misconceptions were prevalent among the Hispanic women interviewed. Patients prefer information from providers, and are desirous of this information prior to labor. Tailored, in-person, educational opportunities for Hispanic patients should be created and evaluated.

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Lost in Translation. Controversies Between Anesthesiologists and Obstetricians on the Labor ward: A Delphi Technique-based Consensus

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Introduction: The practice of maternity care is characterized by close co-operation of several healthcare disciplines – anesthesiologists, obstetricians and nurses in caring for the same patient. Each discipline may interpret medical evidence in different ways, which may potentially compromise patient outcome. Major enquiries into maternity services continue to identify that ineffective communication is associated with poor maternal and neonatal outcome[1]. The purpose of this study was to identify the most important controversial topics between obstetricians and anesthesiologists with a potential to affect patient outcome.

Methods: After REB approval, a consensus-building study based on the Delphi technique [2] was conducted at our institution. A selected panel of experts comprised of obstetric anesthesiologists and obstetricians, responded to a series of 4 parallel sequential questionnaires interspersed by feedback. Two of the 3 investigators were blinded to whom the responses were from. The 1st round was an open question: what are the topics in patient management, and the reasons why, whereby a difference in opinion exists between anesthesiologists and obstetricians that may interfere with patient outcome? The 2nd round sought agreement on the topics gained from the 1st round. The 3rd round sought the ranking of topics and reasons that scored ≥60% consensus, in order of importance. The final round allowed the opposite discipline insight into the controversies gathered by the other discipline and sought topics of mutual agreement.

Results: 10 anesthesiologists and 10 obstetricians participated in the study. Topics and reasons that achieved 60% agreement in each group of specialists are presented in Table 1. Anesthesiologists agreed with all topics, and 50% of the reasons raised by obstetricians. The obstetricians had ≥60% agreement with the topics identified by anesthesiologists, but only 28% agreement of the reasons as to why the differences exist.

Discussion: Although both disciplines initially identified different topics, once presented with the counterpart view, both parties were in agreement. However, there was significant disagreement on the underlying reasons for the controversies. This information may serve as the basis to develop education, training programs and strategies to improve communication between the two disciplines and therefore patient care.

References:
1.Women and Birth 2011;24:72-79
2.Management Science 1963;9:458-467

Additional Files:

Anesthesiologists' Consensus Topics and Underlying Reasons	Obstetricians in agreement (%)	Obstetricians' Consensus Topics and Underlying Reasons	Anesthesiologists in agreement (%)
1) Obstetricians' lack of appreciation of anesthetic risks	**70**	**1) Anesthetic technique for STAT cesarean deliveries**	**100**
a) Disproportion between surgical risk and anesthetic risk	60	a) Delayed incision time due to reluctance to use GA	40
b) Perioperative management of morbidly obese patients	40	b) Difference in priorities: maternal safety (Anesthetist) vs fetal safety (Obstetrician)	100
c) Lack of understanding of the risks of a general vs regional anesthesia	20	c) Lack of understanding that a GA may facilitate surgery	20
2) Management of high risk patients	**70**	**2) Uterotonic administration**	**90**
a) Timing of delivery based on different priority goals. i.e. Anesthetists focus on 'maternal' risks, Obstetricians on 'fetal' risks.	50	a) Difference in 'comfort level' of obstetrics vs anesthetists of their use of iv oxytocin and ergot	80
b) Inadequate consultation and assessment of high risk patients by obstetricians	10	b) Who is the ultimate decision maker between the two disciplines?	80
c) Post-operative disposition of patients	10	c) Anesthesiologists' fear of oxytocin-induced hypotension supersedes effective dose to control bleeding.	30
d) Inadequate referral of selective patients to anesthesia clinic	20		
3) Miscommunication between Anesthesiologists and Obstetricians	**80**	**3) Variation in Anesthesiologists' adherence to NPO for elective cesarean deliveries.**	**70**
a) Lack of joint decisions on L&D	60		
b) Lack of early involvement of anesthesiologists in emergency situations	40		
c) Lack of communication of serious issues and high risk patients	50		
4) Timing of Cesarean delivery	**60**		
a) Obstetricians' personal convenience	10		
b) Little consideration given to anesthetic and labor ward workload	10		
c) Lack of concern for patient safety and 'tying up' an OR with elective CD.	10		
5) Uterotonic administration	**90**		
a) Lack of insight and evidence based medical management in the literature regarding Oxytocin dose.	50		
b) Reluctance to change due to culture and tradition	60		
6) Exteriorization of uterus	**100**		
a) Habit and tradition for obstetrician	80		
b) Claimed better surgical exposure	100		
c) No consideration for the patient discomfort	50		

Abstract T 34

Do Epidural Blood Patches Affect the Placement and Efficacy of Future Labor Epidurals in Obstetric Patients?

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Background: Epidural blood patches (EBPs) are routinely performed for patients suffering from post dural puncture headaches. Recent case reports indicated that previous EBPs might decrease the success rate of future epidurals. With relatively low volume (mean 15.3ml) blood injections, a prior study demonstrated EBPs had no significant effect on subsequent epidurals. The aim of this study is to evaluate obstetric patients with a history of larger volume lumbar EBPs to determine the effects on subsequent labor epidurals.

Methods: Upon IRB approval, 730 women who had EBPs at the Brigham and Women's Hospital (2000-2012) were identified; 400 charts have been reviewed and data collection has been completed on 22 patients who received neuraxial techniques for a subsequent labor and delivery after EBP. Epidural placement and function information were retrieved and analyzed.

Results: Seventeen patients received epidural placements, 3 had combined spinal-epidurals and 2 had spinals. Patients who had only epidural placements were used in the data analysis. An average of 1.8 attempts was made on the original placements, resulting in 10 dural punctures. Seven intrathecal catheters were placed. All 17 patients had EBPs with an average of 26ml of autologous blood injected. Two patients received repeat EBPs with an average of 25ml of blood. All blood patches were achieved with 1 attempt and no complications were noted. For subsequent epidural placements, there were 1.3 attempts on average. Labor epidurals were performed in all 17 patients; 1 patient had 2 subsequent deliveries with epidurals. Level of placement included 3 at L2-3, 8 at L3-4 and 5 at L4-5. Time from placement to first recorded time of comfort was averaged to be 28 min. Mean duration of epidural time was 253 min. Successful epidural placements were defined as epidurals that resulted in good analgesia without need for replacement. Two epidurals needed to be replaced in separate patients. One was due to a one-sided block and the other was due to no identifiable dermatomal level. Subsequent epidurals provided good analgesia without complications or need for further adjustment. The overall epidural success rate was 89%. Three patients required eventual cesarean deliveries. No complications were noted after epidural placements.

Conclusion: EBPs do not appear to affect the placement and efficacy of subsequent epidurals in obstetric patients.
Note: This abstract contains partial data for the purpose of submission. Data collection and analysis of the entire data set will be completed prior to the SOAP meeting. We also plan to match the study group with a control group who had two interval epidurals without EBP.

References:
Hebl JR, et al. Epidural anesthesia and analgesia are not impaired after dural puncture with or without epidural blood patch. Anesth Analg 1999;89:390.
Ong BY, et al. Impaired epidural analgesia after dural puncture with and without subsequent blood patch. Anesth Analg 1990;70:76

Abstract T 35

Evaluation of Continuous Spinal Catheters in Obstetric Patients

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Background: Continuous spinal anesthesia (CSA) has been shown to be effective and safe in older patients (1), but experience is limited in the obstetric population. The prolonged presence of a spinal catheter (SC) after dural puncture (DP) has been reported to reduce the incidence of postdural puncture headache (PDPH) (2), and common practice at our institution is to place a SC following inadvertent DP. Although overall failure rate of CSA in non-obstetric patients is reported to be 2-4% (1), our anecdotal experience suggests a higher rate. We report a retrospective series of parturients managed with CSA.

Methods: Patients who had SCs placed were identified by searching our database. Individual records were reviewed for information related to patient demographics, planned neuraxial technique, adequacy of analgesia/anesthesia, and adverse events. Primary outcome was inadequacy of SCs, as defined by a need to replace the SC with a second neuraxial technique or use of other supplemental analgesic modalities (i.e., intravenous narcotic, general anesthetic for c-section).

Results: Of patients identified with SC placement from 2002 to 2012, 32 have been reviewed in this ongoing analysis. Age was 31.9 ± 6.6 years (mean ± SD). SCs were placed in 17 patients following DP during epidural placement, and 13 during combined-spinal epidural (8 placed for labor analgesia, 4 placed at the time of c-section, 1 at the time of tubal ligation). In two patients, CSA was planned for c-section. Duration of catheter left in situ was 18.9 ± 9.9 hours (mean ± SD). 13 were managed by patient controlled spinal analgesia (PCSA), 11 of which required adjusted settings. Two catheters were initially managed as epidural catheters due to delayed recognition of intrathecal catheter placement. Remaining patients were managed with clinician-administered boluses of intrathecal medication. 17 had a vaginal delivery, and 15 were delivered by cesarean section. CSA was inadequate in 6 patients (18.8%)—3 required a second neuraxial technique, 2 required IV narcotics during cesarean delivery, and 1 required conversion to general anesthetic for cesarean delivery. Adverse events were noted in 5 patients, related to a high block or hypotension. PDPH occurred in 20 patients (62.5%), and epidural blood patch was performed in 11 (34.4%).

Conclusion: Preliminary results suggest that CSA is safe in parturients. Failure rate was higher in our series than reported in the literature for non-obstetric patients (1). Incidence of PDPH in our series suggests that placement of SC following inadvertent DP might not significantly decrease the incidence of PDPH. Future work may compare the efficacy and safety of SCs vs. re-siting the epidural following inadvertent DP.

1. Denny NM, Selander DE. Continous spinal anesthesia. Br J Anaesth 1998; 81: 590-597.
2. Denny N, Masters R, Pearson D, et al. Postdural puncture headache after continuous spinal anaesthesia. Anesth Analg 1987; 66:791-794.

Teaching Labor and Delivery Nurses about Aspiration in Parturients: A “Residents as Teachers” Pilot Comparing Simulation with Didactic Lecture

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Background: Parturients have an increased risk of aspiration during the peripartum period which can lead to significant morbidity. Labor and delivery nurses can play a critical role to decrease potential complications in the delivery suite and operating room. This project was undertaken to teach nurses about aspiration mechanisms, prevention and treatment. Two separate teaching modalities, powerpoint lectures vs high fidelity simulation, were employed. Simulation may improve knowledge, critical thinking, communication, and confidence which are important components of optimal teamwork. In obstetrics, where patient conditions can evolve rapidly, a multidisciplinary educational approach enhances teamwork, patient safety and outcomes.

Methods: 38 of a cohort of 50 nurses have been enrolled in a 6-month cross-over study. Pre-intervention assessment consisted of a survey on prior clinical experience and self-confidence with emergent airway management assistance, and a multiple-choice knowledge pre-test which included 10 questions on aspiration. The nurses were randomized into control (powerpoint lecture, PPT) or high fidelity simulation (SIM) groups that covered equivalent educational material developed and taught by anesthesia residents. Immediately after the intervention, the nurses repeated the survey and a knowledge post-test. After six months, performance and retention will be assessed with each nurse using knowledge tests, self assessment surveys and simulation exercises.

Results: Pre-intervention testing demonstrated that the majority (36/38) of nurses have knowledge deficits regarding aspiration. Mean aspiration knowledge test scores improved irrespective of teaching intervention (PPT pre 6.42 ± 2.12 vs PPT post 8.79 ± 1.03; SIM pre 5.58 ± 1.53 vs SIM post 8.00 ± 1.14, $p<0.001$, paired t-test). There was no difference in post-intervention test scores between the PPT and SIM group ($p= 0.463$). Nurses reported the learning experience enjoyable, useful and rated the course 4-5/5.

Conclusion: This pilot demonstrated the utility and feasibility of using “residents as teachers” to educate L&D nurses on increased aspiration risk and its potential complications in the parturient. Regardless of the teaching intervention used, there was a significant increase in nurse knowledge. Potential benefits of immersive simulation on long term retention will be assessed in follow up at 6 months.

References:

Chopra V, Gesink BJ, DE Jong J, Bovill JG, Spierdijk J, Brand R. Does training on an anesthesia simulator lead to improvement in performance? British Journal of Anaethesia. 1994;73:293-297.
Decker S, Sportsman S, Puetz L, Billings L. The Evolution of Simulation and Its Contribution to Competency. The Journal of Continuing Education in Nursing. 2008;39:74-80.
Quinn AC, Milne D, Columb M, Gorton H, Knight M. Failed tracheal intubation in obstetric anaesthesia: 2 yr national case–control study in the UK. British Journal of Anaesthesia 2013;110:74–80.

Abstract T 37

The Effects of Antibiotic Prophylaxis on Epidural Related Fever in Labor

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Background: Epidural analgesia provides very effective pain relief during labor, its use may be associated with development of maternal fever (> 38° C) in over 20% of women.1 The precise mechanism of the development of maternal fever during epidural analgesia is unclear.5 However, it has been suggested that the development of maternal fever during epidural analgesia could be due to intrapartum infection.11 We investigated whether antibiotic prophylaxis before epidural placement lowers the rate of epidural-related fever.

Methods: In this double-blind placebo-controlled trial 400 healthy nulliparous women requesting epidural analgesia were randomly assigned to receive either cefoxitin 2 gm or placebo immediately preceding placement of an epidural catheter. Maternal tympanic temperature using a Genius® thermometer (Sherwood Medical, St. Louise, MO) was measured hourly, and intrapartum fever was defined as a maternal temperature of ≥38°C. Neonates born to women with fever were evaluated for possible sepsis, and available placentas were evaluated for the presence of neutrophilic inflammation. The primary outcome was maternal fever during epidural analgesia. This analysis used 80% power to detect a two-tailed significance level of < 0.05.

Results: Thirty eight percent women (75/200) in the cefoxitin group and 40% women (79/200) in the placebo group developed fever (p=0.68). The risk difference (95% confidence interval) for fever ≥ 38°C during labor (antibiotic versus placebo) was - 2.0% (-11.5 to 7.5), and for fever > 39°C during labor was -1.5% (- 4.7 to 1.7). Placentas were available from 302 (cefoxitin: n= 150; placebo: n=152) of the study cohort. Approximately half of each study group had placental neutrophilic inflammation, but administration of cefoxitin had no significant effect on any grade of neutrophilic inflammation (cefoxitin: 74/150 (49%) vs Placebo: 84/152 (55%), p=0.30). Fever developed significantly more often in the women with placental neutrophilic inflammation compared to those without such inflammation (73/158 vs. 33/144, p < 0.001; risk difference 23%, [95% CI: 13.0 to 34.0]). There were no significant differences in any neonatal outcomes between the antibiotic and placebo study groups. Sepsis was not diagnosed in any of the infants. There were no neonatal deaths.

Discussion: In this randomized double blind trial in low risk women at term fever during labor epidural analgesia was associated with placental inflammation. However, fever and placental inflammation was not reduced with antibiotic prophylaxis. This finding suggests that infection is unlikely to be the cause in its development.

References

1. Anesthesiology 2004;100:142–8.
2. Anesth Analg 2010;111:1467–75.
3. Birth 2000; 27:206-8.

Abstract T 38

The Anesthesia Information Management System in Obstetric Anesthesia: Experiences and Challenges in an Academic Institution

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Anesthesia information management systems (AIMS) are specialized electronic health record systems that allow for the automated collection and storage of patient data during the perioperative period. During September 2011, the EPIC Hyperspace© (Version Summer 2009) AIMS was implemented at our institution for use in both general and obstetric surgical cases. While this system was well received for intraoperative documentation during general surgical cases, its use in obstetric anesthesia was met with unique challenges.

To help identify the issues specific to obstetric anesthesia practice, we administered an electronic survey to the 145 anesthesia faculty, residents, and certified registered nurse anesthetists at 6 months and 18 months after AIMS implementation with a response rate of 61% and 43%, respectively. A system upgrade addressing the issues identified during our initial survey was installed 9 months after the AIMS was implemented.

At six months, 67% of responders felt the AIMS was helpful in looking up information from prior anesthetic records which rose to 76% at 18 months. Thirty percent of the responders initially felt time efficiency was a challenge when starting an emergency cesarean delivery which decreased to 10% at 18 months. Half of the responders reported persistent network connectivity interruptions and technical difficulties at six months which decreased to 32% at 18 months. At six months, 50% of responders felt that the AIMS allowed them to focus more intraoperative time on the patient which increased to 69% at 18 months. Fifty-eight percent of responders originally indicated that the use of the AIMS allowed for more accurate recording of their patient's physiologic responses to anesthetic agents which increased to 74% at 18 months. At six months, 60% of responders felt the system was inadequate to transition from labor epidural analgesia to cesarean anesthesia which decreased to 55% at 18 months.

Future desired features indicated by responders include the ability to automatically document patient controlled epidural analgesia demand doses (43% at 6 months / 41% at 18 months), better flagging of major adverse anesthesia events such as difficult airway (75% at 6 months / 80% at 18 months), and easier copying of information from prior preanesthesia evaluations (59% at 6 months / 38% at 18 months). At six months of use, 49% of responders felt that the AIMS was equally suited for both general and obstetric anesthesia which increased to 81% at 18 months.

Users of the EPIC Hyperspace© AIMS at our institution had a continuous improvement in their experience over the course of 18 months. The challenges that existed during the system's initial launch have been largely resolved by software upgrades tailored to address the issues identified during our initial survey. Survey feedback will continue to be incorporated into future software upgrades to address current issues with the AIMS and to allow for more efficient data management.

Abstract T 39

Post-Dural Puncture Headache (PDPH), an Alternative Cause of Posterior Reversible Encephalopathy Syndrome (PRES)

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There have been few published reports of post-dural puncture headaches (PDPH) in the setting of posterior reversible encephalopathy syndrome (PRES), and the following case presents this potentially new etiology for PRES. PDPH is characterized by CSF leaking from a dural puncture, causing a loss of CSF pressure in the spine and a loss of buoyancy supporting the brain. When the patient assumes an upright posture, the brain sags, and tension on the meninges and other intracranial structures creates the pain seen with PDPH (1). PRES is a reversible condition, characterized by white matter changes in the posterior circulation, resulting in headaches, altered mental status, seizures, vision loss, and loss of consciousness (4).

The patient presented herein, a G3P1, received epidural anesthesia for natural vaginal delivery and suffered a frank “wet tap” which resulted in a profound PDPH. Ultimately her headache was recurrent despite an autologous epidural blood patch. Patient then received a second blood patch, resolving her headache. However, several days later, the patient presented to her obestetrician’s office with new-onset patchy visual loss, fixed lateral gaze, and upper extremity proprioceptive deficits.

Given the nature of these symptoms, patient was admitted to hospital for neurologic evaluation, which ultimately revealed a PRES syndrome, diagnosed radiologically in the background of the aforementioned symptoms.

Initially, given these radiologic findings, patient was diagnosed with atypical preeclampsia, as it was the only previously accepted etiology of PRES that had been published in the obstetric literature. However, patient did not have typical features of preeclampsia. She was normotensive, without proteinuria, nor significant edema. Since the patient responded to magnesium sulfate, resolving her PRES symptoms, the obstetric team was even more convinced of this atypical preeclampsia-induced PRES syndrome.

However, magnesium sulfate is a known calcium channel blocker, with anti-vasospastic action, potentially resolving our patient’s PRES, absent preeclampsia. Thus, the patient was misdiagnosed with preeclampsia. Ho et al describes PRES with vasospasm in a post-partum woman following spinal anesthesia who developed a PDPH (5). We suggest a similar mechanism at play in this case, where the patient’s PDPH, via traction on the posterior cerebral artery from displacement of the brain, produced a cerebral vasospasm that resulted in PRES.

Despite the paucity of epidemiology available on PRES, the literature does describe several accepted causes of PRES, which include: hypertension, eclampsia and preeclampsia, immunosuppressive medications such as cyclosporine, various antineoplastic agents, severe hypercalcemia, thrombocytopenic syndromes, Henoch-Schönlein purpura, hemolytic uremic syndrome, amyloid angiopathy, SLE, and various causes of renal failure (4). We suggest PDPH as an alternative cause of PRES.

Abstract T 40

Use of Neuraxial Anesthesia and Epoprostenol for Cesarean Delivery for a Patient with CREST Syndrome and Pulmonary Hypertension

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A 26 year old G2P0101 presented for cesarean delivery due to increasing shortness of breath and orthopnea associated with CREST syndrome (calcinosis, Raynaud's phenomenon, esophageal dysmotility, telangiectasia) diagnosed in the second trimester.

Pulmonary function tests showed a mild restrictive ventilatory defect and severely reduced diffusion capacity. CT scan showed diffuse esophageal dilatation. Cardiac echocardiography revealed a moderately to severely dilated right ventricle, moderate pulmonary hypertension with right ventricular systolic pressure (RVSP) of 50-60 mmHg, and an ejection fraction of 50%. Right heart catheterization showed an RVSP of 52 mmHg, PAP 53/25 mmHg and mean PAP 37 mmHg. The trans-pulmonary gradient and pulmonary vascular resistance were significantly elevated, and cardiac output significantly decreased (4.2 L/min). Because the right ventricle showed poor function on echocardiography, there was concern for right ventricular failure immediately after delivery with the increased preload from autotransfusion. Five days prior to surgery, a Swan-Ganz catheter was placed and epoprostenol was titrated to a low dose of 3.92 ng/kg/min to improve pulmonary pressures and cardiac output.

Low-dose combined spinal-epidural anesthesia was elected to avoid intubating a potentially friable airway, and to avoid large changes in pulmonary pressures during induction and intubation. TEE monitoring was not considered due to risks associated with placing the probe in a patient with esophageal dilatation. Cesarean delivery was performed without maternal or neonatal complications. Pulmonary pressures remained stable throughout the procedure without changing the epoprostenol rate.

Discussion: Maternal mortality from pulmonary arterial hypertension remains at 30-50%(1), primarily due to right ventricular dysfunction secondary to increases in pulmonary pressures and pulmonary vascular resistance following delivery. Currently there is no standardized care for these patients. However, in recent case reports, the use of epoprostenol in the peripartum period have been shown to improve maternal outcome with no adverse fetal effects(2). In addition, the patients with pulmonary hypertension associated with CREST syndrome may have pulmonary fibrosis, esophageal dilation, automonic neuropathy, and Raynaud's phenomenon(3). Airway challenges include restricted mouth opening and neck extension due to dermal fibrosis, and potential airway bleeding from telangiectasias(3).

References:

1.Bonnin M. Severe pulmonary hypertension during pregnancy: mode of delivery and anesthetic management of 15 consecutive cases. Anesthesiology 2005;102:1133-7.
2.Goland S et al. Favorable outcome of pregnancy with an elective use of epoprostenol and sildenafil in women with severe pulmonary hypertension. Cardiology 2010;115:205-8.
3.Dempsey ZA et al. The role of regional and neuroaxial anesthesia in patients with systemic sclerosis. Local Reg Anesth. 2011;4:47-56

Abstract T 41

What a Headache... A Case of Subdural Hematoma After Neuraxial Anesthesia for Labor and Tubal Ligation

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Introduction: The differential diagnosis of headache in the peripartum population include tension headache, migraine, preeclampsia or eclampsia, post dural puncture headache (PDPH), cortical vein thrombosis, meningitis, sub arachnoid hemorrhage, subdural hemorrhage(SDH), cerebral infarction and space occupying lesions such as tumors. PDPH is the most common complication of spinal and epidural anesthesia. Intracranial SDH is rare, but could be a lethal complication that can occur after neuraxial anesthesia.(1)

Case Presentation: A healthy 25 year old G2P1001 presented at 41 weeks gestation for a scheduled induction of labor and subsequently requested epidural analgesia. The L4–L5 epidural space was accessed using a 17-gauge Tuohy-Weiss needle in the usual sterile fashion with no complications. The patient underwent a vacuum assisted vaginal delivery with good analgesia. Two hours post delivery the patient complained of non-positional headache inconsistent with PDPH and was managed conservatively with fluid, Acetaminophen, Butalbital and Caffeine. On post partum day one she stated improvement of the headache and presented for tubal ligation. Spinal Anesthesia was attempted but the patient was found to have inadequate analgesia so the decision was made to convert to ketamine anesthesia. On post partum day two she reported a 10/10 postural headache with diplopia that did not respond to oral pain medications; a sphenopalatine ganglion block was performed with some improvement. Six days later the patient presented in the emergency department with worsening headache. A CT head was done which showed a small SDH that was managed conservatively.

Discussion: Given the absence of a frank wet tap in this patient it is possible that a CSF leak occurred secondary to an inadvertent dural puncture during placement of the labor epidural or secondary to the spinal for the post partum tubal ligation. Intracranial SDH formation has been reported after a dural tear with persistent leakage of CSF(2), However the exact pathophysiological mechanism is not known. The leakage of CSF from the dural hole causes reduction in CSF volume, which first lowers the intraspinal pressure and second the CSF pressure which may result in a caudally directed movement of the spinal cord and brain, this in turn pulls and tears the bridging vessels, and a SDH results. Postpartum headache can be relatively benign; alternatively it can be a sign of significant pathology and should be evaluated promptly. This case exemplifies that a headache not consistent with a PDPH may be a premonitory sign of a more serious neurological sequalae and therefore should not be underestimated. Furthermore, this case highlights the need for caution prior to performing a spinal especially in a patient with a headache after a previous neuraxial block.

References:

(1)Vaughan,D,J et al.(2000) Br J Anaesth 2000: 84: 518-520
(2)Sköldefors,EK et al.(1998) Eur J Obstet Gynecol 81: 119–21

Abstract T 42

Anesthetic Management of a Pregnant Patient With Arnold Chiari Type I Malformation

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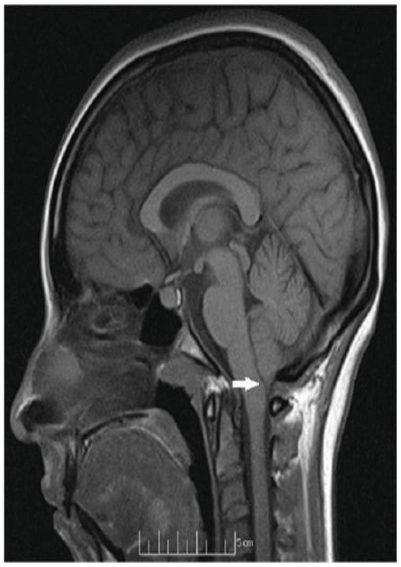
Abstract: Arnold-Chiari type I malformation (ACM-I) is a congenital neurological anomaly that involves the cerebellar tonsils prolapsing into the magnum foramen. Approximately 30-50% of ACM-I patients have syringomyelia. Incidence ranged between 0.56 and 0.77% on MRI studies, of which 15-30% are asymptomatic. Symptoms, including headaches, neck and shoulder pain, paresthesia and loss of pain and temperature sensation in upper limbs, and ataxia are the usual manifestations. It is mostly predisposed to women, in a F:M ratio of 3:1. Severity of symptoms is related to the degree of herniation as seen on the sagittal MRI view.

Case Report: A 17 year-old female, G1P0, with history of hypothyroidism and ACM-I presented with symptoms of headache and neck pain. She denied of any other neurological manifestations. A multidisciplinary team consulted her for planned induction with instrument-assisted vaginal delivery. MRI of the brain showed a 7-mm cerebellar tonsil herniation into the foramen magnum without syringomyelia (Fig 1).

Vital signs were: BP=134/89, P=62, RR=12, and SpO2=99%. Labs were: Hg=11.9 and PLT=206. CSE analgesia was obtained with fentanyl 15 µg and and bupivacaine 1.5 mg intrathecally. A continuous epidural of bupivacaine 0.1% and fentanyl 0.0002% was infused at the rate of 10 mL/h. A 5-mL bolus of bupivacaine 0.25% was injected epidurally 90 min before the onset of fetal expulsion and subsequently augmented with another bolus to provide further analgesia and to minimize the urge of pushing. Labor lasted for 9 h. A healthy girl was born with Apgar scores of 9/9.

Discussion: Attempt to demonstrate which neuraxial technique is safer (epidural vs spinal) in ACM-I parturients has been the subject of controversy. Accidental subarachnoid puncture with the epidural needle can lead to a greater risk of tentorial herniation, decreased CPP, and brain shifts than a spinal puncture. Risk vs benefit analysis and individualized care must be taken into consideration while planning the choice of anesthesia (neuraxial vs general) and the mode of delivery (vaginal vs Cesarean). Key points in the anesthetic management include: early CSE analgesia to decrease painful uterine contractions to dampen elevated CSF pressure, vacuum-assisted vaginal delivery to minimize increase in ICP during maternal valsalva maneuvers, slow titration of bolus through the epidural to prevent undue extradural pressure, and minimization of wide variations in maternal hemodynamics.

Additional Files:



Abstract T 43

Peripartum Hemorrhage: Splenic Artery Aneurysm Rupture

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Introduction: Peripartum hemorrhage (PPH) is one of the leading causes of maternal mortality, accounting for nearly 25% of fatalities.(1) One rare cause of PPH is splenic artery aneurysm (SAA) rupture. We present a case of PPH associated with SAA rupture and subsequent successful resuscitation.

Case Report: A 32 year-old female, G2P1001 at 34 weeks gestation, presented to labor and delivery with increasing abdominal pain and vaginal spotting. She was found to be tachycardic and hypotensive. Fetal bradycardia was identified, and an emergency cesarean section was called. Our initial assessment of the patient in the operating room (OR) revealed a pale, lethargic, ~60kg pregnant female. Her history and physical exam were otherwise unremarkable. Standard ASA monitors were placed and a rapid sequence induction was performed using etomidate and succinylcholine. A radial arterial line and second 18G PIV were placed. The institution's massive transfusion protocol was initiated.

The neonate was delivered 4 minutes after the patient entered the OR. Apgar scores at 1, 5, and 10 minutes were 0, 3, and 6. No pathology was identified in the placenta or uterus.

The patient remained stable initially, but intractable bleeding continued from an unidentified source. The trauma surgery service was emergently consulted. During exploration, the patient became unstable. Two 16G PIV's were placed and a Belmont rapid infuser and cell scavenging device were employed.

The trauma surgeons identified the source of bleeding as a ruptured SAA. A splenectomy and partial pancreatectomy was performed, and the patient was stabilized. Her resuscitation included 41 units of packed red blood cells, 2.3L of scavenged cells, 20 units of fresh frozen plasma, 4 platelet concentrate packs, 4 units of crypoprecipitate, 8L of crystalloid, and 1L of albumin.

Postoperatively the patient was taken to the surgical intensive care unit intubated, but stable. On postoperative day (POD) 3 she was extubated without evidence of adverse sequelae. The infant remained stable and was extubated on POD 1 without apparent sequelae.

Discussion: Ruptured SAA during pregnancy is a rare event with potentially catastrophic consequences. SAA rupture presents with a constellation of signs and symptoms that may be mistaken for other pathology, and it has an identified maternal mortality of nearly 22% and fetal mortality of 15%.(2) While rare, SAA rupture should be considered in the differential diagnosis when other causes of peripartum hemorrhage have been excluded. Anesthetic concerns in this case consist of 1) accurate diagnosis of source of massive hemorrhage 2) obtaining timely adequate intravenous access and 3) administration of blood products appropriate to maintain adequate coagulation and hemodynamic stability.

References:

1)Caillouette JC, et al. Ruptured SAA in pregnancy. Am J Obstet Gynecol.1993 Jun:1810-1.
2)Ha JF, et al. SAA rupture in pregnancy. Eur J Obstet Gynecol Reprod Biol.2009 Oct:133-7.

Abstract T 44

Heriditary Haemorrhagic Telangiectasia

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Heriditary Haemorrhagic Telangiectasia is an autosomal dominant disorder affecting I in 5-8000 individuals (1). Arteriovenous malformation (AVM) can occur in these patients which are are usually silent manifestation of the condition. Pulmonary Arteriovenous malformation (PAVM) can occur up to 48% , Hepatic upto 30%, Cerebral upto 10% of cases.The alteration in cardiac physiology which occur with pregnancy increases the risk of AVM rupture. We report a case of life threatening haemorrhage from the rupture of PAVM in a pregnant lady with known HHT.

Case Report: A 35 yr old primi gravida at 26 week of pregnancy was admitted following a collapse at home.She had woken with severe abdominal and chest pain.The pregnancy was uneventful otherwise apart from two episodes of epistaxis. On arrival she was in shock with a haemoglobin of 6 and severely acidotic. Portable Ultrasound scan of abdomen was performed to rule out abruption which also showed absent fetal heart. After initial resuscitation a laparotomy was performrd to rule out intra abdominal bleed which was negative. She was admitted to high dependency unit(HDU) for post operative care and a routine postoperative chest X Ray showed white out of left lung. USS confirmed haemothorax. A chest drain was inserted at this stage which drained 2.5 liters of blood.She improved following that.The drains were removed the next day and was discharged from HDU. She developed haemoptysis 2 days later and blood reaccumulated in thorax.A PAVM was suspected because of the history of HHT and CT chest revealed this. PAVM was successfully coiled few days later.

With this diagnosis the patient's history of HHT was re-examined. She had previously suffered from recurrent epistaxis associated with migraines.She denied any history of shortness of breath, prior episodes of haemopytosis or seizures and the only clinical signs of her condition were small telangiectasia spots on her tongue.

Discussion: Pregnancy in women with HHT should be managed as high risk. Ideally the patient should be screened for PAVM pre-pregnancy however, despite this the management of asymtpomatic PAVM during pregnancy is unclear, due to the risks associated with treatment balanced against the low risk of complication. Shovlin et al(2) feel that for this reason the screening and treatment of PAVM in asymptomatic pregnancy is unjustified. The knowledge of the condition and therefore pre-planning in the event of an emergency can improve outcome and would have expediated focused management for PAVM in this case.

References

1.FS Govani & CL Shovlin. Hereditary haemorrhagic telangiectasia: a clinical and scientific review. European Journal of Human Genetics (2009); 17: 860-871.
2.CL Shovlin, V Sodhi, A McCarthy et al Estimates of maternal risks of pregnancy for women with hereditary haemorrhagic telangiectasia (Osler-Weber-Rendu syndrome): suggested approach for obstetric services. British Journal of Obstetrics and Gynaecology (2008); 115(9): 1108-1115.

Abstract T 45

Broken Spinal Needle: Case Report and Review of Literature

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Introduction: The occurrence of broken spinal and epidural needles is a rare event. There is little information in literature about management of such cases. We report one case of a retained spinal needle fragment during attempt to perform a spinal anesthesia.

Case report: A 26 y/o term parturient with a BMI of 48.2 presented for elective repeat cesarean section. Spinal anesthesia was the technique chosen. During first attempt at L3-4 interspinous space, a 25G 3.5" Whitacre needle through a 20G introducer was unable to reach the space. It was decided to use a longer spinal needle. To preserve the angulation for the longer needle, the introducer was left in situ and the spinal needle was withdrawn through it. After few cm withdrawal was met with resistance, so both introducer and spinal needles were withdrawn together. Distal 4 cm of the spinal needle was found missing. There were no pain or radicular symptoms. A second attempt at L2-3 interspace with the long needle was successful and satisfactory subarachnoid anesthesia was obtained. During surgery patient developed anaphylaxis, which required resuscitation and epinephrine to maintain hemodynamic stability. After the completion of the case, fluoroscopy showed the needle was not near the spinal canal. Given the patient's intraoperative complication, the neurosurgery recommendation was to leave the needle fragment in place with a two week follow-up. The patient was informed and was asymptomatic at discharge. She developed symptoms one month after the surgery and the needle fragment was removed surgically without complications.

Review of literature in the following medical search databases:"Pubmed","Medl ine","Cochrane" and "Up to Date" with the terms: "spinal needle" plus the words "broken","fractured" and "breakage" was conducted. Out of 36 articles found in English language 15 were considered by the authors to be relevant to the case.1-15 Literature review and our experience identified two major risk factors: obesity and withdrawal of a spinal needle through an introducer, and therefore this practice should be avoided. In 81% of cases needle was surgically removed. Our recommendations in the event of a spinal needle fracture in similar scenario are: cancellation of the surgery is unnecessary, spinal block done at another level is a safe option and the spinal needle fragment should be removed as soon as it is safe for the patient to avoid future patient discomfort.

References: [1]Int J Obstet Anesth 2006;15(2):178 [2]Reg Anesth Pain Med 2006;31(2):186 [3]Anesth Analg 1997;85(1):230 [4]Anesthesiology 1977;46(2):147 [5]Reg Anesth 1994;19(4):293 [6]Anesth Analg 1993;77(2):401 [7]Korean J Anesthesiol 2010;59:S69 [8]Int J Obstet Anesth 2007;16(1):94 [9] Rev Bras Anestesiol 2004;54(6):794 [10]Anesth Analg 1992;75(6):1050 [11] Anesth Analg 1996;82(1):217 [12]J Altern Complement Med 2007;13(1):129 [13] Int J Obstet Anesth 2009;18(3):295 [14]Anaesth Intensive Care 1997;25(1):96 [15]Anesth Analg 2010;111(1)245

Abstract T 46

Use of Celecoxib in Patients with Nonsteroidal Antiinflammatory Drugs Hypersensitivity

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Nonsteroidal antiinflammatory drugs (NSAIDs) are among the most widely used medications in the world[1], and their use for postoperative pain control after cesarean delivery has been part of a multimodal approach. Aspirin/NSAID sensitivity occurs in about 0,3% of the general population[1, 2]. It predominantly affects women, and its prevalence is increasing. Postpartum patients with contraindications to NSAIDs are left with fewer therapeutic options for pain management, and risk necessitating more opiates and therefore potentially more side effects. Given that suboptimal immediate post cesarean pain control may lead to a higher incidence of chronic pain[3], optimal postpartum pain management is essential.

Two main types of NSAID hypersensitivity reactions are usually seen: urticaria/angioedema reactions and NSAID-induced rhinitis and asthma (also known as aspirin/NSAID-induced respiratory reactions and aspirin triad). Usually, these reactions are pseudoallergies and are not IgE mediated. Rather they result from acquired alterations in the cyclooxygenase (COX) pathways which result from the mechanism of action of nonselective NSAIDs. A few publications have shown that COX-2 selective inhibitors could safely be used as an alternative in patients with NSAID hypersensitivity [4-6]. Vigilance, however, is advised since approximately 4% of patients with a history of urticaria/angioedema type reactions will also experience cutaneous reactions following a COX-2 selective inhibitor challenge. Patients with respiratory type sensitivity experience symptoms less frequently following Celecoxib challenge[1]. We will present a series of cases illustrating the management of patients with different aspirin/NSAID hypersensitivity reactions.

1. Knowles, S.R., et al., Management options for patients with aspirin and nonsteroidal antiinflammatory drug sensitivity. Ann Pharmacother, 2007. 41(7): p. 1191-200.
2. Jenkins, C., J. Costello, and L. Hodge, Systematic review of prevalence of aspirin induced asthma and its implications for clinical practice. BMJ, 2004. 328(7437): p. 434.
3. Miller, R.D., Miller's Anesthesia. 7th ed, ed. C.L. Elsevier. Vol. 2. 2009, Philadelphia. 3084.
4. Dahlen, B., A. Szczeklik, and J.J. Murray, Celecoxib in patients with asthma and aspirin intolerance. The Celecoxib in Aspirin-Intolerant Asthma Study Group. N Engl J Med, 2001. 344(2): p. 142.
5. Sanchez-Borges, M., F. Caballero-Fonseca, and A. Capriles-Hulett, Safety of etoricoxib, a new cyclooxygenase 2 inhibitor, in patients with nonsteroidal anti-inflammatory drug-induced urticaria and angioedema. Ann Allergy Asthma Immunol, 2005. 95(2): p. 154-8.
6. Dona, I., et al., Response to a selective COX-2 inhibitor in patients with urticaria/angioedema induced by nonsteroidal anti-inflammatory drugs. Allergy, 2011. 66(11): p. 1428-33.

Abstract T 47

Postpartum Thrombolysis in a Patient with Cardiopulmonary Arrest Secondary to Massive Pulmonary Embolism

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The risk of postpartum venous thromboembolism increases 20-fold from baseline nonpregnant, nonpostpartum women[1], and remains one of the most common causes of maternal mortality in developed countries[2, 3]. Massive pulmonary embolism with cardiorespiratory collapse is, however, less frequent, and confronts us with unusual dilemmas in management. Mortality risk from pulmonary embolism with cardiogenic shock is as high as 70% [4-7]; it is, therefore, recommended to consider use of thrombolysis in pregnant women with life-threatening thromboembolism[2]. No recommendations exist for the use of thrombolysis in the puerperium, but there are few anecdotal cases of it being used [4].

We present the case of a woman with a past medical history of thrombosis who was found in her room breathless and in pain, two days post cesarean section. Soon after, she suffered a cardiac arrest which necessitated cardiopulmonary resuscitation. Systemic thrombolysis with Alteplase in addition to standard Advanced Cardiovascular Life Support management of cardiac arrest proved effective in achieving return to spontaneous circulation. Subsequently, she experienced a massive hemorrhage, which was treated with multiple transfusions and a hysterectomy. Three days later, she was successfully extubated. Her only prolonged sequela was acute renal failure requiring dialysis. She had no neurological impairment and was breastfeeding her newborn on the same week.

1. Jackson, E., K.M. Curtis, and M.E. Gaffield, Risk of venous thromboembolism during the postpartum period: a systematic review. Obstet Gynecol, 2011. 117(3): p. 691-703.
2. McLintock, C., et al., Recommendations for the diagnosis and treatment of deep venous thrombosis and pulmonary embolism in pregnancy and the postpartum period. Aust N Z J Obstet Gynaecol, 2012. 52(1): p. 14-22.
3. James, A., Practice bulletin no. 123: thromboembolism in pregnancy. Obstet Gynecol, 2011. 118(3): p. 718-29.
4. Azarisman, S.M., et al., Immediate postpartum cardiorespiratory collapse: a management quandary. Blood Coagul Fibrinolysis, 2010. 21(6): p. 601-4.
5. Goldhaber, S.Z., L. Visani, and M. De Rosa, Acute pulmonary embolism: clinical outcomes in the International Cooperative Pulmonary Embolism Registry (ICOPER). Lancet, 1999. 353(9162): p. 1386-9.
6. Chunilal, S.D. and S.M. Bates, Venous thromboembolism in pregnancy: diagnosis, management and prevention. Thromb Haemost, 2009. 101(3): p. 428-38.
7. Samoukovic, G., T. Malas, and B. deVarennes, The role of pulmonary embolectomy in the treatment of acute pulmonary embolism: a literature review from 1968 to 2008. Interact Cardiovasc Thorac Surg, 2010. 11(3): p. 265-70.

Abstract T 48

Regional Anesthesia for Cesarean Delivery in a Parturient with an Intracranial Aneurysm

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Introduction: Cerebral aneurysms are thought to be at increased risk of rupture during pregnancy and delivery. Data to support or refute the use of regional anesthesia in these patients is lacking (1). We describe the anesthetic management of a parturient with an intracranial aneurysm.

Case Description: A 34-year-old (P 2-1-5-3) parturient with asthma, obesity, chronic hypertension, hepatitis C, multiple previous abdominal surgeries and a 36-week breech pregnancy presented for elective repeat cesarean delivery. The patient had right-sided blindness and left-sided weakness due to a previously ruptured right para-ophthalmic artery aneurysm. She was treated with endovascular coil embolization, but had aneurysm recurrence with multiple subsequent failed endovascular interventions. A tentative plan was made for off-label pipeline embolization of her aneurysm after delivery.

An epidural was placed in the sitting position (resident preference) despite a theorized potentially greater drop in intracranial pressure should a wet tap occur. Cesarean delivery of a healthy infant followed with arterial line blood pressure readings in the 120-160/60-80 range. Postoperatively, pain was controlled with epidural analgesia and the patient exhibited no new deficits. Two months later a cerebral angiogram showed interval occlusion of her right ophthalmic artery aneurysm (likely due to the hypercoagulable state of pregnancy) and a new left cavernous carotid artery aneurysm. Endovascular embolization of this new aneurysm is planned.

Discussion: The management of a parturient with an unruptured intracranial aneurysm balances the risks of pulmonary aspiration, difficult intubation, and fetal exposure to systemic drugs against the risk of aneurysmal rupture. General anesthesia allows for greater control over transmural pressure (avoiding systemic hypertension and intracranial hypotension—which can occur after a wet tap) while avoiding the compensatory cerebral vasodilation that occurs after a wet tap (which can theoretically increase risk of rupture). Regional anesthesia allows for excellent neurologic monitoring while avoiding airway manipulation and side effects from systemic medications such as opioids (vomiting and associated hypertension, fetal depression, and sedation) (2). While historically these patients were treated with general anesthesia this case shows that regional anesthesia can be performed safely (2).

References:

1. Carvalho LS, Vilas Boas WW. Anesthetic conduct in cesarean section in a parturient with unruptured intracranial aneurysm. Rev Bras Anestesiol. 2009; 59(6): 746-50.
2. Gupta A, Hesselvik F, Eriksson L, Wyon N. Epidural anaesthesia for caesarean section in a patient with a cerebral artery aneurysm. Int J Obstet Anesth. 1993; 2(1): 49-52.

Abstract T 49

Phenylephrine Infusion Test After Alpha Blockade in Pheochromocytoma During Cesarean Section

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Introduction: Pheochromocytomas are rare tumors that secrete catecholamines. We describe the management of a pregnant woman with bilateral pheochromocytomas. A unique aspect of our management was the use of a pre-operative phenylephrine infusion challenge to assess the efficacy of α-adrenergic blockade.

Case: A 35 year old woman with known bilateral pheochromocytomas (who refused adrenalectomy prior to pregnancy) presented for scheduled C-section. She denied hypertension but did report paroxysmal palpitations. Phenoxybenzamine was started 14 days prior to scheduled delivery.

On the day of surgery, orthostatic testing was negative. Since the patient was preoperatively on α-blocking medication, her responsiveness to the α1-agonist phenylephrine was assessed. An IV infusion was started pre-operatively at a rate of 40mcg/min, and increased in increments of 20mcg/min every two minutes to 180mcg/min with no increase in BP or change in pulse.
Following a combined spinal-epidural, vasopressin was infused at 2U/hr to prevent and/or treat hypotension from sympathetic blockade(1). The C-section proceeded uneventfully with hemodynamic stability. The patient was maintained on a patient-controlled epidural analgesia infusion for 24 hours post-op in order to avoid an increase in sympathetic discharge due to pain. Phenoxybenzamine was re-initiated two hours post-operatively and the patient was discharged home on postoperative day 3.

Discussion: The main goal of management of pheochromocytoma is to prevent a hypertensive crisis. Medical treatment with α-blockade should be started as soon as the diagnosis is established and should be given for ≥ 10 to 14 days(2). Prophylactic continuous infusion of phenylephrine is usually initiated in our institution to prevent hypotension, nausea and vomiting that can be associated with spinal anesthesia. However, because of prior α-blockade, we believed that phenylephrine might not have much effect on this patient's hemodynamics. It is also possible that the preoperative absence of α-adrenergic tone would mean that the spinal anesthetic might not cause much further change in vascular resistance. The classic "test" of blockade in the presence of a pheochromocytoma is orthostatic hypotension (not present here), but the lack of response to phenylephrine suggests that she was adequately blocked(3). Only a few cases describing the anesthetic management of the parturient with pheochromocytoma have been reported, and the use of a phenylephrine test infusion is this setting is even more unique.

1. Augoustides JG, et al. Vasopressin for hemodynamic rescue for catecholamine-resistant vasoplegic shock after resection of massive pheochromocytoma. Anesthesiology. 2004 Oct;101(4):1022-4.
2. Witteles RM, et al. Safe and cost-effective preoperative preparation of patients with pheochromocytoma. Anesth Analg. 2000;91:302–304.
3. Reisch N, et al. Pheochromocytoma: presentation, diagnosis and treatment. J Hypertens. 2006;24:2331–2339.

Abstract T 50

Anesthetic Management of Labor in a Patient with Traumatic T3 Paraplegia

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Introduction: Spinal cord injury in pregnancy can present significant anesthetic challenges. We present a case of a 23-year-old female, with new-onset T3 paraplegia sustained during her pregnancy, who presented in active labor.

Case: A 23 y/o G2P0 female was admitted at 15 weeks gestation after a gunshot wound with the bullet lodged in the T3 vertebra. Her immediate injuries included a left hemothorax, left pulmonary contusion, and complete paraplegia of the lower extremities. Neurosurgery treated her unstable spine injury conservatively with bracing. Anesthesia consult at 23 weeks recommended, after neurosurgical clearance, early neuraxial analgesia to prevent possible autonomic dysreflexia. The patient was then discharged to a rehab facility. After multidisciplinary planning meetings, she was readmitted to our obstetric service at 28 weeks for obstetric care, and began having irregular contractions presenting as back pain and premature rupture of membranes at 33 weeks.
A combined spinal-epidural catheter (CSE) was placed uneventfully, with 2 mg of midazolam for anxiolysis. An epidural solution of 0.125% bupivacaine with 3.33 mcg/mL of fentanyl was run for the next 12 hours without significant hemodynamic instability. Breakthrough back pain was treated with 5-8cc of 0.25% bupivacaine. She had an uncomplicated forceps-assisted vaginal delivery. Patient recovered well and was discharged to a rehab facility for further treatment.

Discussion: Autonomic hyperreflexia (AH) is caused by loss of hypothalamic control of sympathetic reflexes. AH is common with spinal cord injury above T6, and manifests as hypertension, bradycardia, tachycardia, cardiac arrhythmias, or respiratory distress. Visceral or cutaneous stimulation below the level of the spinal cord lesion are common precipitants (1). During labor, untreated AH may lead to fetal distress, maternal intracranial hemorrhage, hypertensive encephalopathy and death. (2) Both undiagnosed labor with precipitous delivery and preterm labor are common. Labor is often diagnosed because of unexplained AH.

We placed a combined spinal epidural (CSE) for labor analgesia because this technique would provide both rapid analgesia and verification that the epidural was in the correct space (3). Assessing sensory level of neuraxial anesthesia can be impossible. Our patient had chronic back pain that allowed her to report contractions. We also used a high concentration of epidural medications to provide a dense block to prevent AH. In the event that the patient did develop symptoms of AH, we had planned to place an arterial line and treat with hydralazine and nitroprusside. In conclusion, this patient had a safe outcome following labor as a result of careful planning with a multidisciplinary team and early initiation of labor analgesia.

References:

1. Kuczkowski, et al. Arch Gynecol Obstet 2006;274:108-12.
2. Strowonski, et al. Austral New Zeal J Obstet Gynaecol 2008;48:485-91.
3. Norris. IJOA. 2000;9:3-6.

Abstract T 51

Anesthetic Management of a Parturient with Systemic Mastocytosis

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We describe the anesthetic management of a parturient with systemic mastocytosis, a rare disorder of increased mast cells in extradermal tissues that predisposes to type 1 immediate hypersensitivity reactions and anaphylaxis.

Case Description: A 20 year old G1P0 at 39 weeks gestation with a history of systemic mastocytosis presented for induction of labor. Her disease was characterized by episodes of flushing, pruritus, chest tightness, tongue swelling, tachycardia, hypotension, and abdominal cramping that was responsive to diphenhydramine and IM epinephrine. No triggers were identified. Prior to pregnancy, treatments included oral contraceptives, prednisone, fexofenadine, and montelukast without improvement. She had a history of at least 20 anaphylactic episodes. Pregnancy caused increased flushing that was worsened by stress, rapid temperature changes and uterine contractions. An exacerbation at 8 weeks gestation required multiple doses of epinephrine for resolution.

An L4-5 epidural was placed prior to induction in order to blunt the sympathetic response to uterine contractions. It was tested with lidocaine 1.5% with epinephrine 1/200K and maintained with bupivacaine 0.125% and fentanyl 2 mcg/ml patient controlled epidural analgesia. Labor was induced with a foley bulb followed by oxytocin. Throughout the labor course, the patient was asymptomatic from her disease and vaginally delivered a vigorous infant.

Discussion: Symptoms of mastocytosis can occur either from mast cell release of histamine, leukotrienes, prostaglandins, and cytokines resulting in anaphylaxis or from infiltration of mastocytes into the bone marrow leading to anemia or thrombocytopenia. This case is unique in that the patient's triggers included uterine contractions, increasing the risk of anaphylaxis during delivery. Few reports have been published regarding the management of obstetric patients with mastocytosis. While two have reported adverse effects and fetal compromise secondary to the disease (1, 2), Worbec et al described nine women with cutaneous or systemic mastocytosis who had a total of eleven successful deliveries (3).

The anesthetic management of the parturient with systemic mastocytosis focuses on reducing stressors, which are known triggers for mediator release. In some cases, patients are treated prophylactically with glucocorticoids or histamine antagonists; however efficacy has not been established. Providers should be prepared to treat an episode of mast cell degranulation with intravenous access, epinephrine, and availability of personnel to treat cardiovascular collapse.

References:

1. Donahue JG, Lupton JB, Golichowski AM. Cutaneous mastocytosis complicating pregnancy. Obstet Gynecol 1995;85:813–54.
2. Watson KD, Arendt KW, Watson WJ, Volcheck GW. Systemic mastocytosis complicating pregnancy. Obstet Gynecol. 2012 Feb;119(2 Pt 2):486-9.
3. Worobec AS, Akin C, Scott LM, Metcalfe DD. Mastocytosis complicating pregnancy. Obstet Gynecol 2000;95:391-5

Abstract T 52

A Primigravid Parturient with an Expanding Internal Carotid Artery (ICA) Aneurysm and Neurologic Symptoms

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Introduction: The incidence of intracranial aneurysms in pregnancy is similar to that in the general population, however, the risk of rupture is much higher due to physiologic changes associated with pregnancy. Intracranial aneurysm rupture during pregnancy carries a poor prognosis, with maternal and fetal mortality approaching 35% and 25%, respectively (1).

Case Report: A 33 yo G1PO with an expanding ICA aneurysm was sent for obstetric anesthesia evaluation. The patient had a spontaneous SAH from a ruptured ICA aneurysm 18 months prior, with three coilings before becoming pregnant. At 26 weeks gestational age (wga) the patient developed transient left sided headaches, visual scintillations, and numbness on the right side of her body. A MRI/MRA of the head and neck at 30 wga showed a 7 mm flow-enhancing area at the base of the left ICA, consistent with aneurysm regrowth. After collaboration with the maternal fetal medicine and neurosurgical team, the decision was made to schedule a primary cesarean section at 38 wga. Preoperatively, an arterial line was placed; phenylephrine and nicardipine drips were available and the patient was bolused with 1500 mL of lactated ringers. A spinal anesthetic with 2 mL of 0.75% hyperbaric bupivacaine, 15 mcg of fentanyl, and 150 mcg of morphine was administered. The systolic blood pressure was maintained between 100- 130 mm Hg, a level deemed safe by the neurosurgical team. A baby boy was delivered with vacuum assistance. The neurosurgical attending was present from uterine incision to placental delivery to perform an abbreviated neurologic exam. Hemodynamic and neurologic status remained stable. The patient was transported to the post anesthesia care unit and had an uneventful post-operative course.

Discussion: Although the patient had previous coiling, the aneurysm was not definitively treated. With new neurologic symptoms and imaging that demonstrated aneurysm regrowth, the neurosurgical team was concerned that the stress of labor and vaginal delivery could potentially cause the aneurysm to rupture. A cesarean section with vacuum assistance was chosen to minimize pushing on the uterine fundus, which could increase intracranial vasculature pressure. To monitor hemodynamic status continually and maintain tight blood pressure parameters, a pre-spinal arterial line was used. A neuraxial technique was preferred for the ability to check neurologic status throughout the case. Epidural anesthesia was avoided due to body habitus and likely difficult placement. Accidental dural puncture with an 18 gauge Tuohy needle could have been catastrophic, causing a sudden drop in ICP and risk of aneurysm rupture. With the risk of rupture higher in pregnancy, every precaution in management must be taken. This case illustrates the importance of interdepartmental collaboration and preparation for high-risk obstetric patients.

References

1. Wang L, Paech MJ- Neuroanesthesia for the pregnant woman. Anesth Analg; 2008; 107: 193-200

Abstract T 53

Familial Congenital Muscular Dystrophy and Pregnancy

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Introduction: Familial Congenital Muscular Dystrophy is a heterogenous group of disorders involving progressive muscle weakness secondary to atrophy without evidence of denervation. Clinical and genetic variability occurs among patients with these disorders. Progressive muscle weakness and joint contractures lead to impaired mobility and respiratory compromise. The disease also affects cardiac muscle, resulting in a dilated cardiomyopathy and conduction abnormalities. We present a case of a parturient with familial congenital muscular dystrophy who required a cesarean delivery due to progressive respiratory compromise and discuss the implications for the anesthesiologist caring for such patients.

Case Report: A 25yo 57kg G3P2 with muscular dystrophy, severe scoliosis, Harrington rods, restrictive pulmonary disease, pulmonary hypertension, and cardiomyopathy presented at 18 wks gestation. She was noted to have features of a difficult intubation (small mouth opening, limited neck mobility, short thyromental distance, and Mallampati Score of 3). PFTs confirmed restrictive lung disease (FEV1 11% FVC 19% Ratio 97%) and an echocardiogram showed diastolic dysfunction with preserved LV function, enlarged RV and a RVSP of 45 mmHg. At 24 wks, she developed acute hypercarbic respiratory failure with mental status changes and sustained CO2 elevations despite BiPap. She was fiberoptically intubated in the ICU and subsequently underwent tracheostomy. One week later, she developed elevated peak airway pressures (low 50s) and inadequate oxygenation and ventilation despite maximal ventilatory support. ABG results were 7.35/57/64/92% on 100% FiO2. With the fetal heart tracing showing decreased variability and maternal clinical status deteriorating, the decision was made to proceed with cesarean delivery at 25 2/7 wks. She was transported to the OR on the ICU ventilator after receiving midazolam. A TIVA technique with propofol and remifentanil was begun upon arrival in the OR and rocronium was administered. Upon delivery of the baby, PIPs decreased to the low 40s and oxygen saturation improved to 100%. Weeks later the patient was transferred to a long term care facility as she was unable to be weaned from the ventilator.

Conclusion: Women with progressive myopathies, including familial muscular dystrophy, often experience an exacerbation of symptoms during pregnancy. The increased minute ventilation and decreased FRC of pregnancy may lead to clinical deterioration of a patient's respiratory status. Aspiration may be a concern due to dysphagia and mental status changes. Contractures lead to difficulty with line placement and positioning. Muscular dystrophy patients may be susceptible to a hypermetabolic syndrome similar to malignant hyperthermia, so triggering agents (succinylcholine and volatile agents) should be avoided. A TIVA technique is commonly used. If neuromuscular blocking drugs are used, documentation of adequate reversal is essential.

Abstract T 54

Pulmonary Hypertension and Instrumented Scoliosis in Pregnancy

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Pulmonary hypertension may worsen during pregnancy due to cardiovascular and pulmonary changes, with recent reported mortality of 25-30%. Most studies report successful management of these patients with neuraxial anesthesia. We describe a parturient with instrumented scoliosis who presented with new onset severe pulmonary hypertension (pHTN) in the third trimester.

We present the case of a 28-year-old G1P0 parturient with history of repaired congenital diaphragmatic hernia, left lung hypoplasia, instrumented scoliosis, and released tethered cord. She presented at 37 weeks with a 2-week history of severe dyspnea and SpO2 85%. Pulmonary CT scan was negative for embolism. Echocardiogram revealed right ventricular dysfunction. Cardiac catheterization confirmed severe pHTN with mean PAP 56 mmHg (78/45).

Harrington rods from T2 to sacrum and tethered cord release precluded neuraxial anesthesia. With multidisciplinary team, elective cesarean delivery under general anesthesia with cardiac team and CPB on stand-by was planned. In addition to routine monitors, a 5-lead ECG, 16G intravenous, 20G arterial radial canula, and 7F right internal jugular cordis were placed. Baseline vitals were BP 132/81, HR 80-90, SpO2 95% 2L/min O2, with respiratory acidosis (pH 7.34, pCO2 63, pO2 152, HCO3 34), and haemoglobin (Hb) 117 g/L. Rapid sequence induction consisted of midazolam 1mg, fentanyl 150mcg, propofol 40mg, ketamine 40mg, and succinylcholine 140mg, maintaining hemodynamic stability. Three minutes after intubation, delivery occurred with concurrent blood loss of 600 ml. This resulted in hemodynamic instability lasting 60-90s with hypotension (SBP 60 mmHg), bradycardia (37-40 bpm) and CVP 2 mmHg. This was aggressively managed with IV ephedrine (25+25 mg), atropine 0.6 mg and 1L colloid volume resuscitation. Transesophageal echocardiogram determined normal right ventricular systolic function and CVP improved to 12 mmHg.
The remainder of the intraoperative course was uneventful. The patient was transferred intubated, stable to cardiovascular intensive care (BP 135/65 mmHg, HR 75 bpm, SpO2 100% (FiO2 100%), Hb 78 g/L, mPAP 25 mmHg, CVP 10 mmHg).

Postpartum investigation revealed restrictive lung disease due to scoliosis and left lung hypoplasia, reversible obstructive lung disease, and nocturnal hypoventilation. She was discharged four weeks postpartum with fluticasone/salmeterol and home BiPAP with oxygen. Three-month follow-up showed clinical improvement and better saturation at rest (SpO2 94%).

This patient was previously asymptomatic and presented in late pregnancy with decompensated pHTN. Pregnant patients with pHTN poorly tolerate peri-partum fluid shifts. Mortality is four times higher in those who receive general anesthesia rather than neuraxial anesthesia. Neuraxial anesthesia was not possible and this highlights the importance of multidisciplinary management in these complex obstetric cases.

Eur heart 2009; 30: 256-65
Anesthesiology 2005; 102: 1133-7

Abstract T 55

A Parturient with a Possible Pheochromocytoma, Von Hippel-Lindau Disease and Preeclampsia

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Intro: Pheochromocytoma (PHEO) in pregnancy is rare and hard to differentiate from chronic hypertension (HTN) or preeclampsia (PEC) (1). PHEOs can be associated with several genetic syndromes. Von Hippel-Lindau (vHL) disease is an autosomal dominant syndrome that causes neuroendocrine tumors and CNS hemangioblastomas (2).

Case: A 37-year-old, morbidly obese (BMI 42) G2P1 woman at 33 weeks gestation presented with a possible PHEO. Family history (FH) was a brother and two great uncles who died of intracranial aneurysms. Early in pregnancy, she was diagnosed with HTN, and treated with labetalol. At 31 weeks, her blood pressure increased, PEC was ruled out, and she had slight elevations in urinary norepinephrine and metanephrine. At 32 5/7 weeks, she was admitted to an outside hospital with worsening HTN. Due to the concern for PHEO she was started on phenoxybenzamine and transferred to our institution. Her paroxysmal HTN required labetelol, hydralazine, nifedipine and a nicardipine infusion. An arterial line was placed, the phenoxybenzamine continued, and propranolol added two days later. She soon developed proteinuria, was diagnosed with severe PEC, and magnesium was initiated.

Abdominal sonogram did not reveal an adrenal tumor but could not exclude an extraadrenal PHEO. Due to her FH, vHL syndrome was suspected. Due to severe PEC, the plan was for CS after only one week of alpha blockade, but at 33 6/7 weeks, her LFTs rose, and the patient underwent emergency CS after MRI confirmed the absence of lumbar spinal tumors. A 7Fr peripheral IV catheter was placed, and a CSE with a spinal dose of bupivacaine 12mg, fentanyl 15mcg, and morphine 0.2mg was performed. Intraoperative hypotension was treated with phenylephrine and vasopressin. There were no hypertensive episodes intraoperatively, and a live 1995g infant with Apgars 7, 8 was delivered. The epidural catheter was not used. She was discharged home on phenoxybenzamine and propranolol, and we are awaiting further workup for PHEO.

Discussion: A multidisciplinary team consisting of MFM, endocrinology, cardiology and obstetric anesthesiology was invaluable for this patient. Establishing the diagnosis of PHEO in the setting of pregnancy and PEC is challenging. While we wanted to postpone delivery until sympathetic blockade was adequate (classically 2 weeks), worsening PEC necessitated an earlier delivery. The risks of performing neuraxial analgesia on a patient with possible CNS hemangioblastomas include rupture of the hemangioblastoma, spinal canal bleeding and cerebral herniation resulting from dural puncture if intracranial pressure (ICP) is elevated. However, the risks of general anesthesia with PHEO include large swings in blood pressure and ICP resulting in cerebral hemorrhage (2). MRI confirmed the absence of CNS pathology in our patient, and CSE was performed when signs of end organ damage from PEC were present.

References:
1.Biggar MA. Br J Surg 2013
2.McCarthy T. Int J Ob Anesth 2010

Abstract T 56

Parturient with Congenital Diaphragmatic Hernia

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Congenital diaphragmatic hernias in adulthood are rare, with an incidence of 0.17% (1). Approximately, 90% of cases occur on the left side and are the result of herniation of the gut through the posteroleteral defect of Bochdalek (2). Less than 40 cases of parturients with diaphragmatic hernias have been documented in the literature since 1928 (1).

A 31yo G1P0 with a known Bochdalek's hernia was admitted at 29 weeks gestation for acute dyspnea. The patient presented with worsening early satiety, heartburn, nausea, and epigastric abdominal pain. On admission, the vital signs were stable. The physical exam was remarkable for mild tenderness of the abdomen and labs revealed no electrolyte disturbances. An MRI of the abdomen revealed enlargement of the hernia with no evidence of obstruction. The patient was started on 40% oxygen via facemask and treated with Morphine, Sodium Citrate, and Metoclopramide. Given that the patient remained stable, conservative management was initiated with nasogastric decompression, IV fluids, and total parenteral nutrition by a central venous line. Antenatal corticosteroids were administered to promote fetal lung maturity.

At 30 weeks 4 days gestation, the nausea and vomiting recurred despite nasogastric aspiration. Due to the concern of life threatening visceral strangulation, a decision was made to proceed with a cesarean section. The patient was brought to the operating room the following day in stable condition. A combined spinal epidural was placed at the L4-5 interspace using a 27g spinal needle with intrathecal Bupivcaine 7.5mg, Tetracaine 0.2mg, Morphine 0.1mg, and Fentanyl 10mcg. An additional 5ml of 2% Lidocaine was administered epidurally to achieve a T6 level. The patient tolerated the procedure well and did not require assistance with ventilation. Postoperatively, the patient was transferred to the ICU for observation of respiratory function. The diaphragmatic hernia was repaired eleven days later.

The management of parturients with CDH can be extremely challenging. Anesthetic considerations from the extravasation of the bowel into the thorax include respiratory failure from compression atelectasis, severe reflux, ileus, and bowel incarceration. Vaginal delivery without assistance is usually contraindicated as the Valsalva maneuver can worsen bowel herniation into the thorax (3). If gastric decompression does not relieve the symptoms at presentation a cesarean section with immediate repair of the hernia is usually indicated. Alternatively, as we report in this case, expectant management prolongs pregnancy allowing for the administration of corticosteroids. The repair of the hernia can be performed in the post partum period.

1 Barbetakis, N. et al. World J Gastroenterol 2006 21: 12(15):2469-2471
2 Fleyfel, M. et al. Anesth Analg 1998:86:501-503
3 Genc MR. et al. Obstet Gynecol 2003; 102: 1194-1196

Abstract T 57

Cesarean Section in a Patient with Severe Pre-Eclampsia and Thoracic Ascending Aortic Aneurysm

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Introduction: Aortic aneurysms are defined as localized dilations of the aorta to >150% over normal diameter. For most thoracic aneurysms, repair is recommended when the aneurysm reaches 5.5 cm. Pregnancy increases the risk of aortic dissection. Elevated levels of estrogen and progesterone during pregnancy ultimately result in a loss of elastic fibers in the aortic wall. Reticulin, part of the supportive structure of the aorta is also degraded throughout pregnancy. Finally, compression of the aorta by the gravid uterus increases the risk of dissection by creating resistance to outflow and increasing wall stress. Pre-eclampsia further exacerbates these changes and increases shear stress (dV/dT) on the aortic wall.

Case Report: A 31 year old Nigerian female G3P0 at 35 weeks gestation with a known thoracic aneurysm noted to be 5.6 cm at the ascending aorta was admitted due to a nonstress test with decreased variability. During admission, she was noted to have blood pressures 120-190/40-70 and was diagnosed with preeclampsia. The decision was made to proceed with a scheduled cesarean delivery in the main OR. Prior to initiation of epidural anesthesia, a right radial arterial line was placed as well as a femoral arterial line which could have been used if rapid CPB was needed. Epidural anesthesia with incremental dosing was chosen to slowly decrease SVR and thereby prevent rebound tachycardia that would further increase shear stress on the aorta. Esmolol and nitroglycerin drips were titrated to maintain HR ≤ 80 and SBP ≤ 110, prior to placement of the epidural. The infant was delivered without complication with Apgar scores of 9, 9. After tolerating the anesthesia and surgery without complication she was transferred to the ICU, and subsequently discharged on post operative day 4. On postpartum day 10, she presented to the hospital with 10/10 shearing pain in her back. A CT scan indicated a Type B aortic dissection distal to the left subclavian artery. The ascending aortic diameter was unchanged, but the descending aortic diameter had increased from 3.5 cm to 4.3 cm. After a complex hospitalization, on postpartum day 24, the patient underwent aortic valve and ascending aortic root replacement. She was discharged on hospital day 21 with blood pressure controlled on clonidine and metoprolol.

Conclusion: Approximately 50% of aortic dissections in women under 40 years of age occur during the third trimester of pregnancy or puerperium when heart rate, stroke volume and cardiac output are at their highest. A collaborative approach, including maternal-fetal medicine physicians, cardiovascular surgeon, cardiologist, and cardiothoracic and obstetric anesthesiologists not only resulted in a successful delivery but a successful definitive repair of the thoracic aneurysm.

Abstract T 58

Severe Central Hypothermia: An Uncommon Adverse Effect of Intrathecal Morphine

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Intro: Intrathecal (IT) morphine is commonly used to control pain following cesarean delivery. Common side effects include nausea, vomiting, pruritus and more rarely, delayed respiratory depression. Another, lesser known, side effect of IT morphine is long lasting, severe, hypothermia likely due to disruption of central thermoregulatory mechanisms. Several case reports have identified such instances of hypothermia unresponsive to conventional rewarming strategies, in which patients demonstrated paradoxical symptoms of sweating and subjective feelings of excessive warmth [1]. Possible treatments to reverse such hypothermia include sublingual lorazepam [2] and intravenous (IV) naloxone [3]. We present the case of a patient who experienced profound and persistent hypothermia after administration of IT morphine. Ultimately, the patient was successfully treated with IV midazolam. To our knowledge, this is the first time an IV benzodiazepine has been used to restore normothermia in this context.

Case: A 41 year old, healthy nulliparous patient at term underwent elective primary cesarean under spinal anesthesia (bupivacaine 12 mg, fentanyl 15 mcg, morphine 150 mcg). She exhibited severe hypothermia in the postoperative period with a nadir of rectal temperature of 93.9° F two hours after the placement of the neuraxial anesthetic. The patient reported feeling warm and was diaphoretic despite physical findings of extremely cool skin. She otherwise remained hemodynamically stable with no other complaints. After ruling out common etiologies of postoperative hypothermia, we considered the possibility of hypothermia secondary to spinal morphine. Previous case-reports suggest lorazepam as an effective treatment via an unclear mechanism of action. The patient received oral lorazepam 1 mg 90 minutes after hypothermia was confirmed. Unfortunately, the SL formulation of lorazepam is unavailable at our institution, and the patient exhibited no improvement after 1 hour. Considering the bioavailablility of oral vs. SL benzodiazepines as the reason for initial treatment failure, 2 mg of IV midazolam was administered, and normothermia (97.9° F) was successfully achieved in 45 mins.

Discussion: Opioids are known to be involved in thermoregulation and the determination of a temperature set point [4]. Morphine may also activate transient receptor potentials, which play a role in the cutaneous thermal receptor afferent pathway. Furthermore, by antagonizing glutamate, morphine may interfere with the cool skin sensation that normally triggers physiologic rewarming by shivering and brown tissue activation [5]. Finally, due to possible enhancement of GABA activity, benzodiazepines seem to restore normal temperature regulation pathways without interfering with the analgesic effect of morphine.

1 Hess PE. Int J Obstet Anesth 2005
2 Ryan K. Can J Anaesth 2012
3 Sayyid S. Reg Anesth Pain Med 2003
4 Morrison S. F. Front Biosci 2001
5 Sessler C. Miller RD, Anesthesia, ed. 5

Abstract T 59

Death From Peripartum Liver Rupture Despite Early Diagnosis and Agressive Management

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Introduction: Spontaneous liver rupture is a rare and potentially devastating complication of HELLP syndrome. Here, we describe the diagnosis and management of a case of peripartum liver rupture which included early suspicion and diagnosis of the event as well as Herculean efforts at resuscitation and surgical intervention that ultimately proved to be unsuccessful.

Case: XX was a 42 year old woman G9P3 at 35 weeks gestation who presented with the chief complaint of right upper quadrant pain. Her exam included findings of a blood pressure of 228/132, a tender right upper quadrant and right flank, and a urinalysis with 2+ protein. Due to the concern for both mother and fetus, the patient was rushed to the OR for an emergency C-Section. The surgery was completed without incident under general anesthesia with delivery of an 1885g infant with Apgars of 7 and 9. During the procedure the liver was inspected and no abnormalities were detected; there was no oozing and hemostasis was good. The patient was extubated and brought to the recovery room awake with systolic blood pressures in the 120-140s range. Preoperative labs became available at arrival to the PACU with the following notable

Results: INR 3.28, aPTT 99.2s, platelets 51 x 109/L, ALT 1643 U/L, AST 1779 U/L. A diagnosis of HELLP syndrome was made. About an hour later, the patient became somewhat hypotensive to 90s/60s with heart rate in the 60s to 70s. There were no signs of bleeding either at the incision site or vaginally and the patient's blood pressure responded appropriately to ephedrine. Approximately 20 minutes later the patient again became hypotensive and again responded to ephedrine. As we began the process of placing an arterial line, the patient again became hypotensive, but this time was not responsive to increasing does of ephedrine and phenylephrine. At that time the patient's abdomen was noted to be somewhat distended. An ultrasound of the abdomen was done which revealed a large amount of free fluid. The patient was rushed to the OR, general anesthesia was induced, central access was achieved and significant pressor therapy was started. Once the patient's abdomen was opened, the patient was diagnosed as having a ruptured liver capsule extending over segments 7 and 8 and extensive subcapsular hematomas on segments 6, 4b, 2 and 3. Despite aggressive treatment with pressors, more than 200 units of blood transfusions, two doses of recombinant factor VIIa, initiation of CVVH and more than 7 hours of surgical attempts to repair the liver, our efforts were ultimately unsuccessful and the patient succumbed to her disease.

Discussion: The incidence of liver rupture during pregnancy is thought to be <1/45,000 with the mortality of mother and child around 15% and 42% respectively. Certain aspects of this case, such as the severe pre-operative coagulopathy and the extent of microscopic and gross liver damage likely made resuscitation that much more difficult.

Abstract T 60

Paravertebral Catheter Placement for Acute Rib Pain in a Pregnant Patient With Cystic Fibrosis

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Introduction: Cystic fibrosis (CF) is an autosomal recessive disease secondary to a mutation of a gene on chromosome 7. It leads to reduced chloride conductance, increased viscosity of secretions, leading to pulmonary and gastrointestinal compromise. Due to recent advances in management of patients with cystic fibrosis, life expectancy and quality of life have increased greatly (Thorpe-Beeston et al. BJOG. 2013 Feb;120(3):354-61). With these improvements comes an increased incidence of CF patients becoming pregnant.

Case description: A 30-year-old G2P0010 at 33 weeks 4 days gestation with cystic fibrosis suffering from an acute exacerbation was admitted to the medical intensive care unit. During an acute coughing spell she felt a “pop” on her left side. She then had worsening pain and hypoxia. Unable to tolerate 4 times daily vest therapy, she was likely not going to be able to wait until her goal of 37 weeks for induction of labor. The medical ICU and obstetric services were discussing whether or not to induce labor early or she might need to be intubated for worsening oxygenation secondary to worsening lung function and increased need of narcotics for pain. At this point the acute pain service was consulted to evaluate her.

It was decided she could possible benefit from a nerve block. A paravertebral (PV) catheter was placed with ultrasound guidance between the ninth and tenth thoracic vertebrae on the left. The patient tolerated the procedure well and there were no complications. After an intravenous test dose of 1.5% lidocaine with Epinephrine 1:200,000 and infusion of 0.2% ropivacaine was started at a rate of 6 milliliters per hour. She noted almost immediate pain relief and improvement in ease of respiration. The catheter was left in place for seven days and her pain scores ranged from 0 /10 at rest to 3/10 with movement, with decreased sensation to cold from the 5th to the 9th thoracic dermatome on the left. In the first 48 hours of hospitalization prior to catheter placement she required a total of 41 milligrams of morphine and 3.9milligrams of dilaudid for pain, and after catheter placement she received no narcotics. Also, prior to her paravertebral catheter she had increased oxygen requirements to 4 liters per minute oximask with corresponding oxygen saturations between 92 and 97%. After PV catheter she no longer needed supplemental oxygen. The catheter was removed after 7 days and the patient was discharged home. The remainder of her pregnancy was uneventful and she delivered via spontaneous vaginal route at 38 weeks 5 days.

Discussion: This case illustrates the potential role of paravertebral catheters for acute costal pain in cystic fibrosis patients with exacerbations during pregnancy. By improving pulmonary function this could theoretically lead to improved maternal-fetal outcomes.

Abstract T 61

Urgent Cesarean Section in a Single Ventricle Parturient

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Increasing numbers of children with congenital heart disease (CHD) are surviving to adulthood. Resultantly, they are presenting to the operating room for non-cardiac surgeries at increasing rates—obstetrical procedures not being excluded.

We present the case of a 22 year old G1P0 diabetic female at 36 weeks gestational age who presented in labor in need of an urgent cesarean section due to variable decelerations seen on fetal heart tracing. Additionally, the parturient had been born with a single ventricle and congenital pulmonary atresia which was previously surgically corrected. After having a bidirectional cavo-pulmonary shunt (Glenn procedure) at age 1 followed by a complete Fontan operation at age 4, her cardiac output was heavily dependent upon elevated CVP and preload. With coexisting moderate ventricular dysfunction, she was a NYHA Class 1 controlled with furosemide, spironolactone, and digoxin prior to and during pregnancy. A developmental delay in the patient further complicated her peripartum care. An arterial line was placed pre-operatively and IV access was obtained via two peripheral veins. Due to the urgency of the cesarean section and the lack of heart failure symptoms in the parturient, a central line was not placed pre-operatively. However, necessary equipment including an ultrasound for central line placement was checked and made available if central access became necessary. A cardiac anesthesiologist with TEE experience was available to assist with cardiac monitoring if necessary. An epidural catheter was placed in the OR without difficulty. A sensory level to T4 was accomplished via slow titration of 2% lidocaine and fentanyl with careful monitoring of the parturients vital signs and with administration of IV fluids as necessary. No significant hemodynamic instability developed with our neuraxial technique. However, following delivery of the fetus, the patient developed hypertension with autotransfusion followed by moderate hypotension, bigeminy, and multiple PVC’s secondary to increased preload in concordance with her pre-existing ventricular dysfunction. Since the uterine tone was adequate, oxytocin infusion (20 units/L in LR) was transiently stopped with improvement in her hypotension. The dysrhythmias continued, however, and she was transferred to the ICU for postoperative monitoring.

In patients with single ventricle CHD with previous surgical palliation, epidural anesthesia can be safely administered with slow titration and without detrimental effects to mother or fetus. Because of the hemodynamic alterations associated with delivery and the potential associated problems such as dysrhythmias, tachycardia, pulmonary edema, hemorrhage, and embolism, peripartum care should be managed in a multidisciplinary ICU setting. In a parturient with more symptomatic heart failure, general anesthesia with intensive intraoperative monitoring such as TEE and central access with continual measuring of CVP would be beneficial.

Abstract T 62

Lumbosacral Ultrasound in Anesthesia for Cesarean Section in a Pregnant Woman With Severe Vertebral Deformity, Dwarfism, Severe Preeclampsia and Difficult Airway

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Introduction: Spondyloepiphysealdysplasia (SED) is a rare dominant autosomal disease (3-4:1.000,000) in which changes in type II collagen result in severe bone deformities, dwarfism and hearing/vision problems. This report presents the case of a pregnant woman with this disease associated to severe preeclampsia, difficult airway and indication for urgent c-section.

Case report: A 32-years old primigravida with SED, dwarfism (100cm/43kg), severe thoracic kyphosis and lumbar lordosis and congenital hip dislocation. On the 28th week of gestation she presented with severe preeclampsia, signs of imminent eclampsia and US evidence of fetal distress, with a c-section recommended after corticosteroid therapy. Pre-anesthesia assessment has shown Mallampati class IV, mandibular protrusion class B, limited neck motility, mild dyspnea, pleural effusion, ascites, generalized edema and absence of coagulation disorders. The lumbosacral ultrasound made it possible to locate interspaces and an appropriate image of the yellow ligament at L3/L4, determining the point of puncture about 4cm to the left of the midline. Based on this reference, a single puncture was performed with a 17G Tuohy needle and a peridural catheter (19G) was inserted. Lidocaine 2% with adrenaline (1:200,000) was administered in titrated doses (5ml), associated with 100mcg of spinal fentanyl until a sensory block is obtained in T4 (15ml). The patient maintained hemodynamically stable during the procedure and received 10ml/kg of crystalloids. Material for emergency access to the difficult airway was kept ready in the operating theater. A male newborn was delivered weighing 790g, with no signs of bone deformities and Apgar score 2/7 in 1/5 minutes. Postoperative analgesia comprised 2mg of peridural morphine and 40mg of tenoxicam intravenously after cord clamping. The patient was transferred to ICU with a good clinical evolution and discharge in 7 days.

Discussion: Lumbosacral ultrasound provides valuable information to perform neuraxial punctures which may be crucial in cases of difficult palpation points or of spine deformities. In this case, the ultrasound was essential to find the puncture point, which had a very unusual topography. It allowed performing a single puncture and an intermittent peridural. In this case, without this tool, both the block and the general anesthesia would represent a significant challenge. Anesthesiology Clin 26 (2008) 145–158/ Anesthesiology 63(1985) 548-550

Abstract T 63

When BMIs Reach Triple Digits: The Anesthetic Management of a Pregnant Woman with Super Morbid Obesity

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Intro: As the incidence of super morbid obesity continues to dramatically increase, obstetric anesthesiologists are often faced with the challenges of managing patients affected by the combined physiologic implications of obesity and pregnancy. We present and review anesthetic considerations when managing a pregnant patient with super morbid obesity (BMI 115.3).

Case: A 34 year old G1P0 with pre-pregnancy weight of 630 pounds presented at 11 4/7 weeks with a chief complaint of profound dyspnea and pregnancy. The patient's past medical history was notable for chronic hypertension, obstructive sleep apnea, asthma and GERD in addition to her super morbid obesity, for which she was taking medication prescribed from a physician supervised weight loss clinic. Because weight loss medications have been linked with valvular disease, the patient's initial testing included echocardiography which revealed an ejection fraction of 60-65% and mild concentric left ventricular hypertrophy. Pulmonary function testing was unable to be obtained due to the patient's size, but she received CPAP at night for her sleep apnea. As her pregnancy progressed, the patient gained 138 pounds despite intensive nutritional counseling. This led to decreased mobility causing difficulty in completion of activities of daily living and making transportation to the hospital challenging. The patient was admitted at 33 weeks gestation for inpatient management secondary to these issues. She was delivered at 36 6/7 weeks via cesarean section under epidural anesthesia with delivery of a neonate weighing 3209 grams (APGARs 9/9). An IUD was placed prior to uterine closure, epidural was removed without complication 6 hours post-operatively and anticoagulation was restarted. The patient was discharged home on post-operative day 7.

Discussion: Every organ system is affected by increases in BMI. Redundant tissue and edema in the upper airway create a hostile environment for intubation while increased truncal girth makes neuraxial anesthesia challenging, as evidenced by a sevenfold increase in initial epidural failure rate in obese women. The increased oxygen consumption and disproportionate decrease in FRC due to abdominal mass in super morbidly obese patients cause decreased time to desaturation during a rapid sequence induction. The prevalence of obstructive sleep apnea also makes postoperative pain control challenging as administration of opioids can result in a fifty percent increase in apnea events. These patients also have a higher incidence of hypertension and diabetes and are more likely to have pregnancy-induced hypertension, preeclampsia, gestational diabetes and thromboembolism. Obesity itself is a risk factor for anesthesia related maternal-mortality. With the increasing incidence of obesity around the world, anesthesia providers must be prepared to manage the many comorbidities that challenge safe administration of anesthesia.

Abstract T 64

Anesthetic Management of a Preterm Parturient with Severe Superimposed Preeclampsia and Newly Diagnosed Wolff-Parkinson-White Syndrome

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Patient ST is 34 year-old G2P0101 woman @26 weeks and 4 days who presented to L&D with complaints of blurry vision, and bilateral eye pain. ST had a history significant for chronic hypertension and previous emergent cesarean section (CSXN) due to severe preeclampsia @28 week's gestation. On admission, the patient was noted to have a BP >160/100 with urine protein > 30gm. At this point, ST was admitted with the diagnosis of superimposed preeclampsia and started on magnesium therapy, labetolol, nifedipine, and betamethasone. AFter starting magnesium, ST reported atypical sharp chest pain that radiated to the right shoulder and worsened with inspiration. An EKG revealed a previously undiagnosed Wolff-Parkinson-White syndrome (WPW). Cardiac enzymes were negative. An echocardiogram showed mild LVH, normal valves, and EF 75%. Cardiology consult concluded the WPW was asymptomatic. All AV nodal blocking agents, beta-blockers, and calcium channel blockers were discontinued for BP control to prevent prolonging the refractory period of the AV node. ST was started on hydralazine and nitroglycerin for BP control. The patient's blood pressure improved (BP130/80's). On hospital day 7, ST left against medical advice and with no medications. ST returned 3 days later with complaints of blurry vision and elevated BP >160/100's. At this time, ST was taken for emergent CSXN due to severe preeclampsia, non-reassuring fetal heart rate, and transverse lie of the fetus. A combined spinal-epidural (CSE) technique was performed for the CSXN. Using the needle through needle technique, a 27 guage spinal needle was placed through the epidural needle with CSF flow and 1.4ml of 0.75% bupivacaine with 20mcg of fentanyl and 300mcg of duramorph was injected. After the spinal dose, an epidural catheter was placed. After confirming adequate surgical anesthesia with a sensory level to T4, the CSXN was started. Procainamide (17mg/kg IV infusion) was prepared and ready in the OR to acutely treat any arrhythmias (AF) associated with WPW. Procainamide was to chosen to control the AF rate by blocking the accessory pathway.1 Defibrillator pads were readily available to perform cardioversion for arrhythmias associated with any hemodynamic instability. The neonate was delivered with APGARS 6 & 8 without any episodes of arrhythmias or hemodynamic instability.

1.KK Sethi, A Dhall, DS Chadha, et al. WPW and Preexcitation Syndromes. J Assoc Physicians India. 2007 Apr;55 Suppl:10-5

Abstract T 65

An Epidural Hematoma in a Patient with a Normal Coagulation Profile Following Epidural Analgesia for Labor

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A 28 year old G2P1 with a previous Ceaserean section at 40 weeks presented following a spontaneous rupture of membranes. Epidural analgesia was requested and a catheter was placed at the L3-4 level on the first attempt without any complications. No CSF or blood was withdrawn from either the needle or catheter. There was no paresthesia or any unusual pain during the procedure. Hemoglobin was 11.9 gm/dl and platelet count was 135 x 109/L before the procedure. The catheter was removed without any evidence of bleeding at the insertion site after vaginal delivery.

Five hours after removal of the catheter, the patient complained of bilateral lower extremity weakness and radiating pain. The neurologic examination indicated slightly depressed muscle motor tone of both lower extremities. No bleeding or swelling was noted at the insertion site of the catheter. Post delivery hemoglobin was 9.4 gm/dl and platelet count was 112 x 109/L. An emergency MRI revealed a posterior epidural hematoma at L4 approximately 12.8 x 5.1 mm in size. The hematoma displaced the thecal sac anteriorly with an associated severe central spinal canal compromise. Because the neurologic findings had stabilized for several days, the neurosurgeon recommended conservative therapy without surgical intervention. By post partum day 4, the pain in lower back and motor weakness of lower extremities had gradually improved. She was discharged home with instructions to continue physical therapy.

Discussion: An epidural hematoma following an epidural catheter insertion is a rare but significant complication. The incidence of an epidural hematoma in a healthy parturient can be as low as 2.72 per million. Symptoms from an epidural hematoma include unusual back pain and local tenderness, persistent numbness or motor weakness, or sphincter dysfunction. Bilateral symptoms or symptoms not typical of obstetric neuropathy must be investigated by MRI whenever an epidural hematoma is suspected. While risks of hematomas are low, delay in diagnosis can cause severe and permanent neurologic dysfunction. Once imaging confirms the presence of a hematoma, neurosurgical consultation is required for possible decompression of the spine. Early diagnosis by MRI and surgical intervention if indicated remain the standard treatment for complete neurological restitution.

Reference

1. Ruppen W,Derry S,McQuay H, Moore RA:Incidence of epidural hematoma, infection, and neurologic injury in obstetric patients with epidural analgesia/ anesthesia. Anesthesiology, 2006:105(2); 394-9.
2. Franchi F, Ibrahim B, Rossi F, Maspero ML, Morabito O, Asti D, BVucciarelli P, Buguzzi E: Coagulation testing before epidural analgesia at delivery: cost analysis. Thromb Res, 2011:128(1); 8-20.
3. Moen V,Dahlgren N,Irestedt L:Severe neurological complications after central neuraxial blockades in Sweden 1990-1999. Anesthesiology, 2004:101(4);950-9.

Abstract T 66

Can a Parturient with Transverse Myelitis And Chronic Pain Syndrome be Managed with Labor Epidural?

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Introduction: Transverse Myelitis (TM) is an acute or sub-acute inflammation of spinal cord resulting in motor, sensory and autonomic dysfunction. Since several cases of transverse myelitis have been reported following epidural and spinal anesthesia, regional anesthesia is denied in patients with acute or evolving TM [1]. We present a successful use of labor epidural analgesia for spontaneous vaginal delivery, in a parturient sub-acute transverse myelitis with chronic pain syndrome, without worsening of any neurological deficit.

Case Description & Management: A 32 year old G2P1 with sub-acute transverse myelitis at 39 weeks of gestation was admitted for induction of labor.

Eleven months prior to this admission, the patient had fever and chills for 2 days, developed numbness in both lower extremities, which progressed to weakness and inability to walk, besides having fecal & urinary incontinence. The diagnosis of transverse myelitis at T8 level was confirmed by MRI and CSF analysis. The patient was admitted to ICU, treated with high dose steroid and the symptoms were slowly improved. She was discharged home after 4 weeks.

During the current admission, her neurological examination was normal except chronic pain syndrome and neurogenic bladder, for which she used self-catheterization. After induction of labor, epidural was placed due to intolerable pain. Since the patient required frequent epidural boluses to control her pain, higher concentration of local anesthetic was infused. She delivered a healthy baby without any autonomic instability or neurological deficit and was discharged home on 3rd post partum day.

Discussion: Transverse myelitis is very rare in the obstetric population and only eight cases of parturient with TM have been reported in literature so far [2]. Regional anesthesia is not only prevents autonomic hyper-reflexia but also provides good pain relief in parturient with transverse myelitis. Despite concerns surrounding neuraxial anesthesia and onset of transverse myelitis, we successfully used epidural analgesia in a parturient with transverse myelitis without any new or worsening neurological deficit.

Conclusion: Because of paucity of literature evidence describing the use of regional anesthesia in patients with TM, publishing this case report will further augment documented clinical evidence and create confidence in managing such rare cases.

References

1. Jung Ho Seok, Youn Hee Lim, Seung Hoon Woo, and Jun Heum Yon. Transverse myelitis following
combined spinal-epidural anesthesia. Korean J Anesthesiol 2012 November 63(5): 473-474
2. Thomas S, Massey S, Douglas J, Magee L, Rosengarten M. Obstetric anaesthesia and transverse
myelitis. Int J Obstet Anesth. 2010 Oct; 19(4):467-8

Abstract T 67

“Cesarean Section in a Parturient with Cardiac Tamponade Physiology from Systemic Lupus Erythematosus”

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Introduction: Cardiac tamponade is a rare but serious complication observed in patients with Systemic Lupus Erythematosus (SLE). In patients with SLE, the incidence of tamponade is reported to be between <1%-1.23%. (1,2) We present a case of anesthetic management of a parturient with tamponade requiring cesarean section.

Case Report: A 19yo G2P1 at 30 weeks GA presented with a history of dyspnea and chest pain. The woman had a PMH significant for SLE with mostly skin and joint manifestations and asthma. She presented with anemia, an equivocal EKG, and CXR with cardiomegaly. TTE revealed a large pericardial effusion with early diastolic collapse of the right ventricle and exaggerated respiratory variation, suggestive of elevated intrapericardial pressure. The patient had stable vital signs but an exam consistent with tamponade. We discussed draining the effusion, but the posterior location would be technically challenging, and we were hesitant to use fluoroscopy in the parturient.

On hospital day 8, the parturient developed signs of severe preeclampsia. In a multidisciplinary consultation, the team decided to go to OR for delivery. The patient had a poor airway exam and limited neck extension. After establishing arterial line and two IVs pre-operatively, we placed an epidural catheter and carefully titrated ropivacaine 0.5%. The CT surgeon remained in the OR for possible emergent intervention. We used crystalloid and phenylephrine infusion to preserve hemodynamics. Vital signs were within acceptable ranges. Successful cesarean delivery was achieved without further intervention. Apgars were 8 and 8 at 1 and 5 minutes.

Postoperatively the patient’s course was complicated, but after several weeks the effusion resolved and she was discharged to home in stable condition on four new anti-hypertensives.

Discussion: Cardiac tamponade in the setting of pregnancy presents an enormous challenge. Accepted goals in managing non-pregnant patients with tamponade physiology include maintaining preload and afterload, sinus rhythm, and avoidance of positive pressure ventilation (PPV) and bradycardia. Slow induction of surgical epidural anesthesia with an infusion of phenylephrine prevented the need for general anesthesia with PPV that may have led to cardiovascular collapse. While in the OR, cardiac anesthesia, CPB, and TEE remained on standby. There was no guarantee that epidural anesthesia would be successful, but we felt it was a better initial plan than inducing GA with the potential for airway issues and CV collapse. Although her early postpartum course was complicated, it is possible that early delivery and avoidance of GA prevented the need for drainage of her effusion.

References:
1) Castier MB, et al. Cardiac tamponade in systemic lupus erythematosus. Report of four cases. Arg Bras Cardiol. 2000 Nov: 75(5):446-8.
2) Ketata W, et al. Postpartum pericardic tamponade revealing systemic lupus erythematosus. Rev Pneumol Clin. 2009 Oct: 65(5

Abstract T 68

Anesthetic Management of Hyperthyroid Storm with CHF and Pulmonary Edema in Pregnancy

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Introduction: We present a patient with diagnosis of uncontrolled hyperthyroidism in congestive heart failure (CHF) and pulmonary edema in late pregnancy.

Case Presentation: The patient is a 33 year old G2P0 AA female who presented at 33 weeks to an outside hospital (OSH) with 1-week history of dyspnea, palpitations and lower extremity edema. Though symptomatic of hyperthyroidism since 2010, she was not diagnosed until 1/2012 by her ophthalmologist during the work-up of proptosis. While she was started on PTU and propranolol, she was reportedly non-compliant with her medications. She was found to be in severe respiratory distress and her work up was consistent with congestive heart failure complicated by hyperthyroid storm. She was transferred for further management. On arrival to our institution, review of systems was significant for symptoms of uncontrolled hyperthyroidism and shortness of breath at rest. The physical exam revealed proptosis, diffuse thyromegaly, significant JVD, tachycardia and a loud systolic ejection murmur, wheezing throughout both lung bases and bilateral 3+ pitting lower extremity edema.

Her chest x-ray revealed bilateral hilar congestion, and a prominent cardiomediastinal silhouette with possible left pleural effusion. A transthoracic echo showed left ventricular enlargement, an EF of 50% with high velocity TR and right ventricular systolic pressures of 50-55 mm Hg at rest. T4 was elevated to 39.2 with a TSH of <0.01.

While initially started on IV Labetolol and Magnesium drip, her clinical condition deteriorated and she was urgently taken to the OR for C-section. An arterial line and a right pulmonary artery catheter were placed to assist with hemodynamic monitoring. The decision to intubate was made due to her continued sensation despite epidural anesthesia and high supine pulmonary pressures.
Due to her continued pulmonary hypertension the patient was transported to the MICU and remained intubated. She was diuresed and started on PTU and continued on IV beta blockers overnight. She was able to be extubated late the following day.
She remained in the hospital for 2 weeks due to co-morbidities of her hyperthyroidism. She and her baby were discharged without sequelae by week 3.

Discussion: Hyperthyroidism is a difficult disease in terms of diagnosis. Uncontrolled Hyperthyroidism due to non-compliance with medications leads to significant cardio-pulmonary morbidity. Successful management of untreated hyperthyroidism in pregnant patients presents as a unique challenge.

References:
1. Clin Obstet Gynecol. 1997 Mar;40(1):45-64.
2. AANA J. 2011 Jun;79(3):249-55.

Abstract T 69

An Extraordinary Catastrophe: Fibromuscular Dysplasia Causing a Spontaneous Common Iliac Artery Aneurysm Dissection with Rupture Leading to Massive Hemorrhage and Death in a Parturient

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Patrick O. McConville, M.D. - University of Tennessee College of Medicine - Knoxville, TN

Case Presentation: A healthy 32 yo G2P1 WF was admitted for spontaneous labor at 35 weeks gestation. She had an uncomplicated delivery, postoperative course and was scheduled for discharge two days later. She acutely developed right hip pain and collapsed. She was pale, diaphoretic, incontinent, but spontaneously ventilating and had a pulse, although hypotensive. She was resuscitated with IV fluids and vasopressors. Labs were unremarkable. She remained hypotensive despite resuscitative efforts. Arterial line was placed, labs were redrawn, revealing a hematocrit of 12. Following transfusion of four units PRBCs we proceeded to the operating room for exploratory laparotomy. She had three large bore IVs, and a rapid sequence intubation was performed with Etomidate and Succinylcholine, and she was hemodynamically stable throughout this process. Upon incision, her MAP fell to 35 mmHg. She was placed on the massive transfusion protocol, a norepinephrine infusion was started and central access was obtained. No source of bleeding was identified, but a large right sided retroperitoneal hematoma was noted extending from the pelvis to the diaphragm. Hemostasis was not obtained, cardiac arrest ensued and patient expired. Post-mortem studies revealed a 5cm right common iliac artery aneurysm, with a 9cm dissection with extension into both external and internal iliac arteries that ruptured, secondary to fibromuscular dysplasia and cystic medial necrosis. Family history was positive for SCD in her father and brother.

Discussion: Spontaneous iliac aneurysm dissection with rupture in pregnancy is an extremely rare and unreported event. Over half of the non-traumatic aortic dissections that occur in women under 40 are in the context of pregnancy. Dissections that occur in parturients most commonly involve either the coronary arteries, the thoracic or abdominal aorta, and often these patients have underlying connective tissue disorders or a bicuspid aortic valve (1). There are few isolated cases of large vessel dissections. Risk factors include hypertension and age independent of pregnancy (2). There are numerous reviews of aortic aneurysms and dissections in the setting of connective tissue diseases and pregnancy, with varying recommendations for management of these. During late pregnancy, it is believed that hormonal changes lead to a loss of structural integrity and a loosening of the ground substance which further enhances risk for dissection (3). A reasonable degree of suspicion, early diagnosis and intervention is crucial for survival.

1. West J Emerg Med. 2011 November; 12(4): 571–574.
2. Int J Legal Med. 2012 Jun 28.
3. Ann Thorac Surg. 2013 Feb;95(2):701-3.

Abstract T 70

Transfusion Protocol for Massive Obstetric Hemorrhage - Should There be One?

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Ivan Velickovic, M.D. - SUNY Downstate Medical Center - Brooklyn, NY

Introduction: Current transfusion practices vary widely among OB-GYN departments. Conventional massive obstetric hemorrhage protocols may underestimate the optimal plasma and platelet to red blood cell (RBC) ratios. We present 3 cases of massive obstetric hemorrhage where different transfusion regiments resulted in different operative courses and different blood loss.

Case 1: A 44 y/o female G1P1001 underwent a primary C-Section under CSE. Patient became progressively hypotensive in PACU and was taken back to the OR for exploratory laparotomy. Due to a complete lack of coagulation, immediate transfusion of PRBC was started with FFP paralleling PRBC. 10 U PRBC, 8 U FFP and 6 U of platelets were given. Bleeding was controlled by total abdominal hysterectomy (TAH). The INR values during surgery were 1.1, indefinite, 2.4, 2.1 and 1.6. The hemoglobin values were 11.6, 6.4, 7.5, 6.6 and 7.2. The total blood loss was 8,000 ml. The patient was discharged on post-operative day (POD) 8.

Case 2: A 37 y/o female G3P3002 with placenta previa underwent a primary C-Section under CSE. Decision was made to perform a TAH after difficulty in controlling bleeding medically. Immediate transfusion of PRBC was started with FFP paralleling PRBC. 10 U PRBC, 8 U FFP, 2 U cryoprecipitate and 2 U of platelets were given. The INR values during surgery were 1.1, 1.6, 2.1, 1.8, 1.4, 1.3 and 1.2. The hemoglobin values were 11.0, 7.7, 8.2, 8.3, 8.7, 7.0 and 7.3. The total blood loss was 5,600 ml. Patient was discharged on POD 5.

Case 3: A 37 y/o female G2P1001 with history of myomectomy underwent a repeat C-Section under CSE. Decision was made to perform supra-cervical hysterectomy after difficulty controlling bleeding medically. Transfusion of PRBC was started with FFP paralleling PRBC. 11 U PRBC, 8 U FFP, 1 U cryoprecipitate and 1 U of platelet were given. The INR values during surgery were 0.9, 1.2, 1.1, 1.0, 1.0 and 1.0. The hemoglobin values were 12.8, 5.6, 7.0, 11.4, 10.4 and 10.5. The total blood loss was 3800 ml. Patient was discharged home on POD 6.

Discussion: Post partum hemorrhage following C-Section, is associated with significant morbidity and mortality, with blood loss as a leading cause of early death. Our 3 cases differ mostly in the timing of the transfusion of FFP. The first patient went into full DIC while the second and third patients had only minimal or no coagulation disturbances - INR 2.1 and INR 1.2 respectively. Earlier plasma transfusions would probably have decreased or prevented consumption coagulopathy in our first patient, as happened in the second and third patients. Transfusion protocol 6:6:1 of PRBC/FFP/Platelets was pretty efficient in our second and third patients. However, even this regimen may become obsolete as new data is emerging on the role of fibrinogen concentrate in massive obstetrical bleeding. We will need more studies in the future to determine the optimal transfusion guidelines for massive obstetric hemorrhage.

Abstract T 71

Cesarean Section in a Pregnant Woman with Acute Type A Aortic Dissection and Tamponade with Subsequent Cardiopulmonary Bypass and Repair

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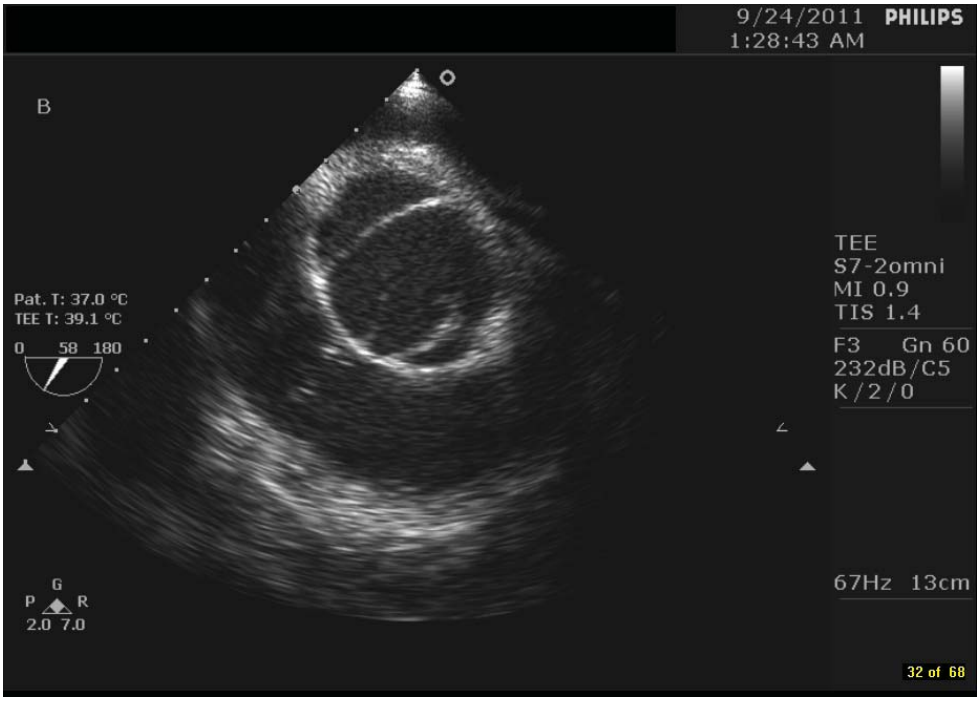
Introduction: Aortic dissection in pregnancy while rare, can lead to devastating outcomes for both the mother and fetus. In women under the age of 40, over 50% of type A aortic dissections occur in the obstetric population (Katz NM et al. Am J Cardiol 1984;54(6):699-701). The most common risk factors for aortic dissections during pregnancy include hypertension, Marfan syndrome, Turner syndrome and bicuspid aortic valve.

Case description: A 34 year old G4P0121 at 33+3 weeks gestation presented to her local labor and delivery with complaints of substernal chest pain and shortness of breath. She was initially treated for indigestion, however the pain continued. An EKG showed sinus tachycardia. Cardiac enzymes and a chest x-ray were normal. A transthoracic echo was performed which showed the aortic root dilated to 6.7cm with linear echodensity consistent with dissection and a moderate pericardial effusion. The patient was stabilized and transferred via life flight to our tertiary care facility.

Upon arrival her blood pressure was 120/80 and her heart rate was 120 beats per minute. She was rushed to the operating suite for emergent cesarean section and subsequent ascending aortic repair with valve replacement.

Under general anesthesia the cesarean section was uncomplicated. A liveborn female infant was delivered, weighing 2390 grams with Apgars of 4 and 9 at 1 and 5 minutes, respectively. Intraoperative transesophageal echocardiogram revealed an acute ascending aortic dissection with signs of cardiac tamponade and a bicuspid aortic valve. During the cesarean delivery access was obtained for cardiopulmonary bypass via the right axillary artery and left femoral vein. After median sternotomy, the pericardial sac was opened and a large amount of dark blood and clot was removed. The dissection flap started from the non-coronary and right coronary cusp near the annulus and extended to the distal ascending aorta, involving both the right and left coronary ostia. A 25mm mechanical valve with conduit was used for the repair. The cardiopulmonary bypass time was 3 hours, and she was able to come off of bypass without issue. She was discharged from the hospital on post-operative day 5.

Discussion: This case illustrates the importance of early diagnosis of acute dissections during pregnancy to avoid potential catastrophic outcomes for both mother and fetus.



Abstract T 72

Beating the Odds – Multi Disciplinary Team Effort Resulted in Survival of a Neonate, Despite Mother Having Multiple Iso-Immunizations (Anti-D, C, E) with Methylenetetrahydrofolate Reductase (MTHFR) Deficiency and Antiphospholipid Syndrome

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Introduction: Rh-D iso-immunization has decreased significantly due to widespread use of Rh-D immunoglobulin, but has led to the relative increase in the presentation of Rh-C and E iso-immunization as a cause for Hemolytic Disease of Newborn (HDN). We present a survival of newborn, who received multiple Intra Uterine Transfusions (IUT) and exchange transfusions for HDN, despite mother being developed Anti-D, Anti-C, and Anti-E antibodies in her blood. She was also diagnosed with Methylenetetrahydrofolate reductase (MTHFR) deficiency and Antiphospholipid Syndrome (APS).

Case Description & Management: A 28 yr old G5 P1122 was admitted at 26 weeks gestation with severe HDN for IUT and fetal anemia was diagnosed due elevated peak systolic velocity (PSV) of middle cerebral artery (MCA).

The mother was Rh-D, C and E negative and developed Anti-D, Anti-C and Anti-E antibodies from allo-immunization with Antiphospolipid syndrome and MTHFR heterozygote. Her obstetric history included two abortions, one full term and one pre-term baby.

The obstetric management of this pregnancy included intra-uterine transfusions at 26, 28 and 29 weeks, under combined spinal epidural anesthesia. Patient delivered a preterm baby at 30 weeks and 2 days by Cesarean section under spinal anesthesia with 1, 5 & 7 apgar, Hb 4.6 and Hct 13.8. The neonate was admitted to NICU, received two partial exchange blood transfusions and two platelet transfusions. Against all these odds, the baby was discharged home in stable condition on the 34th post-delivery day.

Discussion: Both MTHFR and APS cause thrombophilia leads to early abortion, coronary artery occlusions, and venous thrombosis in parturient, requiring anti-coagulation throughout pregnancy [1]. Neuraxial block in an anti-coagulated patient is a challenge for anesthetic management, particularly in this patient who required multiple interventions under regional anesthesia. Most cases of allo-immunization with Anti-C and Anti-E are resulted in mild to moderate HDN, except few cases requiring intrauterine transfusion as reported in literature [2]. We believe that timely coordinated multidisciplinary team effort is the key for successful management of complicated cases like this leading to good outcome.

References

1. Couto E, et.al. Association of anticardiolipin antibody and C677T in methylenetetrahydrofolate
reductase mutation in women with recurrent spontaneous abortions: a new path to thrombophilia?
Sao Paulo Med J. 2005 Jan 2;123(1):15-20
2. Murki S, Kandraju H, Devi SA. Hemolytic disease of the newborn- anti c antibody induced
hemolysis.Indian J Pediatr. 2012 Feb; 79(2):265-6

Abstract T 73

Marfan's Syndrome and Neuroaxial Anesthesia for Cesarean Section

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Introduction: Marfan's syndrome (MFS) is an autosomal dominant trait with a reported incidence of 1:3000 to 1:5000 individuals. We report a patient with MFS who received anesthesia for three pregnancies.

Case Report: A 37 year old G3 P2012 with Marfan's syndrome presented for elective repeat C/S and BTL in 2012. Vital signs: Ht 5"7" Wt 160lbs BP 100/60 P79 Hct 36, platelets 153, Creatinine 0.8 Cardiac echo unchanged. Medications: betablockers. Allergy to latex. In 2002, she had a modified "elephant" procedure for aortic aneurysm repair. In 2007, spinal was used for primary C/S for breech. It required 3 spinals to achieve surgical level after 45 minutes. Spinal resolved within two hours. In 2009 repeat C/S, a total of 200mgs of 5% hyperbaric lidocaine and 15mgs of spinal 0.75% bupivacaine was required to achieve a T4 level over 50 minutes. Recovery from the spinal was complete in two hours. Postoperatively, the serum creatinine rose from 1.6 to 2.8. Ketoralac and ibuprophen were suspected since the level normalized when they were discontinued. The patient did have theMRI done. Epidural anesthesia was initiated in the PACU and 25mls of 2% lidocaine with epinephrine and sodium bicarbonate was injected through the epidural needle in 5mls increments every 5 minutes. The epidural catheter was inserted but no level was detected for 30 minutes when the patient reported warmth in her right foot. Additional 10 mls of lidocaine was administered at 5 minute intervals and a T6 level was achieved 30 minutes later. She was brought to the OR where 10mls of lidocaine and 100 mcg fentanyl were given to solidify a T4 level. Repeat C/S and BTL proceeded uneventfully. The baby had Apgars of 9 and 9. Morphine 3 mgs was given with 10mls of 0.25% bupivacaine for postop analgesia.

Discussion: The patient most likely has ductal ectasia since 60 to 90% of patients with MFS have it. This will explain why she a lot more anesthetic to achieve a surgical level. Local anesthetic resistance cannot be excluded since it took 45 to 60 minutes to achieve any level. There might, in addition, be local anesthetic resistance in this patient since it took 45 to 50 minutes to get a level with spinal. We are still trying to persuade the patient to have an MRI since her father, sister and first child have MFS and it might help future anesthesia providers to definitely know if ductal ectasia exists in this family.

Abstract T 74

Anesthetic Management of a Laboring Patient at High Risk for Neurological Catastrophe: Call-Fleming Syndrome

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Introduction: We present a case report of a pregnant patient with a recent diagnosis of Call-Fleming syndrome who underwent labor induction and had spontaneous vaginal delivery with a combined spinal epidural (CSE) anesthesia. While the phenomenon of reversible cerebral vasoconstriction syndrome (RCVS) has been discussed with regards to the postpartum period, to the best of our knowledge, it has not previously been reported in a laboring patient.

Case Presentation: 24 y/o G5P2 woman with history of migraine headaches presented at 34 weeks gestation in OB clinic with complaints of severe, sudden onset "thunderclap" headache and left-sided weakness. Aneurysmal subarachnoid hemorrhage was excluded by imaging. MRA demonstrated a few areas of severe stenosis of intracranial vessels. Call-Fleming syndrome was suspected and confirmed with subsequent serial trans-cranial Dopplers. The patient was placed on verapamil and levetiracetam. Two weeks later, the OB team decided to induce the patient's delivery due to decreased fetal movement/ oligohydramnios. Patient was still reporting severe headache although her transcranial doppler showed no vasospasm. Though the neurology team suggested c-section delivery as the safest option, the anesthesia team believed vaginal delivery after neuraxial anesthesia would provide the least fluctuations in hemodynamics, which would be optimal in this patient. The multidisciplinary team proceeded with the plan for vaginal delivery. During early labor while the patient was fairly comfortable, CSE was placed with the spinal medication containing minimal local anesthetic (0.5mg bupivacaine), 25mcg of fentanyl, and 0.3mg of preservative-free morphine. An infusion of bupivacaine 0.1% and fentanyl 2mcg/ml was started at 6ml/hr. No test dose was given. The patient's blood pressure was monitored via A-line. She required 2 epidural boluses of fentanyl 50mcg and 1 bolus of 0.125% bupivacaine (10ml) to maintain adequate pain control. A healthy baby was delivered by vacuum extraction after 5 hours of labor.

Discussion: RCVS was recognised recently as a separate syndrome and combined a group of previously described diseases (Call-Fleming syndrome, benign angiopathy of the CNS, migrainous vasospasm, etc..) It is characterized by multifocal narrowing of the cerebral arteries that resolves over days to weeks. Although the vasospasm is reversible and temporal, it disrupts normal perfusion of the brain and puts the patient at risk of developing ischemic or hemorrhagic stroke. Pain, anxiety, stress, fluctuations in blood pressures, valsalva and sympathomimetic medications which are all common and tolerated during normal labor and delivery, can become life-threatening for the parturient with RCVS and places her at a high risk of neurological catastrophe. We believe that if the obstetrical situation permits, NSVD with a CSE anesthetic dosed with high narcotics/low concentration local anesthetics is preferable for hemodynamic stability.

Abstract T 75

Severe Uncorrected Kyphoscoliosis in a Pregnant Patient. Decision Making and Anesthetic Management of Cesarean Delivery

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Introduction: We present the decision-making and anesthetic management of a pregnant patient with severe kyphoscoliotic deformity.

Case: A 36 yo G1P0 Filipino woman with a history of asthma and severe, uncorrected kyphoscoliosis was admitted to antepartum with shortness of breath. She was 132 cm tall and 45 kg. ABG on RA revealed pH 7.40/pCO2 50/ HCO3 30/pO2 51.

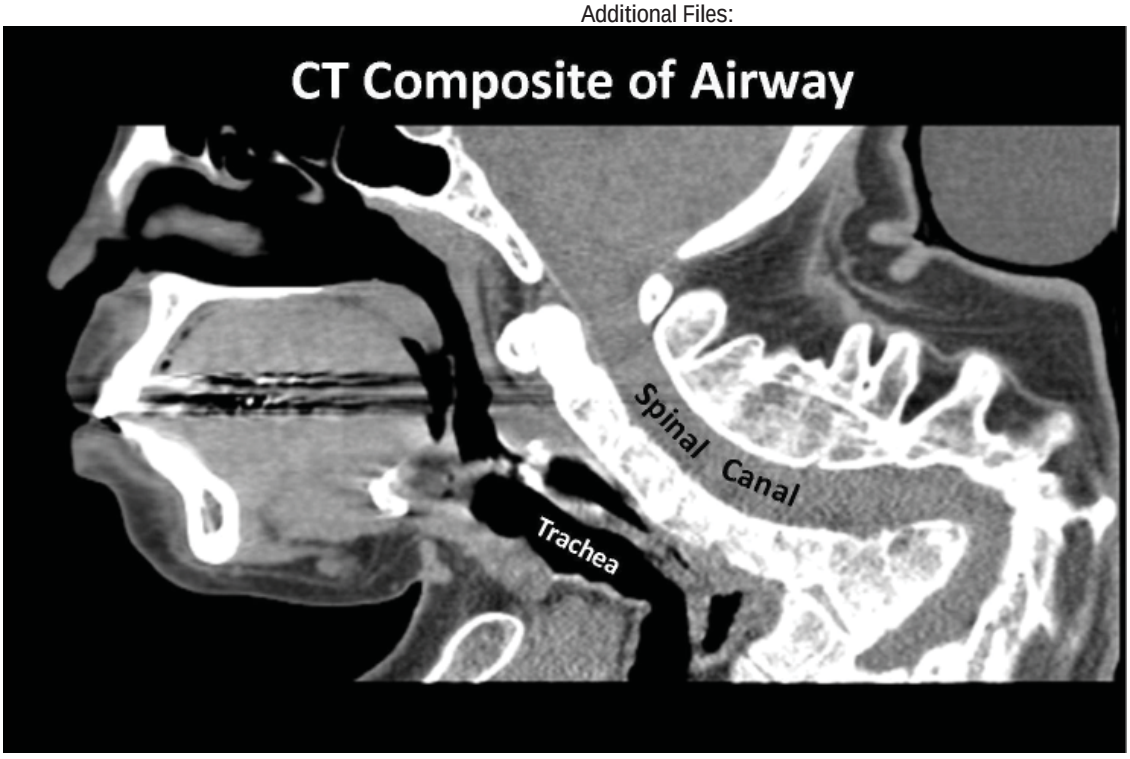
The patient's chin was touching her chest, and her shoulders were at the level of her ears. Neck extension was fair; MP 3. Chest auscultation revealed bilateral wheezes. ECHO was nl with PA systolic pressure 25 mmHg and LVEF 58%. Spirometry showed a severe restrictive pattern, with FVC 0.70 (35% predicted); FEV1 0.52 L (28% predicted); FEV1/FVC 75%.

CT of the airway was read as widely patent (CT attached). However, immediately below the cricothyroid cartilage, the trachea deviated posteriorly at a significant angle, only to then deviate a second time at a nearly 90o angle caudally. Concern was expressed that even if the trachea could be orally intubated, or a tracheostomy could be performed at the level of the cricothyroid membrane, that positive pressure ventilation past the 90o bend would be problematic.

At 26 weeks the patient's O2 requirement increased from 1 to 2 L/min. ABG revealed a pH 7.33 and pCO2 that was increased at 52 mmHg. Concerns were balanced between the fetal consequences of early delivery and the effect of the increasing uterine size on the patient's severe restrictive lung disease. Induction of labor was considered, but was believed unlikely to be well tolerated. The decision was made to perform a scheduled CD at 27 weeks gestation with ENT present. General anesthesia was rejected because of intubation and ventilation concerns above. Epidural anesthesia was chosen because of controllable onset. The catheter was placed without difficulty, and a bilateral T4 level was achieved. A 1065g male infant was delivered by classical CD with APGARS 5 & 6. The patient was transferred to the ICU in stable condition and left the hospital four days after delivery on home O2 therapy.

Discussion: The success rate for epidural anesthesia in uncorrected scoliosis is 80%. We experienced none of the reported problems in this population, including placement difficulty, asymmetric, patchy or unilateral block. The care of this unusual patient brought together a multidisciplinary team that determined a safe time and method of delivery, leading to a successful outcome.

Additional Files:



An Emergent Cesarean Delivery in a Jehovah's Witness with a 30 x 16 x 25 cm Uterine Fibroid and Massive Hemorrhage

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Melissa B. Russo, M.D. - Ochsner Clinic Foundation - Jefferson, LA
Adrienne P. Ray, M.D. - Ochsner Clinic Foundation - Jefferson, LA

Intro: In 2008, 1,914,000 Americans described themselves as Jehovah's Witnesses. Since most JW's refuse blood products, it is important to have frank discussions about possible blood loss and be appropriately prepared for massive hemorrhage when a JW undergoes a surgical procedure.

Report: A 36-year-old G1P0 JW at 37 weeks presented emergently with regular painful contractions. On exam, the patient was 3 cm dilated, 90% effaced and breech presentation. The patient had a known 30x16x25 cm uterine fibroid. She was consulted about the risk of massive hemorrhage with her fibroid and likely need for blood transfusions however the patient refused any blood products other than albumin and Cell Saver. A 14g IV and lumbar epidural were placed. Within 1 hour, the patient was 5 cm dilated with late decelerations. The patient was then taken to the OR for an emergent cesarean delivery. Standard ASA monitors were placed and an arterial line and rapid infusion catheter were secured. A triple lumen central line, Cell Saver, and rapid infuser were made available for emergent use in the OR. The patient was again consulted about possible massive hemorrhage but continued to refuse any blood products. The patient's lumbar epidural was slowly dosed with fentanyl, 2% lidocaine and sodium bicarbonate. The patient's blood pressure and fetal heart tones decreased immediately after lying supine with left uterine displacement. Hypotension was only responsive to epinephrine boluses. The OB team made a vertical midline incision to avoid the fibroid and delivered the baby 1 minute after incision. The patient lost 4000cc of blood during this period and became unconscious. Conversion to a general anesthetic using RSI and video laryngoscopy was performed. A central line was placed and an epinephrine infusion initiated. Cell saver was started and albumin boluses given to maintain perfusion. The patient was given pitocin, hemabate and methergine to control bleeding but to no avail. Due to numerous adhesions and continuous bleeding, hysterectomy was not feasible and bilateral uterine artery embolization was required. The patient was transported under anesthesia to IR and successfully embolized. She was then transported to the ICU with a Hgb of 3.3. Despite the patient's pre-op wishes, her husband requested a blood transfusion for her on post-op day 1. She was extubated on POD 2. By POD 3 she was fully conversant and expressed appreciation of all resuscitative measures including the transfusion. She explained that, despite all of our counseling, she did not truly understand her life was in danger. She was discharged on POD 12.

Discussion: Since the public typically considers cesarean deliveries to be a low risk procedure, it is important to clearly express the risks associated with massive hemorrhage to JW patients so they can make informed decisions about their own care. It is also imperative to make appropriate preparations for JW patients in the OR in case of massive hemorrhage.

Abstract T 77

A Complex Case of Labor Management in a Patient with Autonomic Hyperreflexia Due to a C5-6 Injury Who Sustained an Unintentional Dural Puncture During Epidural Placement

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Autonomic hyperreflexia (AHR), once considered a mortal danger for women with spinal cord injuries (SCI) in labor, may be prevented or ameliorated by early labor analgesia. Though limited, case reports describing this practice in parturients with SCI and concomitant AHR have yielded positive outcomes for mother and baby, thus giving hope to the 2000 women of child-bearing age who sustain SCI each year. Anesthesiologists play a vital role in ensuring the safety of such patients when they become pregnant.

We present the case of a 34 year old, gravida 5 para 0 at 35 weeks gestation, incomplete quadriplegic with SCI at C5-6 from a motor vehicle accident at age 16, who presented with elevated blood pressures and headaches. Labor was ruled out, so it was presumed that she was experiencing symptoms of AHR secondary to kidney stones found on renal ultrasound. Urology was consulted for treatment, and her blood pressure spikes from sympathetic activation were successfully controlled with epidural analgesia.

Her anesthetic management became complicated by an unintentional dural puncture, and subsequent development of a headache. Though her symptoms were characteristic of a spinal headache, the cause of it was confounded by the fact that she had recently presented with headaches associated with AHR. Additionally, the patient had protein in her urine and became thrombocytopenic to 97.000, thus making pre-eclampsia another plausible etiology for her headache (despite the patient's preexisting proteinuria).

After discussions with MFM, she was induced because of her complicated clinical picture. Epidural analgesia was continued, which adequately controlled her blood pressures during contractions. The obstetricians strongly advised against a Cesarean section due to risk of stroke and other complications with additional stress to her body. Additionally, the patient had an appendicovesicostomy to allow catheterization from her umbilicus, which covered the anterior surface of her gravid uterus. According to her urologists, access to the uterus would involve almost certain damage to her bladder.

The rest of the patient's labor was uneventful, and she delivered vaginally with vacuum assistance. Her headache persisted two days later, so an epidural blood patch was performed using the in-situ catheter. The patient's headache resolved almost immediately, and she was discharged after two days.

Despite multiple comorbidities and complications, the patient underwent a safe and successful labor. This is undoubtedly attributed to the discussions that took place about her case among various care providers, including MFM, obstetricians, anesthesiologists, and urologists before she presented to the hospital in labor. She was cared for via a multi-disciplinary approach, and early involvement of the anesthesia team led to close monitoring and frequent communication amongst all parties involved, thus yielding a positive outcome.

Abstract T 78

Neuraxial Analgesia in a Parturient with Marfan Syndrome (MF) and Dural Ectasia (DE) – A Matter of Informed Choice

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Introduction: Neuraxial anesthesia (NA) is endorsed in parturients with MF if aortic dilation is present, as effective pain relief reduces the risk of aortic dissection/rupture. This population is known to have a high incidence of DE which includes ballooning of the dural sac, along with protrusion of dura outside the spinal canal. DE thus presents a conundrum in patients having NA, increasing the risks of both failed NA and inadvertent dural puncture. We report our experience with providing epidural analgesia to an MF parturient with known DE.

Case: A 30yo G3P1011 at 38wks EGA was seen in clinic to discuss labor analgesia. She had known MF; and was a 69 in, well-developed female with arachnodactyly and joint laxity. Medical history included pneumothoraces requiring sclerotherapy. She was taking pindolol 10 mg bid and had no allergies. Of note, she had an LP for a meningitis workup followed by development of a post-dural puncture headache (PDPHA). The PDPHA was unrelieved by blood patches, and she underwent 2 laminectomies (L3-5) for attempted dural repair, during which she was diagnosed with DE. She had a recent TTE which demonstrated a LVEF of 65%, mild MR, and a normal aortic diameter. Even after discussion of possible dural injury and block failure, she still opted for epidural analgesia. She presented in active labor 3d later with a cervical dilation of 4 cm and requesting epidural placement. The space was located using a 17G Weiss needle using an LOR technique at T12-L1 (just above her surgical scar) and the epidural catheter was inserted. After a negative test dose, the block was induced with divided doses of 0.25% bupivacaine, and an infusion of 0.2% ropivacaine was started. She had good labor analgesia for 4.5hrs, but developed a unilateral block that responded minimally to repositioning, catheter withdrawal, or repeated 5 ml boluses of 0.25% bupivacaine. As the patient was at 7 cm dilation, and reported some relief from the largely unilateral block, we agreed to maintain the epidural infusion and with supplementation with parenteral analgesics. She delivered vaginally 4hrs later without complication.

Discussion: It was decided that an epidural would provide optimal labor analgesia in this patient as it would provide both excellent analgesia for labor, and could provide operative anesthesia for a cesarean section. It was thought prudent to avoid CSE and SAB anesthesia in a patient who already suffered from a breech in dural integrity. Additionally, we were aware of documented inadequate intrathecal blocks in this patient population. As previously reported (1), this patient had received labor analgesia with a remifentanil PCA during her first pregnancy, because of the perceived risks, which resulted in an unsatisfactory outcome in the patient's opinion. For the second pregnancy the patient was willing to undergo the risks of NA in an effort to have a less painful labor.

1. SOAP 2011, Abstract A-66.

Abstract T 79

Anesthetic Management in Parturient with Severe Marfan Syndrome

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19y/o G2P1 female with Marfan syndrome complicated by severe progressive scoliosis s/p posterior spinal fusion from T3 to L3 with rods and bone grafts, thoracic aortic aneurysm s/p composite graft replacement of ascending aorta and aortic valve with St. Jude valve and mild to moderate stenosis of the prosthetic aortic valve on anticoagulation therapy presents for delivery of singleton gestation. At time of initial consultation, patient strongly requested trial of labor. Given the patient's significant medical history, the risks of neuraxial analgesia far outweigh the benefits. Furthermore, Marfan syndrome in a parturient significantly increases the risks of severe complications and mortality, with aortic dissection being the most frequent cause of death among these patients. According to the ZAHARA study, the presence of congenital heart disease carries a very high risk for peripartum cardiac events, including CHF and arrhythmias. This patient's Marfan syndrome is even further complicated by the presence of moderate stenosis of her prostethic valve, which could result in severe hemodynamic compromise if patient experiences significant increase in her afterload as occurs with valsalva or laboring. Medical management of these patients, therefore, may necessitate the use of invasive monitors. Finally, given this patient's prior cardiac surgical history being without anticoagulation carries a high risk of thromboembolic events, however maintaining anticoagulation therapy carries a higher risk of severe hemorrhage during the peripartum period. All of these factors, when examined together, argue for a very well controlled, planned elective cesarean section under general anesthesia with preparation for significant blood loss and invasive hemodynamic monitoring, and the patient must be strongly advised against neuraxial analgesia and especially against a trial of labor. Drenthen et al. Predictors of pregnancy complications in women with congenital heart disease.

Eur Heart J (2010) 31 (17): 2124-2132.

Abstracts ~ Friday

Abstract F 1

Risk Factors for Severe Hemorrhage-Related Morbidity in Patients Diagnosed With Uterine Atony Undergoing Cesarean Delivery

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Introduction: Rates of postpartum hemorrhage (PPH) due to uterine atony (UA) have increased in the US.(1) Although severe maternal morbidity can result from PPH,(2) risk factors for severe hemorrhage-related morbidity (HRM) associated with UA are unclear. We performed an observational study to investigate risk factors for severe HRM among women diagnosed with UA undergoing cesarean delivery (CD).

Methods: 2294 women with a diagnosis of UA were identified from the NICHD MFMU Network prospective study registry of 57182 patients who underwent CD between 1999-2002. UA was defined by administration of methylergonovine and/or carboprost. A composite outcome for HRM was defined by ≥1 of the following events: intraoperative or postpartum transfusion, uterine artery or hypogastric artery ligation, ICU admission for pulmonary edema, coagulopathy, ARDS, postoperative ventilation, or hemodynamic monitoring. Multivariate logistic regression was used to identify clinical predictors for severe HRM. Internal validation was performed using 10-fold cross-validation.

Results: The frequency of severe HRM in the cohort with diagnosed UA was 19.6%. The most common complication and perioperative intervention was postpartum transfusion (13.7%) and uterine artery ligation (5.1%) respectively. Based on multivariable analysis, predictors significantly associated with an increased risk of severe HRM were: African-American or Hispanic race (vs. Caucasian); multiple gestation; placenta previa; placental abruption; ≥2 prior CD; ASA class 3 or 4 (vs. ASA class 2); general anesthesia ± regional anesthesia (vs. spinal anesthesia) [Table]. Interestingly, pre-pregnancy BMI of 30-34.9 and ≥35 were significantly associated with a decreased risk of severe HRM (vs. BMI<25: referent group) [Table].

Conclusion: Our results confirm that established risk factors for severe PPH are associated with UA-related HRM (e.g., placenta previa, placental abruption, general anesthesia, African-American or Hispanic, ≥2 prior CDs). Surprisingly, overweight and obese patients were at decreased risk of severe HRM, which may be explained by hospital-level factors (e.g., more experienced physicians managing obese patients during CD) or clinical factors (e.g., better physiologic compensation to blood loss in obese patients compared to non-obese patients; non-linear decreases in blood volume with increasing weight).

References: (1) Am J Obstet Gynecol 2010;202:353 e1-6. (2) Obstet Gynecol 2009;113:293-9.

Abstract F 2

Review of High Risk Obstetric Anesthesia Antepartum Consult Clinic – 2000 – 2012

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Background: The management of high-risk pregnancies for women with significant medical co-morbidities is becoming an increasingly prominent responsibility for anesthesiologists. At a tertiary-level teaching hospital in Canada, with a labor and delivery unit volume of 7000 deliveries per year, an obstetrical anesthesia antenatal clinic was established in 1999, to review high-risk parturients. Our study objective was to define the incidence of high-risk parturients seen at the antepartum anesthesia clinic between 2000 – 2011. We hypothesized that the majority of high-risk parturients delivering at our institution were reviewed prior to delivery.

Methods: This retrospective review identified all high risk antenatal anesthesia consultations during three representative years (2001, 2006, and 2011). The proportion of high risk deliveries that had an anesthesia antenatal consultation was estimated by examining the total number of high risk deliveries in one randomly selected month from each of the three years. Data extracted from each anesthesia consultation included the primary indication for consultation, presence of secondary diagnoses, maternal age, gestational age at clinic visit, due date and parity.

Results: A total of 1357 women attended the high-risk obstetrical anesthesia clinic during the 2001 (n=411), 2006 (n=427) and 2011 (n=519) calendar years. The consultations were conducted on 6.3% (411/6485), 6.8%(427/6297) and 7.8% (519/6706 of all women delivering in 2001, 2006 and 2011 respectively. The mean maternal age at time of consultation was 32.9 years (sd:+ 5.1). 52% were nulliparous and parturients were seen at an average gestational age of 34.3 weeks (sd: + 3.3). The number of patients per year seen in the clinic gradually increased over the last decade (p = 0.006). The three most common categories for maternal referral across the three years were cardiac (268/1357) representing 19.7% of all consults (95% CI: 17.6, 21.9); musculoskeletal (210 / 1357) representing 15.5% (95% CI: 13.6, 17.5); and hematologic (183/1357) representing 13.5% (95% CI: 11.6, 15.3). While the pattern of primary diagnoses for consultation did not change over the three years sampled, obesity was the one exception. Consultations due to obesity increased from 1% of all consults in 2001 to 12% in 2011 (p = 0.000). There were increasing number of parturients with more than one high risk diagnosis over the years - 74 in 2001 (18%), 173 in 2006 (41%) and 276 in 2011 (53%). It was estimated that only 24.7% of eligible women for antepartum high risk obstetrical anesthesia consultation (1357/5484) were seen in the clinic during the three year review.

Conclusion: Future prospective studies are needed to confirm if there are substantial numbers of high-risk parturients missing an antepartum anesthesia assessment, and whether the consultations are important in improving clinical care and patient satisfaction.

Abstract F 3

The Impact of Breastfeeding on Postpartum Pain After Vaginal and Cesarean Delivery

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Introduction: Animal studies indicate that oxytocin may play a role in pain modulation [1, 2]. The analgesic effects of breastfeeding with its associated endogenous oxytocin release have not been well investigated. The study aim was to determine the impact of breastfeeding on perineal, incisional and cramping pain following vaginal and cesarean delivery.

Methods: Healthy multiparous women who had vaginal (n=43) and cesarean (n=40) deliveries of singleton term infants, and who were breastfeeding were enrolled in this IRB-approved observational cohort study. Women completed diaries to record perineal or incisional, and cramping pain scores 5 minutes before, during, and 5 minutes after breastfeeding. Demographic, obstetric and neonatal variables, as well as analgesic use were recorded.

Results: Cramping pain was significantly increased during, as compared to before or after breastfeeding in both the vaginal (P<0.001) and cesarean (P<0.001) delivery cohorts (Table). There was no difference in incisional pain before, during and after breastfeeding in women post-cesarean delivery (Table). There was a subtle increase in perineal pain during, compared to before (P=0.011) and after breastfeeding (P=0.032) in the vaginal delivery cohort (Table). The median (IQR) time to first successful breastfeed was 90 (60-165) minutes and 210 (175-248) minutes in the cesarean compared to vaginal delivery groups (P=0.041). The number of successful breastfeeds in the first 24 hours post-delivery were 8 ± 2 (P=0.209 between cesarean and vaginal delivery cohorts). At 6 weeks post-delivery 94% and 97% of the cesarean and vaginal delivery women respectively were successfully breastfeeding (P=0.489 between groups).

Discussion: Our findings suggest that breastfeeding increases cramping pain following vaginal and cesarean delivery. The increase in cramping pain is most likely due to the breastfeeding-associated oxytocin surge increasing uterine tone. No analgesic effect on perineal or incisional pain was observed during breastfeeding, indicating that endogenous oxytocin associated with breastfeeding may not play a significant role in postpartum pain modulation. Findings from this study can be utilized to inform patients about the impact of breastfeeding on pain following vaginal and cesarean delivery.

References:

1. Yang J. Peptides 2007;28:1113-9
2. Miranda-Cardenas Y. Pain 2006;122:182-9

Table: Pain Before, During and After Breastfeeding between the Study Cohorts

	Breastfeeding Timing		
	Before	During	After
Post-cesarean delivery			
Incisional pain	1.3 (0-3)	1.2 (0.4-2.9)	1.3 (0.4-2.3)
Cramping pain	0.8 (0-2.8)	2.6 (1-4.8)*	1.6 (0.6-2.8) †
Post-vaginal delivery			
Perineal pain	0 (0-0.2)	0 (0-0.4) γ	0 (0-0)
Cramping pain	0.2 (0-1)	3 (0.4-4)**	1 (0-1.8) ††

Values expressed as median (range).

*P<0.001 vs. before and after breastfeeding; †P=0.015 vs. before breastfeeding. **P<0.001 vs. before and after breastfeeding; †† P<0.001 vs. before breastfeeding.

γ P=0.011 vs. before and P=0.032 vs. after breastfeeding.

(Related-Samples Wilcoxon Signed Rank Test)

Pain was measured using a verbal pain scale 0-10 (0 = no pain and 10 = worst pain imaginable) 5 minutes prior to, during and 5 minutes after breastfeeding.

Abstract F 4

Ethnic Differences in Labor Epidural Request and Subsequent Pain Relief

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Background: As the ethnic and racial diversity of Americans increases, it is imperative that we understand these populations' expectations and concerns regarding labor anesthesia. The objective of our study was to analyze ethnic differences in labor analgesia characteristics with regards to timing of continuous labor epidural (CLE) placement and the degree of pain relief in our Hispanic and Non-Hispanic parturients.

Methods: 397 parturients were enrolled in this IRB approved prospective study. Data collected included patients' race/ethnicity, cervical dilation within one hour of CLE placement and numeric pain scores (0-10) upon CLE placement and after analgesia was established. Data was also collected on parturients' primary language, formal education, source of labor epidural education, obstetric provider, insurance status, method of delivery, use of induction medications, use of intravenous pain medicines and initial labor plan.

Results: Ethnicity, pain after CLE placement, parity, education level, source of CLE education, labor augmentation, final delivery method, and reason for epidural placement significantly influenced timing of CLE request. Numeric pain scores did not differ prior to CLE placement (median = 8; p = 0.133). However, numeric pain scores were greater in Hispanic parturients (median = 4) compared with Non-Hispanic parturients (median = 3) after adequate CLE analgesia was established (p = 0.006). At the time of CLE placement, Hispanic parturients had significantly greater cervical dilation (Mean ± SD; 4.01 ± 1.96 cm) compared with Non-Hispanic parturients (3.32 ± 1.88 cm; p=0.019). Mean cervical dilation continued to be 0.59 cm greater in Hispanic parturients relative to Non-Hispanic parturients at the time of CLE placement after controlling for education, reason for placement, labor augmentation, final mode of delivery, and insurance status in a multivariate regression model (SE = 0.28; p =0.040).

Conclusions: Our data indicate that Hispanic parturients requested CLEs later in labor than Non-Hispanic groups despite equal reported pain scores. These findings may be due to a lack of appropriate education on labor analgesia and suggests that anesthesia providers need to facilitate improvements in minority patient education about labor analgesia.

Abstract F 5

Increase in Cardiac Output Due to Autotransfusion During Labor Can be Demonstrated by Electrical Cardiometry

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Aortocaval compression (AC) by the pregnant uterus can be harmful to mother and fetus both antepartum and during labor. It reduces uterine artery pressure and placental perfusion and causes uterine venous congestion. Despite such potential harm, there are few methods of detecting AC, other than by observing a decrease in maternal brachial blood pressure or fetal bradycardia. Electrical cardiometry (EC) calculates maternal cardiac output (CO) in a continuous and non-invasive manner. We hypothesize that a reduction in maternal CO serves as a proxy for AC, since decreased venous return will decrease CO. Conversely, a non-compressed vena cava will allow increased venous return and CO. Figure 1 shows simultaneous recordings of intrauterine pressure, CO by EC (the moving average over the last 10 cardiac cycles, recorded every 10 seconds), and instantaneous CO (stroke volume for a single contraction multiplied by instantaneous heart rate) by transthoracic echocardiography (TTE) using the LVOT/VTI method in a laboring patient at term. The patient was in pain-free labor under epidural analgesia and was positioned with approximately 45 degrees of left lateral tilt. A periodic increase in CO following each uterine contraction is observed with both TTE and EC. The simplest explanation for these periodic increases in CO is autotransfusion of blood out of the contracting uterus into the systemic circulation, in the presence of an unobstructed inferior vena cava. While absolute values for CO differ between the two methods, there appears to be a significant correlation in the trends, suggesting that EC may be a non-invasive and continuous method for detecting changes in CO in pregnant patients. Changing maternal position during labor under epidural analgesia often reduces the baseline CO as measured by EC and eliminates the "autotransfusion waves" of increased CO shown in Figure 1, suggesting the presence of AC when the patient is moved into a sub-optimal position. Detection of previously unrecognized AC may help guide antepartum and intrapartum management, leading to improved maternal and fetal outcomes.

Abstract F 6

Impact of Neuraxial Labor Analgesia on Newborn Safety Markers: A Report from No Pain Labor N' Delivery in China

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Introduction: There are no large-scale studies focusing on newborn outcomes directly related to initiating neuraxial labor analgesia (NA) in China. No Pain Labor N' Delivery (NPLD) was launched in Wenzhou China in 2010. The barrier put forward by the Chinese community was whether their resources could support safe provision of newborn care after NA. The aim of this study is to evaluate the impact of the implementation of NA on newborn safety outcomes in a single academic hospital.

Methods: Data were collected by medical record review and several pre-existing databases at the Second Hospital of Wenzhou Medical College in 01/2009-06/2011. A part time obstetric anesthesia service (0800-1700 on weekdays) was established on 05/29/2009 and became 24/7 on 05/03/2010. NPLD was conducted on June 2010. The epidural protocol modified from current practices at Northwestern University consisted of levobupivacaine 0.0625% + sufentanil 0.1-0.2μg/mL, initial bolus 20 mL, continuous infusion 10mL/h with optional manual bolus (5-10mL per), used only in the first stage of labor. No other analgesics were available. Patients deemed high risk were delivered via cesarean delivery (CD). The study period was divided into three phases: baseline (01/2009-06/2009, NA=0%), phase-in (07/2009-05/2010), and post-NPLD (06/2010-06/2011, NA>50%). Outcome variables include naloxone administration, NICU admission (NICUa), NICU length of stay, average 1 and 5 minute Apgar scores for newborns admitted to NICU, incidence of Apgar scores <3 and <7 at 5 minutes, intrauterine fetal death, and 7 day infant mortality. Vaginal and cesarean deliveries were analyzed separately. The Baseline and post-NPLD phases were compared with t-tests. Statistical significance was considered at $p < 0.01$.

Results: The NA rate increased from 0% to 57% after the NPLD intervention (see figure) during a course of 15,415 deliveries. A summary of results is shown in the table. A significant decrease in the rate of naloxone administration (-0.61%) after vaginal delivery while NICUa following CD increased from 13.7% to 20.3% occurred following NPLD but overall NICUa was not altered.

Conclusion: Although the etiology of the increase in NICU admissions born via CD is unclear, the overall NICU admission rate was unchanged. The naloxone usage reduction seems clinically insignificant. Our data suggests that the implementation of NA in the first stage of labor in this community is safe to newborns.

Abstract F 7

iEpidural

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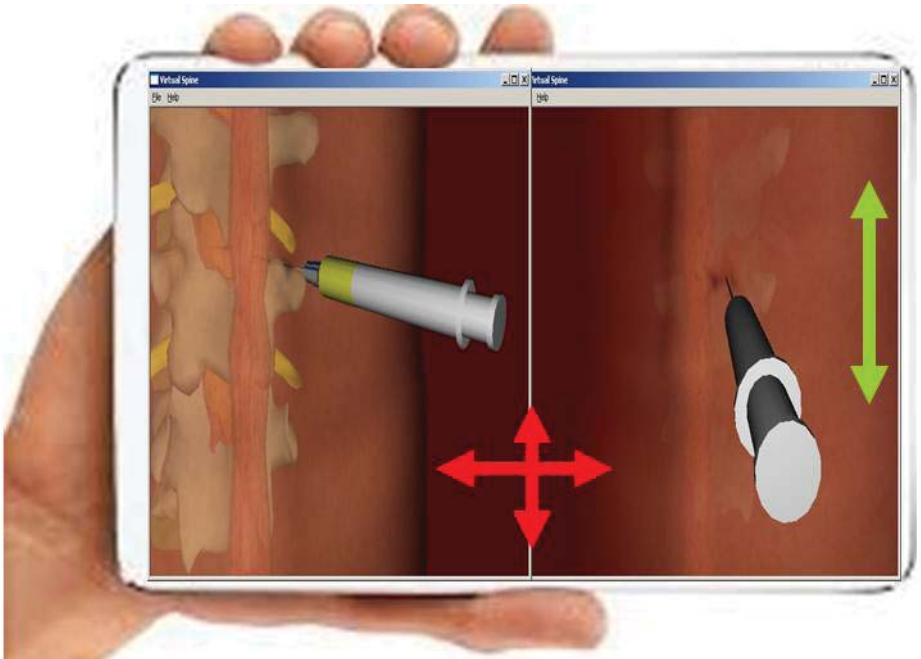
Introduction: Skills acquired on a simulator are transferable to the clinical setting. To achieve an 80% success rate for the dexterity intensive skill of epidural placement requires a minimum of 90 attempts1 . A free application is being developed that enables residents to practice epidural or spinal anesthesia on an iPad or iPhone.

Methods: The simulation uses the Apple iPhone SDK and Unity 3D Game Engine. The iPhone's accelerometers are used to manipulate the direction of the virtual Tuohy needle-syringe assembly .The touch screen is used to advance the needle into the epidural space. When the ligamentum flavum is pierced, the plunger telescopes into the barrel of the syringe. If the dura is punctured, the syringe fills with yellow fluid. Audio cues are given as a grinding sound when bone is encounterd or a 'pop' for the flavum.

Results: http://youtu.be/5ngZBG6yTnM

Discussion: Current plastic- rubber epidural manikins cost on average $2000, haptic (force feedback) virtual reality simulators in excess of $15,000. iPad based video games are a cost effective way of providing realistic training without the expense of maintaining a simulation lab.

Reference: Anesth Analg 1998;86:635-9.



How UK Obstetric Anaesthetists Test Neuraxial Anaesthesia: A Comparison of OAA Approved Surveys in 2004 and 2010

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Introduction: Neuraxial anaesthesia is the preferred mode of anaesthesia for caesarean delivery. As complications from neuraxial block are the predominant cause for complaint against anaesthetists [1], there is interest in the best method of assessing the adequacy of anaesthesia prior to caesarean delivery. Although cold sensation is commonly used, evidence suggests the risk of intra-operative pain may be reduced by assessment of light touch [2]. We aimed to determine how neuraxial anaesthesia was being assessed, and whether changes in clinical practice reflected the differing evidence in the literature, over a six-year period.

Method: Both surveys were approved by the OAA Audit subcommittee (No. 42 & 106). The first survey was sent to UK consultant OAA members in 2004 asking how neuraxial anaesthesia was assessed prior to caesarean delivery, and what was documented. The survey was repeated in 2010.

Results: There was a response rate of 733/1045 (70%) and 549/1219 (45%) in 2004 and 2010, respectively.

The majority of anaesthetists tested more than one sensory modality in both surveys. The proportion of anaesthetists testing three modalities increased by 20% (95% CI 14-25, $P < 0.0001$). Cold was the most commonly used modality in both surveys. There was a trend towards increased assessment of light touch, and testing of motor blockade increased by 23% (95% CI 17-28, $P < 0.0001$). The number of anaesthetists checking pinprick fell by 20% (95% CI 14-25, $P < 0.0001$).

The upper level of anaesthesia accepted was dependent on the modality being tested. Testing to T4 with cold was the most common assessment in both surveys, and increased by 13% (95% CI 7-18, $P < 0.0001$) between surveys. There was also a increase in the testing of light touch to T5 by 18% (95% CI 11-25, $P < 0.0001$).

In both surveys, the extent of block to cold was the most commonly documented modality (81.9% & 90.0%). Documentation of light touch and motor block both increased ($P < 0.0001$).

Conclusions: Our surveys showed that methods of assessing neuraxial anaesthesia differed from those advocated in the literature. The wide range of modalities, methods of testing and targeted sensory levels suggests that clearer recommendations on best practice for assessment and documentation of neuraxial anaesthesia prior to caesarean delivery are required.

References

[1] Szypula K, Ashpole KJ, Bogod D, Yentis SM, Mihai R, Scott S, et al. Litigation related to regional anaesthesia: an analysis of claims against the NHS in England 1995-2007. Anaesthesia. 2010; 65: 443- 53
[2] Russell IF. Assessing the block for caesarean section. International Journal of Obstetric Anesthesia. 2001; 10 : 83-5

Abstract F 9

Team Management of Peripartum Spontaneous Coronary Artery Dissection: Explicit Communication Aids in Cardiac-Specific Treatments

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Introduction: Albeit rare, spontaneous coronary artery dissection (SCAD) affects a younger and healthier population and accounts for up to 27% of cases of peripartum myocardial infarction (MI)1. Prompt recognition with arrangement for percutaneous coronary intervention (PCI) serves both diagnosis and treatment1. Rapid initiation of adequate cardiopulmonary resuscitation (CPR) is essential for survival when maternal cardiac arrest occurs.

Methods: Obstetricians, anesthesiologists, nurse midwives, and labor nurses participated in a recurring team-training course at the Center for Medical Simulation. With IRB approval, 20 of 22 videos with acceptable AV quality were evaluated independently by 2 physician investigators for specific management strategies, teamwork/organization variables, and quality of CPR in the setting of a simulated patient with postpartum SCAD.

Results: Fisher's exact test (STATA, ©1985-2009 StataCorp LP) was performed to look at associations between administration of aspirin or nitroglycerin (ASA/NTG), calling for cardiology help, stating aloud a differential diagnosis ≥2 considerations (Ddx≥2), stating aloud the possibility of an MI, and identifying an event manager. Speaking aloud a Ddx≥2 was associated with more teams administering either ASA/NTG (Fisher's exact test, p=0.014), as was speaking aloud a possible MI (Fisher's exact test, p=0.026).

CPR was substandard in 80% of resuscitations, most commonly due to rate < 90/min, multiple/prolonged interruptions, and not continuing compressions for two minutes after return of spontaneous circulation. Two groups failed to effectively discharge the defibrillator multiple times during attempts in the setting of ventricular fibrillation.

Discussion: Despite simulated evidence of MI, many teams did not call for cardiology or administer full MONA (morphine, oxygen, nitroglycerin, aspirin). Speaking aloud either "MI" or more than one working diagnosis was associated with more frequent administration of cardiac specific medications (ASA/NTG), confirming the advantage of transparent thinking in diagnostic problem solving.

A performance gap remains for effective, high-quality CPR in this multidisciplinary obstetric team. Prior work has shown that CPR skills quickly degrade2; a more concerted effort to maintain these essential skills is needed.

References:
1. Exp Clin Cardiol 2009;14(1):e8-e16.
2. BMJ 1993;306:1576-7.

Table 1. Summary of results.

Action	Number of teams/total teams (%)
EKG ordered	19/20 (95%)
Oxygen administered	19/20 (95%)
Morphine given	11/20 (55%)
Aspirin given	9/20 (45%)
Nitroglycerin given	10/20 (50%)
Either aspirin or nitroglycerin	16/20 (80%)
Both aspirin and nitroglycerin	4/20 (20%)
Beta blockers given	4/20 (20%)
All MONA given	0/20 (0%)
Differential diagnosis (≥ 2 diagnoses) stated aloud	8/20 (40%)
Myocardial ischemic event stated aloud	9/20 (45%)
Cardiology help called for	12/20 (60%)
Code leader identified explicitly	7/20 (35%)
Event manager identified explicitly	10/20 (50%)
Incidents of slow CPR, prolonged CPR interruptions, or not continuing CPR for 2 minutes after ROSC	16/20 (80%)

Management of Maternal Cardiac Arrest by Anesthesiology Residents: Evaluation of a Crisis Checklist in Anesthesia Simulation-Based Training

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Introduction: Maternal cardiac arrest (MCA) is a rare but devastating event, and immediate advanced cardiac life support (ACLS) with necessary modifications for pregnancy is critical. Teaching anesthesia trainees how to manage this high acuity, low frequency event may be enhanced by simulation based-technology. The use of a checklist for simulated operating room crises improves management (1), but this has yet to be demonstrated in obstetric crisis training. Our objective was to evaluate the impact of checklist use by anesthesia residents for the management of a simulated MCA. Knowledge acquisition, retention and self-evaluation were also compared.

Methods: Anesthesia residents were randomized to control or intervention groups. All participants completed a multiple choice MCA baseline knowledge test then received a standardized 15-minute didactic lecture on management of MCA. The intervention group was then introduced to a MCA checklist, and the control group was not. Within a week, the participants managed a videotaped MCA scenario at our simulation center. All participants received standard debriefing and completed a written self-assessment and feedback form. A week later, participants completed a MCA knowledge post-test. Videos were scored by two blinded independent raters for performance of technical and non-technical

Results: Nine anesthesia residents have been recruited to date. Results are shown in the Table. Residents in the checklist group performed superiorly in all skills and had a shorter time to perimortem cesarean delivery. Residents uniformly valued the simulator experience, and those in the checklist group found the checklist to be helpful both before and during the simulation. Based on self-assessment scales, there was no difference between groups regarding acquired confidence to recognize and manage MCA.

Conclusion: High-fidelity simulation training for obstetric emergencies provides a valuable platform to evaluate and modify crisis checklists. The use of a checklist by anesthesia residents in simulated scenarios of MCA had significant impact on completion of essential technical tasks, with a less substantial but notable improvement in nontechnical tasks as well.

References:
1.Arriaga AF et al. N Engl J Med. 2013;17;368(3):246-53
2.Hards A et al. Can J Anaesth. 2012;59(9):852-60
3.Ziewacz JE et al. J Am Coll Surg. 2011; 213(2):212-217

Table 1

	Control	Checklist	*P*value
N	4	5	
Participant demographics			
-CA-1	0	0	
-CA-2	2	3	
-CA-3	2	2	
Simulator performance scores			
-Technical tasks	24.4 (5.3)	28.9 (2.0)	0.024*
-Non-technical tasks (SD)	10.1 (3.8)	12.9 (2.2)	0.07
-Time to perimortem CS (min)	4.7 (1.1)	3.9 (0.3)	0.06
Knowledge assessment			
-Pre-test, % (SD)	63 (0.5)	76 (1.7)	0.17
-Post-test, % (SD)	85 (0.6)	92 (1.3)	0.36

CA= clinical anesthesia year; SD = standard deviation; CS = cesarean section; min = minutes

Abstract F 11

Childbirth, PTSD and Past Traumatic Experience: A Complex Relationship

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Background: Childbirth is a potentially traumatic event, with reports of approximately 2% women developing post traumatic stress disorder (PTSD) subsequently. Also experience of child sexual abuse (CSA) is associated with postnatal PTSD. We sought to examine experience of prior traumatic events on PTSD and depression symptom levels immediately following childbirth, in addition to peri-traumatic dissociation during the birth itself.

Methods: Anonymous cross-sectional self- completion questionnaire study, with IRB approval (0122-08-HMO). Participants were 12-48 hr postpartum women. Questionnaires included birth questionnaire constructed for this study, Peri-traumatic Dissociative Experiences Questionnaire, Beck Depression Inventory, Trauma history questionnaire and Posttraumatic symptom scale. Primary outcome was expression of PTSD symptoms in women reporting previous traumatic experiences. Sample size based on pilot data assumed that among 15% women reporting CSA, 25% will report PTSD symptoms, versus 5% without CSA, requiring 180 women to detect a difference, power of 80%, two-tailed significance level 5%. Chi squared and ANOVA tests were used to examine differences; $p < 0.05$ considered significant.

Results: Questionnaire completion rate was 185/382 (48.4%). Twenty-seven women (14.6%) reported CSA. Trauma History Questionnaire showed 53 women (30.8%) experienced one traumatic event, 59 (34.3%) two or more and 61 women (34.7%) reported no prior traumatic event.

Fifty-eight (26.5%) women reported birth-related traumatic event, 16 (27.6%) reporting current and 30 women (51.7%) reporting previous birth as traumatic; 12 (20.7%) reported both. Nine women (5.2%) reported experience both CSA and birth related trauma. Symptom levels of PTSD, depression and dissociation were compared by trauma type. Groups differed significantly in levels of depression and dissociation, but not PTSD, Table 1. Women with previous traumatic birth were significantly more likely to have decided prenatally on epidural than the other groups (75.9.3% (past birth traumatic) vs 33.3% (past & current birth traumatic) vs 46.7% (current birth traumatic) vs 57.5% (no birth traumatic), $X2=7.6$, $p<0.05$).

Conclusion: Previous experience of traumatic events should be sought among pregnant women as they may affect postpartum reactions. Birth related trauma may affect decisions regarding consequent birth plans.

	No traumatic event N=72	Any Sexual abuse N=18	Any birth trauma N=58	Any other trauma N=37	Birth and CSA N=9	F	P
PTSD	2.7 (6.2)	2.8 (5.5)	4.7 (9.3)	1.6 (3.8)	0.9 (2.7)	1.5	Ns
Depression	6.2 (4.4)	7.9 (4.5)	9.4 (6.2)	7.2 (4.7)	9.9 (8.9)	2.8	<0.05 birth>non
Dissociation	12.2 (5.0)	15.4 (6.1)	16.7 (7.3)	13.4 (5.1)	15.9 (4.2)	4.5	p<0.005 birth>non

Abstract F 12

Preliminary Analysis of Pre- and Post-Partum Neurosensory Testing in Parturients Undergoing Cesarean Section Versus Vaginal Delivery

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Background: Pain in pregnancy is highly variable among women throughout the entire antepartum, intrapartum, and postpartum periods. Chronic pain after delivery can develop. Prediction of pain an individual woman may experience is very difficult, but could be helpful in medical therapy. We present neurosensory data from an ongoing longitudinal study that will include future genetic analysis. Future genetic markers combined with other tests could help predict an individual woman's pain tolerance where other methods have failed.

Methods: This pilot study evaluates pain in a healthy cohort of women before, during, and after delivery. Women are recruited in early pregnancy from hospital obstetrical practices, sign informed consent, have no preexisting chronic pain or mood disorders, and plan for labor analgesia. Four components of data are collected: Quantitative sensory testing (QST) and Psychosocial questionnaires (PSQ) are done several times in the peri-pregnancy period, a survey of labor pain experience is recorded post delivery, and genetic testing (blood or saliva) samples are collected. See Figure. LPGS Flow diagram (Labor Pain Genetics Study). Standard PSQ surveys and QST testing methodology (mechanical – algometer, Thermal –Medoc thermal, Windup 47 tests) are performed. Gracely Box Scale and Situational Pain Catastrophizing Scale are done after QST.

Results: Current QST results for the 140 consented patients over three of 4 survey periods are presented. Survey periods include visit 1 (QST 1+ PSQ 1) – up to 20 weeks pregnant, visit 2 (QST2 + PSQ2) – 37-40 weeks gestation, visit 3 the delivery period, and visit 4 (QST3+PSQ3) – 6 weeks postpartum. Patient data is stratified by women who delivered vaginally either assisted or spontaneously (VD), and those who had cesarean deliveries (CS). Significant decreases in pressure and heat thresholds were seen in CS patients only from visit 2 to 4. Pressure tolerance increased in all groups between visit 1 and 2. Gracely Box scale decreased progressively from visit 1 thru 4. Heat threshold and tolerance uniformly increased from visit 1 to 2, but decreased only in CS women thresholds by visit 4.

Discussion: Long term clinical research studies face many challenges including patient cooperation and follow through. Inter-individual communication and enthusiasm are key characteristics to study longevity and progression. Interesting trends emerged with regards to pregnant female heat and pressure QST tests. Future analysis include genetic tests and examining the relationship between labor and delivery pain scores and analgesic pain medication in the first 24 hours postpartum in this same cohort of women.

Abstract F 13

Pharmacokinetic Analysis of Fentanyl's Effect on Labor Pain

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Several studies have sought to quantify the impact of systemic analgesic drugs for the relief of pain during labor. This question is surprisingly difficult to answer. Systemic opioids are widely considered the default analgesic in the absence of neuraxial analgesia and it would not be considered ethical to withhold analgesics from a patient who requested them, even in the setting of a research trial. As such, neuraxial analgesia is commonly compared to analgesia with systemic opioids but there are no prospective randomized trials that compare systemic opioids to placebo or no analgesia. It is reasonable to assume that patients who request analgesia may be having more pain than those who do not request analgesia before the analgesic is given. Even if the analgesic had efficacy, it might not relieve pain to a lower level than the group who had less pain to begin with.

In order to unravel this difficult question, we applied techniques of mixed effects modeling that we have described previously (1) to a purpose enrolled database of parturients who had the option to receive intravenous fentanyl (50 mcg), nitrous oxide (50% in oxygen) or nothing. Patients had the option to receive neuraxial anesthesia at any time but their data were not considered for analysis after initiation of neuraxial analgesia. Fentanyl concentrations were estimated using pharmacokinetic variables when pain scores were provided.

Patients who were treated with fentanyl had reached half maximal pain earlier in labor than those who were not treated with fentanyl (1.7cm vs. 4.2 cm cervical dilation, $P<0.007$). When pain scores taken in the presence of analgesic concentrations of fentanyl (>0.6 ng/ml) were compared to those without fentanyl or subanalgesic fentanyl, there was no significant difference. Nitrous oxide did not affect any aspect of the pain response and there was no significant interaction with opioid.

Patients having earlier onset of severe pain are more likely to request fentanyl analgesia. When the plasma fentanyl concentration is predicted to be analgesic, there is no difference in pain report. Therefore, parturients who are treated with fentanyl have more severe pain before treatment and treatment with fentanyl is able to provide analgesia do as to make the two groups indistinguishable.

1. Anesthesiology. 2009 Nov;111(5):1093-110

Abstract F 14

Anesthetic Management of Women with Invasive Placentation: A Review of 55 Cases

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Introduction: Invasive placentation is one of the most important causes of postpartum hemorrhage and cesarean hysterectomies. The incidence of placenta accreta continues to rise with the increasing rate of cesarean deliveries (CD) [1]. In our institution, women benefit from a multidisciplinary team (MDT) care model that was implemented in 2008. The purpose of this study is to review the obstetric and anesthetic management of women with invasive placentation since 2000.

Method: After REB approval, we conducted a retrospective review of all cases diagnosed with invasive placentation (accreta, increta and percreta) from 2000 to 2012. Patient demographic data, diagnostic imaging reports, surgical, interventional radiology and anesthesia procedures, blood loss and use of resuscitation products, complications and patient disposition including length of hospital stay were recorded. The data was analyzed based on the type of anesthesia (general or regional) for CD. $P<0.05$ was considered statistically significant.

Results: Fifty-five cases were identified from hospital health records according to ICD-9/10-CA coding for placenta accreta. The most relevant findings are presented in table 1. The results reveal a trend towards less blood loss and a statistically significant ($p=0.001$) reduction in the need for blood transfusion in women who received regional anesthesia. The length of postoperative hospital stay was significantly less ($p=0.022$) in patients managed after the implementation of the MDT. We observed a significant change in the choice of surgical management of these cases from conservative uterine preservation to planned cesarean hysterectomy after 2008 ($p =0.0001$).

Discussion: Our review suggests that epidural anesthesia is as safe and effective as general anesthesia in the management of these patients; furthermore it is associated with less need for intraoperative blood transfusion. It also suggests that a structured MDT approach can reduce length of hospital stay. The evolving change from a conservative approach to a planned pro-active cesarean hysterectomy seems to have improved patient outcome.

Reference 1. Anesthesiology 2011;115:852-7

Abstract F 15

Neuraxial Opioids in an Era of Critical Drug Shortages: A Review of Intrathecal Hydromorphone

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Critical drug shortages affect all areas of medicine. Lack of one drug ultimately leads to shortages of others as clinicians use alternatives. In 2010, 178 shortages were reported, rising to 251 in 2011; primarily affected are chemotherapeutics and sterile injectables.(1) The cause is multi-factorial, including manufacturing problems, economics, and trouble obtaining raw materials.(1) Anesthesiologists are forced to modify anesthetic plans by using alternative medications, changing the anesthetic procedure, and postponing/cancelling cases. Drug substitutions may be more costly, have undesirable side effects, or more adverse events.(1)

Intrathecal (IT) preservative free morphine is often added to the spinal anesthetic for cesarean sections (C/S) to decrease postoperative pain for 12-24 hours and has significant IV and oral opioid sparing effects.(2) With the critical shortage of this formulation, we performed a literature review to find an equivalent IT hydromorphone dose.

A search of the keywords intrathecal and hydromorphone was performed in Google Scholar, Cochrane Registry, SCOPUS, MEDLINE, and CINAHL. Although, IT hydromorphone use in acute postoperative pain is limited, there is an abundance of literature supporting its use in chronic pain. While morphine and ziconotide are the only agents approved by the US Food and Drug Administration (FDA) for IT use, pain practitioners commonly prescribe hydromorphone for IT pumps.(3) The most recent Polyanalgesic Consensus Conference (PACC) of 2012 included IT hydromorphone as an acceptable opioid for chronic use. Its inclusion for the management of neuropathic and nociceptive pain infers hydromorphone's relative neurologic safety, as it is used in much higher doses than for C/S.(3)

We found two RCTs studying IT hydromorphone for acute postoperative pain: one in arthroscopic knee surgery(4) and one in total hip/knee replacement(5). Dosages varied and neither correlates with C/S pain. A retrospective chart review and a case report of IT hydromorphone in C/S suggest 50-100 mcg of IT hydromorphone is effective, with a safety profile similar to morphine.(6,7)

In conclusion, few prospective RCTs study the use of IT hydromorphone in acute postoperative pain. Since hydromorphone is not approved by the FDA for IT use, morphine is routinely administered. Based on this review, 50-100 mcg of IT hydromorphone may be an alternative to 100-200 mcg of IT morphine for C/S; dose finding studies are necessary. Preemptively studying alternative medications prior to critical drug shortages has become necessary.

References:
1. BMJ 2012;345:e8551, 2. Acute Pain Management. Cambridge University Press, 2009:230-44, 3. Neuromodulation 2012;15(5):436-66, 4. Eur J Anaesthesiol 2012;29(1):17-21, 5. J Bone Joint Surg Am 1991;73(3):424-8, 6. AANA J 2012;80(4 Suppl):S25-32, 7. AANA J 2011;79(5):427-32
8. Anesth Analg 2005;101(5 Suppl):S30-43

Abstract F 16

A Novel Needle Tip Ultrasound for Epidural Guidance

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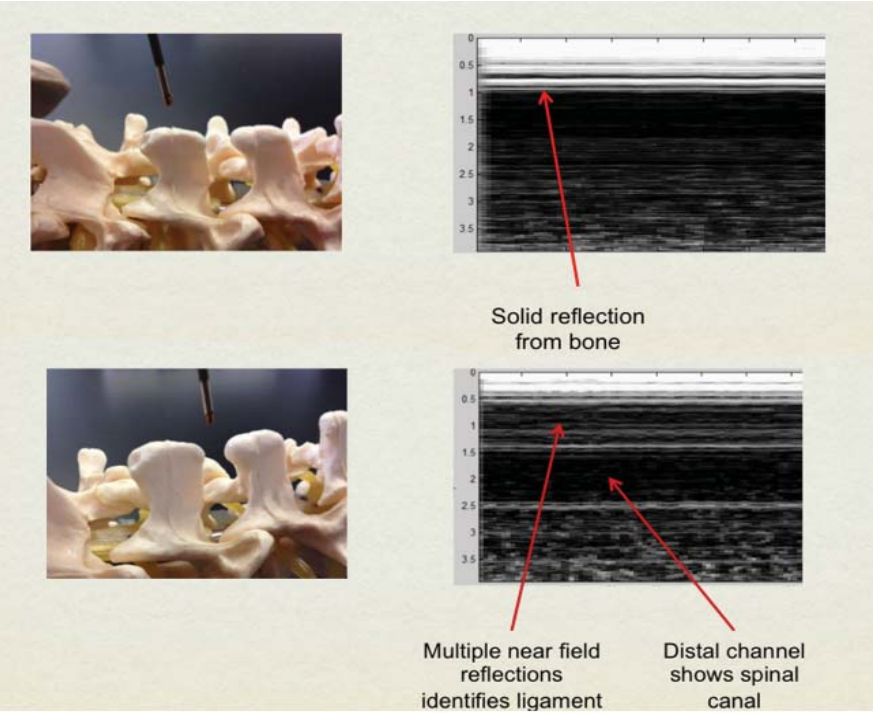
Background: Ultrasound has become a cornerstone of procedural guidance including most peripheral nerve blocks. The epidural space remains a challenge for external linear array ultrasound guidance because the spine is highly echogenic due to irregular contours and offers only small median and paramedian windows for visualization. Obese patients are even more challenging for ultrasound guidance as the distance to the epidural space increases. A novel front viewing needle tip m-mode microultrasound was developed to improve epidural guidance. The needle tip design gains in signal-to-noise ratio as it approaches the epidural space.

Methods: Thoracic and Lumbar epidurals were performed in human cadavers by 2 attending OB anesthesiologists. The ultrasound within an introducer needle was placed in the midline of the spine to a depth of 2cm. The operator predicted whether they were aimed at bone or the epidural space and predicted the distance to the respective landmark. A Tuohy needle was then advanced through the introducer and loss of resistance (LOR) vs. striking bone was used to confirm or refute the prediction.

Results: 36 epidural attempts were made in 4 human cadavers. 78% of the passes predicted to be aimed at the epidural space were confirmed by LOR. The anesthesiologist was able to predict the depth of the epidural space to within an average of 4.7mm (1-14mm). 77% of the passes predicted to be aimed at bone were confirmed by striking the bone. The anesthesiologist was able to predict the depth of bone to within an average of 3.1mm (0-10mm).

Conclusion: A forward viewing needle tip ultrasound has advantages in real-time guidance to the correct path for epidural placement. Initial results indicate the potential to increase the percentage of first pass epidural successes resulting in improved procedural efficiency and decreased patient discomfort. A human trail is planned to investigate the performance of this device in clinical practice.



Abstract F 17

Nutritional Advice in Labouring Women With Epidurals

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Introduction: Previously there have been strict policies with regard to nil by mouth during labour on the delivery suite. Changes in anaesthetic practices and research into the affects of nutrition during labour have led to the production of national guidelines on this subject[1]. NICE guidance states that isotonic drinks maybe more beneficial during established labour than water. Our trust has adopted this and also states that post epidural insertion women should no longer eat food. We looked at women in labour with epidurals and noted poor uptake of this advice. We increased awareness of guidelines by giving nutritional advice when consenting the parturient for an epidural. We also increased availability of isotonic drinks in the hospital and used educational posters in areas where they were being sold. Adherence to guidelines was audited pre and post intervention.

Methods: Over a 5week period all women who had a labour epidural were followed up regarding nutritional intake. We ascertained duration of labour and information on types of food and drink consumed pre and post epidural insertion. After increasing the availability of isotonic drinks and the awareness of NICE guidelines on intrapartum nutrition we then re-audited.

Results: In the first audit cycle13/64 women ate after their epidural insertion. No woman drank isotonic drinks during their labour. Some women were drinking nothing at all pre (2/64) or post (2/64) epidural insertion. In the second audit cycle 4/31 women ate after their epidural was sited. One woman drank nothing pre epidural and 4/31 drank nothing post epidural. 11/31 women drank isotonic drinks after there epidural was sited and 19/31 stated they were aware that isotonic drinks were available in the hospital.

Discussion: We have shown an improvement with compliance of our trusts (and national) guidelines regarding intrapartum nutrition. This may have benefits to the high risk parturient by providing a calorific source, which is rapidly absorbed by the stomach, thereby reducing ketosis and aspiration risk[2].

References:
1.NICE. Intrapartum care of healthy women and their babies during childbirth. 2007 Guideline 55

2. Kubli M, Scrutton M, Seed P, O'Sullivan G. An evaluation of isotonic sports drinks during labour. Anaesthsia and Analgesia. 2002. 94:404-408

Abstract F 18

Epidurals: Myths and Old Wives Tales- What Are the Midwives Telling Our Patients?

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Introduction: Midwives' knowledge regarding epidural analgesia requires further evaluation in the United Kingdom. Studies in Australia have demonstrated a 56% correct response rate in epidural complications knowledge amongst registered nurses and midwives(1). We conducted a survey to evaluate midwives' knowledge about this method of analgesia prior to deployment of an educational programme.

Methods: A nine-question survey link was sent via email to all midwives registered in our hospital. Participants were asked to state their primary location of work: community, labour ward, antenatal or postnatal ward or other. Questions reflected those that are commonly asked by patients to anaesthetists, those in which epidural placement has obstetric implications and those where common midwife misunderstanding has been anecdotally recognised. The entire cohort of midwives was asked to complete the on-line survey. Subsequent collection and analysis of results was performed using surveymonkey.com.

Results: Fifty four responses were recorded from one hundred and fourteen survey completion requests (response rate=47%). The breakdown based on midwife primary location is shown in Table 1.1. There was considerable variation in the percentage of midwives answering questions correctly with the highest proportion for a single question being 94% and the lowest being 37% (Table 1.2). There appears to be a divergence based on primary location of work (community vs labour ward) in epidural knowledge. This can be illustrated especially with regard to two specific points of epidural knowledge (Table 1.3): presence of the motor block and the likelihood of causing a caesarean section.

Conclusions: Inevitably, the likely first healthcare professional to be asked questions regarding epidurals are midwives. The results of the survey illustrate that there is less than uniform consensus and accuracy in midwives' knowledge regarding epidural analgesia. It is recognised in this study that the suboptimal response rate may skew results. Nevertheless, there were few questions in our survey which were answered correctly by more than 90% participants. With regard to epidural knowledge, there is clearly a need for better education. Further studies of a larger cohort may elucidate further deficiencies in knowledge which may benefit from anaesthetic-led midwives education.

References:
1.Bird A, et al. Registered nurses' and midwives' knowledge of epidural analgesia. Collegian 2009;16(4):193-200.

Table 1.1							
Main Place of work	Percentage (%)						
Community	35						
Labour ward	40						
Antenatal	11						
Postnatal	3						
Other	9						

Table 1.2						
	Yes	No	Don't know			
Is an epidural the most effective pain relief in labour?	84	14	2			
Does an epidural increase the chance of having a Caesarean Section?	59	37	4			
Does an epidural cause long term backache?	6	90	4			
Does an epidural prolong labour?	81	13	6			
Does an epidural cause delay in initiation of breastfeeding?	18	82	0			
Does an epidural increase the chance of instrumental delivery?	94	4	2			
Does an epidural cause an increase in maternal temperature during labour?	70	17	13			
Does a low dose epidural prevent your patient from mobilising?	37	59	4			
Can an epidural be requested at full cervical dilation?	92	6	2			

Table 1.3	Labour ward Percentage (%)			Community Percentage (%)		
	Yes	No	Don't know	Yes	No	Don't know
Does an epidural increase the chance of having a Caesarean Section?	53	43	5	68	26	5
Does a low dose epidural prevent your patient from mobilising?	42	53	5	31	63	5

Abstract F 19

The Effect of an Intravenous Fluid Bolus on the Endothelial Glycocalyx

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Background: Due to normal physiologic changes during pregnancy, the parturient is prone to develop interstitial edema from decreased intravascular oncotic pressure. This edema can be exacerbated by crystalloid administration. However, crystalloid therapy is routinely used to treat hypovolemia and hypotension during labor and delivery. The endothelial glycocalyx (EG), a layer of extracellular glycoproteins and proteoglycans, plays an important role in regulating fluid shifts.[1] Disruption of the EG can lead to edema formation. [1] To study the potential harmful effects of a crystalloid bolus on the EG in the parturient, we measured two biomarkers of the EG before and after giving a fluid bolus.

Methods: Patients recruited for the study were healthy term parturients scheduled for elective cesarean delivery under spinal anesthesia. Two peripheral IVs were placed in opposite arms – one for fluid administration and one for blood sampling. A baseline blood sample was obtained. Then, 750 mL of warmed (approximately 38 degrees Celsius) lactated Ringer's was infused over 15 minutes. Afterwards, a post-bolus blood sample was obtained. Finally, a blood sample was collected at the end of surgery to be used as a reference. Blood markers studied were serum heparan sulfate and serum syndecan-1. To account for the dilutional effects of fluid administration, we adjusted the serum concentrations by total serum protein. We used a paired t-test to test the null hypothesis H0:μBL=μBolus versus Ha:μBL<μBolus where BL=baseline.

Results: There were notable trends towards increased values for both glycocalyx markers. Mean serum syndecan-1 levels were 15.1 ng/mg protein compared to 17.0 ng/mg protein after fluid bolus (p=0.179) and mean serum heparan levels were 395.3 ng/mg protein compared to 472.9 ng/mg protein after fluid bolus (p=0.120).

Conclusions: The results of this study indicate that a crystalloid fluid bolus disrupts the EG. If this trend is confirmed, then alterations in fluid management strategies in both the parturient and other patients at risk for edema must be considered. Specifically, crystalloids given at a slower rate may be more effective due to the disruptive effects of a fluid bolus on the EG. Our study could provide the rationale basis for the optimal method of volume replacement in normotensive but hypovolemic patients at risk for interstitial edema.

Reference:
1.Pries AR, Secomb TW, Gaehtgens P. The endothelial surface layer. Pflugers Arch. 2000;440:653-666.

Abstract F 20

Release Patterns of Liposomal Bupivacaine in Artificial Cerebrospinal Fluid

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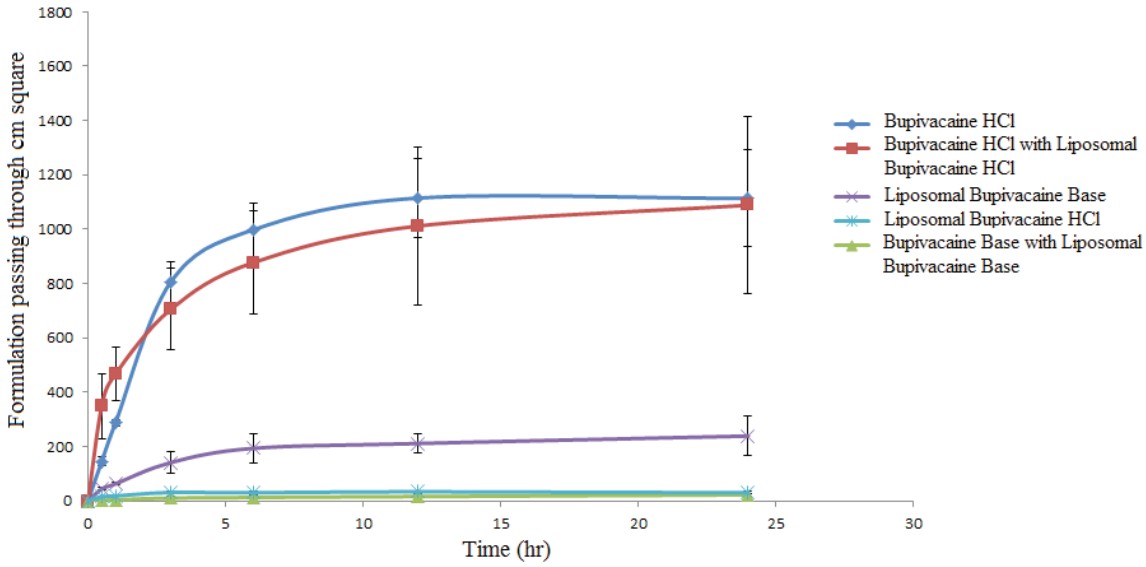
Objective: Local anesthetics are encapsulated into liposomes in order to prolong their effective duration without increasing their toxicity. In this study we aimed to prepare different forms of multilamellar liposomal bupivacaine to evaluate controlled release pattern for bupivacaine in artificial cerebrospinal fluid (CSF).

Methods: Primarily, bupivacaine HCl, bupivacaine base, cholesterol, dipalmitoyl phosphatidyl choline and methanole were distilated with vacuum in rotavapor device and were kept in ultrasound bath to achive homogenic distribution to get bupivacaine base with liposomal bupivacaine base and bupivacaine HCl with liposomal bupivacaine HCl. Artificial CSF buffered solution was prepared. Bupivacaine base with liposomal bupivacaine base, bupivacaine HCl with liposomal bupivacaine HCl and bupivacaine HCl were put in franz diffusion cell. The solutions were kept in hot water bath for 24 hours. The samples were taken in the first half, 1, 3, 6, 12 and 24th hours (first experiment). Solutions of bupivacaine base with liposomal bupivacaine base and bupivacaine HCl with liposomal bupivacaine HCl were centrifuged to get liposomal bupivacaine base and liposomal bupivacaine HCl. Liposomal bupivacaine base and liposomal bupivacaine HCl were put in franz diffusion cell. The solutions were kept in hot water bath for 24 hours. The samples were taken in the first half, 1, 3, 6, 12 and 24th hours (second experiment). Fifty-four sample obtained from the first experiment and 36 samples obtained from the second experiment were analyzed with HPLC and UPLC, respectively and the chromatographies were obtained.

Results: Fifty-four sample obtained from the first experiment and 36 samples obtained from the second experiment were analyzed with HPLC and UPLC, respectively and the chromatographies were obtained. Calibration graphics were obtained for bupivacaine base and bupivacaine HCl. The release pattern of these formulations were shown in the graphic. Multilamellar liposomal bupivacaine showed slow release in artificial CSF compared to bupivacaine HCl.

Conclusion: In this study we have achieved slow releasing pattern of liposomal bupivacaine compared to non-liposomal bupivacaine in artificial CSF. With the results of this study we are encouraged to use liposomal bupivacaine in obstetric anesthesia in the future of course after successful animal studies.

Key Words: Liposome, bupivacaine, CSF



Graphic 1. Release Patterns of the Liposomal Bupivacaine Formulations

Abstract F 21

Management of Accidental Dural Puncture During Labor: Effect of Technique Choice on Obstetric Outcomes.

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Introduction: When an accidental dural puncture (ADP) occurs during the placement of an epidural technique, some practitioners place a spinal catheter, whereas others will re-site an epidural catheter. Both approaches during labor have been observed to result in a similar incidence of post dural puncture headache (PDPH) and epidural blood patch (EBP).(1) However, whether these approaches could affect obstetric outcomes is unknown. Based on prior studies on labor analgesia and institutional experience,(2,3) we hypothesized that placement of a spinal catheter, when compared to an epidural catheter, would decrease the duration of second stage of labor and the rate of instrumented vaginal delivery.

Methods: The medical records of term parturients who experienced an ADP from 2008 to 2012 were reviewed. Data on the age, body mass index, parity, the duration of first stage of labor after neuraxial technique, duration of second stage of labor, and the mode of delivery were collected. The total duration of catheter presence, catheter replacement rates due to suboptimal analgesia, presence of PDPH, use of EBP, and neurologic symptoms were documented. Unclear or doubtful ADP and emergent cesarean delivery for fetal indications were excluded. Numerical and categorical data were analyzed with 1-way analysis of variance and chi-square tests, respectively, with significance at $P \leq 0.05$; data expressed as Mean ± S.D.

Results: Comparisons between the spinal (N = 124) and the repeat epidural (N = 45) groups indicated similar baseline demographics. A significant decrease in the duration of second stage of labor was observed in the spinal catheter group compared to the epidural group (61.1 ± 71.4 min vs. 89.8 ± 90.4; P = 0.05*). However, this was not associated with a decrease in instrumented (8% vs. 10%, P = 0.74%) or cesarean delivery rates (14% vs. 16%, P = 0.69). Despite earlier onset of analgesia, the spinal group had a significantly higher incidence of catheter replacement (22/124) compared to the repeat epidural group (1/45; P = 0.009**). There were no differences in the rates of PDPH, EBP, or neurologic symptoms between groups.

Conclusions: In this retrospective study, we observed that a spinal catheter following an ADP is associated with a decreased duration of second stage of labor, but without altering delivery outcomes. Of interest, spinal catheters required more frequent replacement when compared to a re-sited epidural catheter. Although prospective confirmation will be needed, these findings may assist decision making for labor analgesia in a parturient with an ADP.

References:

1. Russell IF, Int J Obstet Anesth 2012 Jan; 21(1): 7-16.
2. COMET Study, Lancet 2001:358:19-23.
3. Tsen LC, et al. Anesthesiology 1999; 91:920-5.

Abstract F 22

Why Did It Take That Long? A Study of Factors Influencing Cesarean Delivery Times

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What is the average cesarean delivery (CD) time? Is performing a CSE rather than a spinal for a tertiary CD worth the increased risk of PDPH? We investigated the surgical time required for a primary (C1), secondary (C2), tertiary (C3) and quaternary or more (C4) CD. A secondary aim was to determine other factors that predict surgical time. Factors affecting CD times have been reported1,2, but differences in practices exist that make any such results only moderately generalizable.

Methods: This is a Retrospective study of 782 CD performed from January to June 2011. Data was gathered from the electronic perioperative record. We examined the effect of primary vs repeat CD (C1-C4), indication, age, gestational age, BMI, attempted TOL, elective (scheduled cases) or emergent status (other than scheduled), anesthetic performed, and tubal ligation (BTL) on skin to skin, skin to uterine incision, and uterine incision to closure time. Primary versus repeat CD were compared by ANOVA and post hoc Scheffe's test. Linear regression assessed the corrected combined effect of all independent variables.

Results: There was no difference in skin to closure and uterus to closure times between C1 and C2 CD, but C3 and C4 were longer (Table 1). Factors that affect surgical time were: BMI, GA, C3, C4 and BTL, these independent factors account for about 10% of the variance (Table 2). BTL added only ~9 min to the total surgical time when corrected for other factors.

Conclusion: We were able to demonstrate that there was no statistical difference between a C1 and C2 CD with a mean time of 55-60 min, making a spinal a good alternative for these cases; C3 and C4 mean time were 71-79 min respectively. Considering time for onset of anesthesia, skin prep and drape time, it is not unreasonable to consider a CSE for C3-C4 CD, especially if some of the factors shown to have a moderate impact on surgical times are present as well. A limitation of the current report is that we did not examine surgeon experience as a factor (we may be able to add this data in future analyses). It is possible that 1st yr Ob/GYN residents perform most C1 CD and more senior residents or fellows are involved in the more complicated cases. This could explain why we do not see a time difference between C1 and C2.

References:

1. Wilson, S. Int J Obstet Anesth 19, 417–421 (2010).
2. Doherty, D. A. Aust N Z J Obstet Gynaecol 48, 286–291 (2008).

Abstract F 23

Hands-On Gel Phantom and Instructional Video Training Improve Sonoanatomy Knowledge: A Randomized Controlled Trial

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Introduction: Millions of parturients worldwide annually receive neuraxial anesthesia and analgesia.1 , Parturients with a high body mass index, difficult-to-palpate landmarks, or those with spinal abnormalities present unique challenges to anesthesiologists2. Ultrasonography has been demonstrated to improve localization of the epidural space in this patient population3, subsequently reducing needle insertion attempts and improving patient safety2. This randomized control trial evaluates two teaching modalities aimed to improve spinal sonoanatomy identification among anesthesiology faculty and residents. Results can consequently be used to improve obstetric anesthesiology education and training.

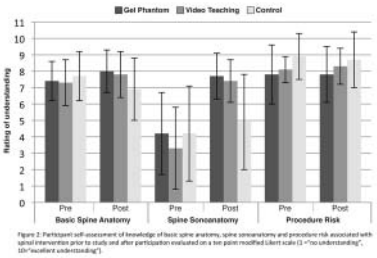
Methods: Twenty-three anesthesia residents and 27 attending anesthesiologists were randomized into gel phantom model, instructional video, and control groups. All participants attempted sonoanatomy identification on a human volunteer, both immediately after the intervention and three weeks later. Perceived knowledge, knowledge retention and participant satisfaction were evaluated using modified Likert scales.

Results: Both interventions improved spine sonoanatomy identification accuracy compared to the control group immediately following training, but not at follow-up. Logistic regression analysis demonstrated both interventions improved the odds of transverse process (gel 12.61, p=0.013; video 7.93, p=0.030) and lamina (gel 65.12, p=0.003; video 8.97, p=0.031) identification. Perceived knowledge of basic spinal anatomy and spinal sonoanatomy improved in the intervention versus control group (Figure 1). Participants indicated high satisfaction with both teaching modalities.

Conclusions: Hands-on gel phantom or instructional video training can improve anesthesia faculty and resident knowledge of lumbar spine sonoanatomy. Prior studies suggest that incurred benefits from this knowledge and training include improved neuraxial needle placement3 and patient safety2. Future studies are required to assess clinical improvement, in procedural performance in parturients.

Ref:

1. Osterman et al, Natl Vital Stat Rep 2011; 59: 1-13, 16
2. Faitot et al, Int J Obstet Anesth 2011; 20: 124-127
3.Grau et al, Reg Anesth Pain Med 2001; 26: 64-67



Oral Intake in Labour: A UK Survey in Collaboration With the Royal College of Midwives

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Introduction: In recent years the incidence of pulmonary aspiration in obstetric anaesthesia has fallen, leading to more liberal oral intake practices in labour across the UK. In 2007 the National Institute of Clinical Excellence (NICE) issued guidance for oral intake in labour, with different recommendations for uncomplicated labour (low aspiration risk-LAR) - light diet ; versus those who developed risk factors making general anaesthesia (GA) more likely, or who received opioids (higher aspiration risk-HAR) - liquids only. We reviewed UK practice in 2010.

Methods: The survey was distributed to all UK obstetric units.

Results: 145/243 (60%) units responded. 105/145 (72%) had a policy for oral intake in labour. Of these units: 90/105 (86%) identified women as either LAR or HAR and managed them differently with respect to oral intake in labour; 15/105 (14%) units did not differentiate between aspiration risk and managed all women identically. Only 47/105 (45%) units reported that their oral intake policy was influenced by risk factors for aspiration unrelated to pregnancy (ie difficult airway, obesity, diabetes). Table 1 shows the oral intake policies employed in UK units. 7/145 (5%) units reported adverse events they felt related to oral intake/fasting: 3 aspiration cases; 4 ketoacidosis cases.

Discussion: Balancing evidence for oral intake in labour with the rare risk of aspiration underpins why NICE recommendations differ for LAR/HAR women. Though the majority of units had a policy for oral intake in labour, and identified LAR/HAR groups, many were either more restrictive or liberal than NICE recommended. Of note were units who kept all labouring women nil by mouth, and those who allowed all labouring women unrestricted diet. A number of UK units also did not consider important non pregnancy related risk factors for aspiration in their policies. Should guidance be reinforced again? Should we adopt a more US approach where only clear fluids are advised in labour with further restrictions case by case? Units reported aspiration does still occur, and with one case in the last confidential enquiry it is food for thought.

References: American College of Obstetricians and Gynecologists Committee on Obstetric Practice (2009). ACOG Committee Opinion No. 441: Oral Intake During Labor, Obstet Gynecol. 114(3):714. National Institute for Health and Clinical Excellence (2007). Intrapartum care of healthy women and their babies during childbirth. RCOG Press, Londo

Table 1

	Units differentiating between LAR/HAR 90		Units NOT differentiating between LAR/HAR 15
Policy	*LAR women*	*HAR women*	*All women*
NBM & IV Fluids	0/90 units	6/90 units	3/15 units
Oral Water/Ice only	5/90 units	16/90 units	1/15 units
Oral Isotonic/clear fluids only	5/90 units	45/90 units	3/15 units
Oral Fluids (unrestricted) only	1/90 units	9/90 units	1/15 units
Light oral diet	62/90 units	8/90 units	3/15 units
Unrestricted oral diet	10/90 units	0/90 units	3/15 units
Maternal preference	6/90 units	0/90 units	0/15 units
Obstetric/Midwifery decision	1/90 units	6/90 units	1/15 units

Abstract F 25

Too Posh to Push or Too Smart to Cope? A Survey of Women's Preferences and Beliefs Related to Childbirth Across Generations & Reproductive Life Stages

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Introduction: Increasing use of medical interventions during childbirth has led to increasing concern over and criticism of women's choices. This survey explored women's beliefs/preferences regarding epidural pain relief and preferred delivery mode across generations and reproductive life stages as well as factors contributing to decision-making.

Methods: Following REB approval, 3 groups of women were recruited. Groups were: 1) young adult currently non-pregnant women, ages 18-25, recruited from the University of Toronto campus, 2) adult currently pregnant women receiving antenatal care at a clinic at Sunnybrook Health Sciences Ctr(SBHSC); and,3) older(>50years) non-pregnant women providing non-professional birth support to laboring women at SBHSC. Respondents self-completed a survey consisting of closed and open-ended questions related to demographics, past birth experiences, preferences/beliefs related to epidural analgesia and preferred delivery mode and factors contributing to these choices. Women's beliefs were examined using responses to fixed statements with 5-point Likert scales (strongly disagree to strongly agree). Analyses included appropriate use of quantitative and qualitative methods.

Results: 281 women participated(Group 1 n=120; Group 2, n=104, Group 3, n=57). Over 70% of each group had or were completing a post-secondary degree. Most (>80%) women in all groups agreed or strongly agreed with the statement, "All women should have the right to an epidural in labor." If given the choice, 32% of Group 1 (young, non-pregnant), 52% of currently pregnant (Group 2) and 64% of older women would opt for epidural pain relief. More than 70% of Group 3 and 30% of Group 2 respondents had had a previous labor epidural. Most women in each group (51-61%) disagreed or strongly disagreed with the statement, "Women who receive an epidural during childbirth miss out on the natural birthing experience". The majority of women in Groups 2 (64%) and 3 (71%) also disagreed or strongly disagreed with the statement, "I would be disappointed if I got an epidural," whereas 37% of young non-pregnant women disagreed and 32% were neutral. Six percent of young group 1, 10% of Group 2 women and 12.5% of older support women reported elective caesarean delivery as their preferred delivery mode. Opinions of most older support women came from their own experiences whereas younger women(both groups 1 and 2) cited friends and family as major influences in decision-making. These outweighed the advice of medical providers for all groups.

Conclusions: Highly educated women, regardless of age and reproductive life stage, value both epidural pain relief during childbirth and a woman's right to choose it. A small but significant number of women also see elective primary cesarean section as a preferred delivery option. These findings suggest a shift in women's perspectives toward use of medical interventions during childbirth that spans generations.

Abstract F 26

OBstetric Emergency Team (OBET) Response System: Activation Triggers and Location of Request Origination

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Background: An OBET response system was introduced on a busy tertiary, maternal care unit in April 2010, with a goal of timely recruitment of inter-professional personnel skilled in managing rapidly evolving high-stakes OB emergencies.1,2 We recorded medical indications triggering OBET activation, and the location of origin of emergency assistance requests during its 33 month history.

Methods: IRB approval. Obstetric quality database and call records were used to classify all OBET activations, from April 2010 (month of implementation) to December 2012, according to triggering medical condition & location of origination.

Results: OBET was activated 455 times. Fetal heart rate (FHR) concerns were the leading trigger (279 calls, 61.3%). Other triggers included precipitous, imminent, or outborn deliveries (68, 14.9%), postpartum hemorrhage (48, 10.5%), trauma (18, 4.0%), cord prolapse (14, 3.1%), maternal cardiopulmonary problems (9, 2.0%), antepartum bleeding (6, 1.3%), shoulder dystocia (6, 1.3%), uterine rupture (3, 0.7%), seizure (3, 0.7%), labor in emergency department (ED) (4, 0.9%), abruption (2, 0.4%), breech & complete cervical dilation (2, 0.4%), hypoglycemic neonate (2, 0.4%), and ruptured ectopic (1, 0.2%). There were ten (2.2%) OBET calls that were duplicate activations, and 11 (2.4%) that had unknown triggers.

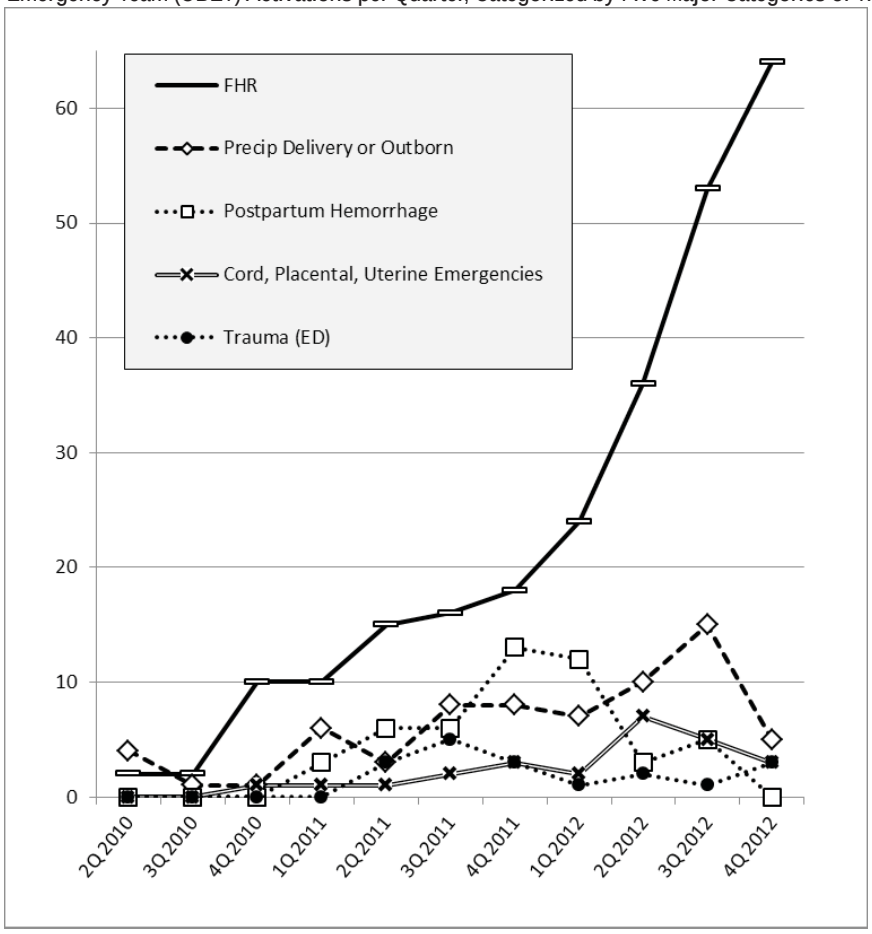
Not surprisingly, L&D was the most common activation location of origin (248 activations, 61.3%). Nearby maternal care areas included the ante-/post-partum floor (53, 11.6%), maternal special care & triage area (34, 7.5%), and obstetric overflow area (3, 0.7%). There were 77 OBET activations (16.9%) originating in the ED, two (0.4%) in the children's hospital ED, and 7 (1.5%) in various medical center locations (e.g. lobby, elevator, garage, ICUs, OR).

Discussion: Review of data on triggers & location of origination are helpful in assessing the health of a rapid response system. Results are consistent with the goal of responsiveness to the unique needs of parturients. Specific indications correlate with clinical quality improvement initiatives. Increases in PPH and FHR

indications reflect vigorous efforts to encourage earlier summoning of response personnel to improve outcomes. The subsequent decline in PPH as a trigger mirrors collaborative practice changes that significantly reduced the incidence of PPH on our unit.

Ref: 1) Grosman GG, et al. Am J Obstet Gynecol 2008;198:367.e1-7. 2) Skupski DW, et al. Obstet Gynecol 2006;107:977-83.

Number of Obstetric Emergency Team (OBET) Activations per Quarter, Categorized by Five Major Categories of Triggering Indications



Abstract F 27

Is the Dose of Oxytocin Pre-Delivery Associated With More Epidural Drug Consumption?

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Background: The administration of oxytocin for induction or augmentation of labor is widely used, and has been increasing. Women who undergo induction of labor tend to have greater epidural utilization perhaps because oxytocin administration results in a more painful labor. (1, 2) We examined whether higher oxytocin administration as calculated from an Area Under the Curve (AUC) required greater epidural drug administration as measured by AUC.

Methods: After IRB approval, a manual retrospective medical chart review was performed for calendar year 2008. Inclusion criteria was primigravid women aged >18 years admitted with a gestational age >36 weeks in spontaneous labor and received oxytocin for labor augmentation. The dosage rate and time interval of oxytocin administration prior to delivery was used to calculate a total pre-delivery oxytocin area under the curve (AUC). Epidural medications were also calculated as AUC as both infusion and bolus dosing. At our institution epidural analgesia is provided by a 0.2% ropivacaine infusion without narcotic and anesthesiologist administered boluses of either ropivacaine, bupivacaine, lidocaine, or chloroprocaine with or without fentanyl. Epidural boluses were converted to ropivacaine equivalent dose in mg by minimal local anesthetic concentration equivalency. (3) Epidural AUC was divided by the epidural duration, to obtain an hourly ropivacaine equivalency rate, in order to account for differences in duration of epidural use. Oxytocin AUC were divided into quartiles of oxytocin exposure, and were compared to the average hourly ropivacaine equivalent rate. ANOVA analysis was performed, $p<0.05$ was statistically significant.

Results: Based on the inclusion criteria there were 216 patients were divided into oxytocin quartiles. The augmented group showed increasing total (infusion and bolus) and bolus ropivacaine requirements with increasing quartile of oxytocin AUC, $P< 0.0001$. The increasing ropivacaine requirement still held even when comparing mean hourly ropivacaine requirements against quartile oxytocin AUC by ANOVA $p=0.035$.

Conclusion: Higher oxytocin dosing results in increased pain as measured by higher epidural drug requirements. Higher oxytocin AUC resulted in patients requiring more total epidural medication, even after adjusting for infusion duration, indicating more painful labor. Labor augmentation will increase utilization of anesthesia services as measured by number of required physician boluses despite the use of PCEA. The need for more epidural bolus administration with higher oxytocin exposure may be perceived as a failed epidural by patients and negatively impact patient satisfaction.

References:

1. Midwifery. 2012 Oct 15. pii: S0266-6138(12)00158-1.
2. Aust N Z J Obstet Gynaecol 2011; 51:151-7.
3. Br J Anaesth 1999;82:371-3.

Abstract F 28

Pre-Procedural Ultrasound Does Not Decrease the Number of Attempts in Trainees Performing Spinal Anesthesia for Obstetric Patients: A RCT

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Introduction: Ultrasound guidance has become a standard of care in anesthesia practice. The educational benefits of ultrasound imaging for teaching regional anesthesia have been validated by various studies. For anesthesiology trainees pre procedure spine ultrasound has been shown to reduce the number of attempts and the number of failures in placing epidural catheters. This study was designed to evaluate the benefits of pre- procedural spinal ultrasound guidance on trainee anesthesiologists performing obstetric spinal anesthesia for cesarean section.

Methods: In this randomized controlled trial eighty obstetric patients who required elective Cesarean Section were randomized to pre-procedure ultrasound examination and palpation or palpation alone, prior to spinal anesthesia placed by first year anesthesia residents. The primary outcome was the number of attempts for dural puncture. Secondary outcomes included, time to CSF, block location, block height, the need for staff intervention, paresthesia, and bloody tap.. As well, subjective ease of placement was rated by the trainee on a 100 mm visual analog scale.

Results: Baseline demographic data were similar between the two patient groups. The median number of attempts with pre-procedure ultrasound was 3 [interquartile range 2-7]. This was not significantly different from the number of attempts with palpation alone of 3 [1-6], (p = 0.69). The median duration of spinal placement with ultrasound was 92 [51-140] seconds vs. 75 [53-126] seconds with palpation alone (p = 0.56). There was no statistical difference between placement duration, need for staff intervention, paresthesia, bloody tap, block location, block height, or subjective ease of spinal placement.

Conclusion: Pre-procedure spinal ultrasound prior to spinal anesthesia placement by first year anesthesia residents showed no significant difference in the number of attempts, duration of spinal placement, need for staff intervention, paresthesia, presence of blood, block height, or subjective ease of spinal placement.

Reference :

Orebaugh SL, Williams BA, Kentor ML. Ultrasound guidance with nerve stimulation reduces the time necessary for resident peripheral nerve blockade. Reg Anesth Pain Med 2007 Sep;32(5):448-54.

Vallejo MC, Phelps AL, Singh S, Orebaugh SL, Sah N. Ultrasound decreases the failed labor epidural rate in resident trainees. Int J Obstet Anesth 2010 Aug 7.

Clinical Outcomes

Outcome	*Ultrasound* (n = 40)	*Control* (n = 40)	*P Value*
Attempts	3 [2-7]	3 [1-6]	0.69 [m]
Duration (seconds)	92 [51-140]	75 [53-126]	0.56 [l]
Spinal Location L2-3 / L3-4 / L4-5	10 / 26 / 3	6 / 29 / 5	0.44 [c]
Paresthesia	3	1	0.61 [f]
Completion by staff	6	4	0.73 [f]
Bloody Tap None/Trace/Significant	37 / 3 / 0	37 / 3 / 0	1.00 [f]
Block at 5 minutes	T4 [T3-T6]	T3 [T3-T6]	0.64 [m]
Block at 10 minutes	T3 [T2-T4]	T3 [T2-T4]	0.99 [m]
Ease of Spinal (100 mm VAS)	69 [43-83]	74 [40-86]	0.45 [m]

Abstract F 29

Can We Get Maternal Hypotension “0” with Low Dose Using a Combined Spinal-Epidural Technique? A Randomized Controlled Trial

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Background: We investigated the possibility of reducing the hypotensive events that can occur during a caesarean delivery by combining a spinal epidural technique, using low or ultra-low drug dose.

Method: One hundred and two women scheduled for elective caesarean delivery, were randomly chosen to receive either intrathecal hyperbaric l-bupivacaine 3.75mg (L-3.75 n=51) in addition to fentanyl18µg or hyperbaric l-bupivacaine 5mg (L-5, n=51) in addition to fentanyl 25µg. In both group 10ml of l-bupivacaine isobaric 0.25% was administrated epidurally. The following parameters were used: Hemodynamic data, vasoactive drugs, pH fetal and neonatal resuscitation rate as well as sensor motor levels at 3,5,10 minutes and the end of the surgery.

Results: The demographic characteristics, the baseline hemodynamic profiles, the length of surgery and the caesarean’s reasons were similar in both groups. The previous abdominal surgery was taken into account because of the possible fibrous and adherences. And this was homogeneous as well.

There were no differences in the incidence of hypotension vasoactive drugs between the two groups, although it was less in L-3.75 group. The global hypotension incidence was 32.35%. The motor block was lower in L-3.75 group. The Bromage scale was 0 in 84.3% and 3 in 5.9% in L-3.75 group at the end of the surgery, and Bromage 0 of 52.9% either Bromage 3 in 9.85 in L-5 group. The sensory block achieved was enough for a caesarean delivery in global terms (85.6%).

Reinforcement in the epidural or intravenous was needed for group L-3.75 in 25.5% of patients, no difference whether they showed history of abdominal surgery or not. In group L-5 reinforcement was necessary only in patients with previous surgery with an incidence of 11.8%. There were found statistically significant differences between pH and type of Rea’s neonate in the two groups, being related to maternal hypotension, in the group of L-3.75 overall results were better. There were no differences in other side effects analyzed: drowsiness, itching, bradycardia and trembling.

Conclusions: We didn’t find any statistically significant difference in the incidence of hypotension, although the trend was favourable in the group L-3.75. The maternal hypotension was associated with fetal acidosis.

The use of combined techniques allows guaranteeing the patient’s safety through a low dose usage. The ultra-low doses could be an alternative to consider in cases of infants which mother’s hemodynamic stability is one of the key components for their survival. However, we need to keep looking for multimodal therapies that will lead to achieve the desired maternal hypotension “0”.

References:

-Teoh et al. Ultra-low dose combined spinal-epidural anesthesia with intrathecal bupivacaine 3.75mg for caesarean delivery: a randomized controlled trial. Int J Obstet Anesthe, 2006.15(6):273-8
-Leo et al. A randomized comparasion for low doses of hyperbaric bupivacaine in combined spinal-epid

Abstract F 30

Effect of Intraoperative Phenylephrine infusion on Redistribution Hypothermia During Cesarean Section Under Spinal Anesthesia

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Introduction: General anesthesia and neuraxial techniques alter thermoregulatory responses. This can cause severe hypothermia during spinal anesthesia.1 Forced air warmers and warm IV fluids have not shown to be consistently effective. Phenylephrine infusion has been found to decrease redistribution hypothermia in oral surgery patients under general anesthesia. 2 Our primary goal was to evaluate the effect of phenylephrine infusion on maternal temperature during Cesarean delivery under spinal anesthesia.

Method: Following IRB approval, this observational, on-going study enrolled ASA I-II parturients scheduled for Cesarean delivery with spinal anesthesia (n=15). OR temperature was maintained at 25-26ºC. After co-loading of one liter IV crystalloid (40ºC), spinal anesthesia was performed (hyperbaric bupivacaine 12 mg, fentanyl 15 mcg and morphine 0.2 mg). Additional warm blankets were provided per patient comfort level. All patients received a phenylephrine infusion at 40 mcg/min initiated with spinal placement and titrated to maintain mean arterial pressure within 20% of baseline. Maternal oral temperature was measured at spinal placement and every 10 minutes after for 60 minutes, at newborn delivery and PACU admission.

Results: The overall mean change in maternal temperature for each time point is shown in Table 1. Using univariate analysis, both cumulative dose of phenylephrine received and time at which the temperature was taken were significantly associated with change in maternal temperature (both $p < 0.0001$). In the univariate model, a 10 minute increase in time was associated with a mean decrease in maternal temperature of 0.044ºC. Each cumulative 1 mg of phenylephrine received was associated with a mean drop in maternal temperature of 0.11ºC.

Conclusion: Past studies have documented the incidence of hypothermia during Cesarean delivery with temperatures below 36ºC to be about 77% with an incidence of 60% for temperatures less than 35.5ºC.3-4 In the current study, though maternal temperature decreased, the concomitant use of phenylephrine infusion prevented the decrease in temperature to be more than 0.22ºC. None of the patients had temperatures less than 36.3ºC. Thus, the use of phenylephrine infusion during Cesarean delivery is beneficial to decrease the magnitude of maternal hypothermia.

References:
1. Anesthesiology 2008;109:318-38
2. Anesth Analg 1999;89:462-5
3. Anesth Analg 2000;91:662-6
4. Anesth Analg 2007;105:1413-9

Abstract F 31

Rate of *Double Trouble* in Obstetric Anesthesia

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Introduction: The phenomenon of *double trouble* (failed regional followed by difficult or failed rigid laryngoscopy) at C-section appears to be increasing over the past decade. The UK triennial reports, CEMACH (Confidential Enquires into Maternal and Child Health), from 1994 – 2005 do not list any cases of *double trouble*. In contrast, the 2008 NAP4 report of the Royal College of Anaesthetists reveals two of four cases of failed intubation during general anesthesia for c-section were associated with failed regional (1). What do the American data show?

Methods: A search was conducted of our IRB approved maternal airway database from 1974 – 2010 for *double trouble*. In addition, the ASA Closed Claims Project database was reviewed for this phenomenon (2).

Results: The risk in the US for *double trouble* ranges from 9% (4/45) nationally to 67% (6/9) in our institution. See table, where the first three rows are from our hospital.

Discussion: With the increased use of regional and decline in general anesthetics for C-section one would expect the rate for failed or difficult rigid laryngoscopy to increase. Extra vigilance should be used to maintain LMAs, video laryngoscopes and fiberoptic equipment in all obstetric suites.

References: (1)British Journal of Anaesthesia 106 (5): 617–31 (2011) (2) Karen Posner, personal communication, ASA Closed Claims Project.

Years	Failed rigid	Blind nasal rescue	Pre - emptive fiberoptic rate	LMA rescue / failed rigid laryngoscopy	Failed regional / failed rigid laryngoscopy	Failed regional / difficult intubation
1974 - 1984	1/264	6/9			1 / 9	
1985 - 2004	1/833		14%			
2005 -2010	1/55		3%	8 / 9	6 / 9	
ASA Closed Claims						4 / 45

Abstract F 32

Patient Controlled Epidural Anesthesia for Labor: Bupivicaine vs. Ropivicaine, A Meta-Analysis

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Introduction: Bupivicaine has been widely available for many years for epidural anesthesia. It has been shown to be highly effective for sensory analgesia, however some patients developed unacceptable motor blockade at higher doses, which has the risk of prolonging labor. In addition there is also an associated risk of cardiovascular toxicity with unintentional IV bupivicaine injection. Since its introduction in 1996, Ropivicaine has gained popularity due to its decreased incidence of cardiovascular toxicity and greater selectivity of sensory fibers compared with bupivicaine(1). Despite these theoretical advantages, large studies have failed to show any advantage of ropivicaine over bupivicaine for any mode of epidural analgesia in laboring patients.

While this topic has been the subject of meta-analysis, most of these studies were large scale trials of continuous infusions. As such very little data exists comparing these two anesthetics for patient controlled epidural analgesia in laboring patients. The goal of this study was to:
1) Review the current literature reporting on the use of bupivicaine and ropivicaine for patient controlled analgesia in laboring patients.
2) To use meta-analysis to compare amount of anesthetic used, complications, motor blockade and anesthetic outcomes among these studies.

Methods: A literature search was conducted of Pubmed, OVID and Cochrane databases for English language peer-reviewed publications comparing Bupivicaine to Ropivicaine for patient controlled epidural analgesia in laboring patients. Only prospective/randomized studies were included for review. Studies were combined using a random-effect meta-analysis and publication bias was evaluated.

Results: Following PRISMA guidelines, 11 studies(1605 patients) were included for final analysis. There was no significant difference in the volume of anesthetic used, or the risk of hypotension, nausea and pruritis. While the odds ratio of having motor blockade was over 3 times higher in the patients receiving bupivicaine ($p<0.001$), there was no significant difference noted in patient satisfaction, duration of labor or mode of delivery. There was significant publication bias noted in reporting of motor blockade ($p<0.05$), however adding imputed studies does not significantly alter out results.

Conclusion: While there is a significant difference in the incidence of motor blockade, the use of ropivicaine does not appear to offer any advantage, or decreased complications over bupivicaine. In addition, increased motor blockade does not appear to have any significant effect on maternal satisfaction, or the type and duration of labor.

1. Ropivicaine versus bupivicaine for epidural labor analgesia. Beilini, Y and Halpern, S. 2010, Anesth Analg, pp. 482-7.

Abstract F 33

Implementation of a Massive Transfusion Protocol Improves Blood Product Delivery Practices in Patients with Severe Postpartum Hemorrhage

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Background: Postpartum hemorrhage (PPH) is a major cause of maternal morbidity and massive PPH is a leading cause of maternal mortality worldwide. Recent studies suggest that a transfusion ratio of platelets to fresh frozen plasma (FFP) to red blood cells (RBC) of 1:1:1 may be beneficial in cases of massive postpartum hemorrhage as has been shown in patients with other forms of massive bleeding (1). At our institution, we initiated a Massive Transfusion Protocol (MTP) in March, 2011, along with a multidisciplinary educational program regarding the benefits of appropriate transfusion ratios for massive hemorrhage. The primary objective of this study was to determine whether our program and MTP altered PPH transfusion practices.

Methods: Data from the Johns Hopkins Hospital Blood Bank were obtained from January, 2010 to June, 2012 and those patients admitted to Labor and Delivery requiring massive transfusion (MT) were included. MT was defined as transfusion of ten or more units of RBCs. Ratios of FFP to RBCs and platelets to RBCs were calculated for each patient and analyzed in two groups, those occurring before implementation of the MTP and those occurring after. An unpaired t-test was used to compare pre and post-MTP data, and $P < 0.05$ defined significance.

Results: 19 women admitted to Labor and Delivery met inclusion criteria. There were nine cases pre-MTP and ten cases occurring post-MTP. Overall, the FFP to RBC ratio was 0.32 pre-MTP and 0.81 post-MTP (P=0.0005). The platelet to RBC ratio was 0.82 pre-MTP and 1.27 post-MTP (P=0.13) (Figure 1). Of the 9 cases occurring after implementation of the MTP, only 3 cases officially activated the protocol.

Conclusion: In cases of massive PPH, implementation of an educational program and MTP led to a significantly greater FFP to RBC ratio. This improvement was noted even in cases that did not officially activate the protocol. Possible explanations include greater awareness for the 1:1:1 ratio through the large educational effort that occurred with the implementation of the MTP, or that the Blood Bank was able to thaw and issue FFP more quickly after obtaining new equipment in support of MTP activations. The increase in platelet to RBC ratio was not significant, possibly because it was already close to 1:1 in the pre-MTP time period.

Reference:
1. Pasuqier, P, Gayat E, Rackleboom T, et al. Anesthesia and Analgesia. 2013; 116: 155-161.

Abstract F 34

Hydrogen Sulfide in High Concentrations Vasodilates the Fetoplacental Circulation in the Dual-Perfused, Single Isolated Human Placental Cotyledon

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Introduction: Hydrogen sulfide (H2S), a new endogenous gasotransmitter produced in vascular endothelium from homocysteine, regulates human vascular tone(1). H2S is present in the placenta and corpus cavernosum(2,3). Sodium sulfide (Na2S) in solution produces H2S and HS- to generate biphasic vascular changes in non-pregnant rodent aortas(4). Lower concentrations (10 – 100 uM) constrict, higher concentrations (100 – 1600 uM) relax vasculature. H2S is intricately involved in pulmonary hypoxic vasoconstriction (PHV)(5). Hypoxemic fetoplacental vasoconstriction (HFPV) is analogous to PHV. We investigated the influence of H2S on the fetoplacental circulation.

Methods: With IRB approval and informed written consent fresh placentae (n = 5) were harvested at elective CS from healthy women at term. Organs were transported expediently to our laboratory where a fetal chorionic artery and vein serving a discrete cotyledon were isolated and cannulated. Three needles were inserted into the maternal placental interface. Both sides of the placenta were perfused with Krebs Ringers buffer (KRB) at constant pH (7.4) and temperature (37^{o}C). The open (non-recirculating) model was employed. Cotyledons were perfused for an hour to stabilize pressures. Fetal perfusion rates were held constant. With constant flow, fetal arteriolar perfusion pressures (FAP) is inversely related to arteriolar vascular resistance. FAP were recorded every 5 minutes. Na2S was added to the fetal reservoir and concentrations increased incrementally every 30 minutes (10, 30, 100, 300 uM). Thereafter 5-hydroxytryptamine (5HT) was infused demonstrating normal fetoplacental vasoconstriction. FAP recorded just before every step interval was used for data analysis. One way analysis of variance compared FAPs.

Results: FAP (α FVR) was unaffected by low Na2S concentrations (10- 100 uM) but decreased significantly over time with a high concentration (300 uM) Figure 1

Discussion: High concentration H2S only dilated but did not constrict the fetoplacental circulation (1). Since H2S mediates PHV, experiments utilizing H2S generators and inhibitors are needed to determine how H2S affects human HFPV in vitro.

References:
1.Liu et al J Cardiovasc Pharmacol 2011;58:560.
2.Holwerda et al Placenta 2012; 33:518.
3.Di Villa Bianca et al PNAS 2009;106:4513.
4.Lim et al Am J Physiol Cell Physiol 2008;295:C1261.
5.Skovgaard et al Am J Physiol 2012;303:R487.

The Use of Saliva Kits for ADRB2 Genotyping in Preeclampsia: Mothers and Premature Babies

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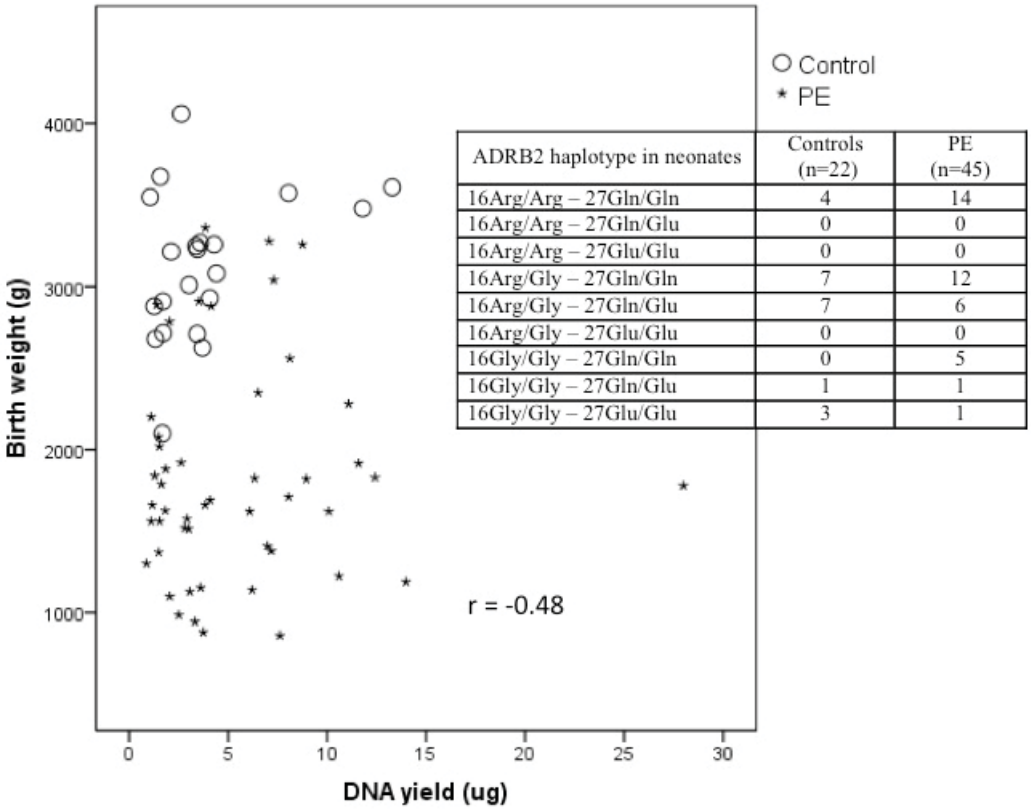
Background: Management of maternal hemodynamics is an ongoing challenge during cesarean delivery in severe preeclampsia, since spinal anesthesia may result in hypotension requiring vasopressors. While maternal and fetal genotypes appear to influence vasopressor requirement and neonatal acidosis (1), the effect of phenylephrine on placental perfusion in preeclampsia has not been clarified. One of the aims of this ongoing project is to investigate the impact of genetic variants on maternal hemodynamics and neonatal acidosis at delivery in preeclampsia. Gathering blood samples for neonatal DNA analysis can be challenging, and no study has evaluated the feasibility of using saliva kits for DNA collection in neonates.

Methods: Women with severe preeclampsia requiring a cesarean delivery with a standardized spinal anesthetic are randomized to receive ephedrine or phenylephrine for management of spinal hypotension. Saliva is collected within 48 h of delivery by an anesthesiologist trained to use the DNAgenotek™ kits, with OG-500 tubes for maternal samples, and OG-250 tubes for neonatal samples (OG-250 uses 5 tiny sponges to absorb neonatal saliva, compared with 2 mL collected in adults using OG-500). ADRB2 haplotype distribution is performed as previously described (1). Data presented as mean ± SD.

Results: Genetic data from 22 normotensive mothers/babies (controls) and 54 preeclamptic mothers/babies (PE) has been analyzed. Mean birth weight was 3134g (± 447) in controls vs 1834g (± 663) in PE (p<0.001). DNA yield was 3.8μg (± 3.2) in controls vs 5.4μg (± 4.8) in PE babies (p=0.255), and was overall 40.6μg (± 40.8) in mothers (n=76). The DNA yield did not correlate with the neonatal birth weight (Pearson correlation -0.48, Figure). Genotyping was possible in all controls, and technically impossible in 9/54 preeclamptic neonates. Neonatal ADRB2 haplotype distribution is presented (Figure).

Discussion: Although collecting saliva from premature neonates may appear technically impossible, the DNA yield with commercially available saliva kits was remarkably good. These findings confirm the feasibility of DNA collection and genotyping in premature newborns, which offers exciting perspectives for future studies that can explore genomic/pharmacogenomic associations in the context of obstetrics, anesthesia and perinatology.

1 Anesth Analg 2011;112(6):1432-7



ADRB2 haplotype in neonates	Controls (n=22)	PE (n=45)
16Arg/Arg – 27Gln/Gln	4	14
16Arg/Arg – 27Gln/Glu	0	0
16Arg/Arg – 27Glu/Glu	0	0
16Arg/Gly – 27Gln/Gln	7	12
16Arg/Gly – 27Gln/Glu	7	6
16Arg/Gly – 27Glu/Glu	0	0
16Gly/Gly – 27Gln/Gln	0	5
16Gly/Gly – 27Gln/Glu	1	1
16Gly/Gly – 27Glu/Glu	3	1

Figure: DNA yield in neonates, presented by birth weight, and ADRB2 haplotype distribution

The Effect of Resource Improvement on the Decision-to-Delivery and Post-Anesthesia Care Unit Time Intervals in a Low-Resource Setting

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Introduction: Limited resources in developing countries hamper the ability to conduct prompt emergency cesarean section (CS) within the 30-minute benchmark for the decision-to-delivery interval (DDI) upheld by most developed countries.1,2,3 Delay may culminate in maternal and fetal complications including death.3 The purpose of this study was to compare DDI and post-anesthesia care unit (PACU) times before and after a dedicated obstetric operating room was created at Ridge Regional Hospital in Accra, Ghana.

Methods: The study compares patients undergoing CS in Aug-Sept 2011 (before) and Aug-Sept 2012 (after) the addition of the new OR facility opened on March 1, 2012. The following time periods were recorded for each patient: T1 (decision), T2 (arrival to OR holding room), T3 (anesthesia start), T4 (delivery), T5 (PACU arrival), T6 (PACU discharge). Data was also stratified by urgency (emergent vs. elective CS); day of the week (weekday vs. weekend), and work shift (day shift vs. night shift). Maternal and neonatal outcomes were assessed. The DDI is defined as the interval between T1 and T4 and PACU time as the interval between T5 and T6. Time intervals before and after the new OR were compared using appropriate non-parametric statistics. NICU stay was evaluated with chi-square.

Results: Of 1,129 parturients, 559 (49.5%) had CS before and 570 (50.5%) after OR completion. Patient characteristics were similar in age, parity, gestational age and CS urgency. DDI decreased by 25% (overall) and 22% (emergency) and PACU time decreased by 46% (Table). The DDI was shorter at night for both periods, with an avg of 6 CS/day and 4 CS/night. The DDI was shorter on weekend days in 2011, with an avg of 9-10 CS/weekday or weekend day. There were no maternal deaths in 2011 but 3 deaths in 2012. Only 2 (0.5%) and 9 (2.2%) of emergency CS were conducted within 60 min, for 2011 and 2012 periods, respectively; and only one was done within 30 min in 2012.

Conclusion: A dedicated maternity OR facilitated process improvement. Waiting times decreased and fewer newborns were in the NICU. Adhering to a 30-minute DDI benchmark, however, may be impractical in resource-poor settings. Further investigation and quality improvement efforts are required to delineate these gains and to make further progress in the reduction of delays in emergency obstetric care.

References: 1Obstet Gynecol 2006;108:6-11, 2J Obstet Gynaecol 2006; 26(4):307-10, 3Int J Gyn Obstet 2012;116:17-21.

Table: Cesarean Section Time Intervals and NICU Characteristics.

	Aug-Sept 2011 (before) N=559	Aug-Sept 2012 (after) N=570	
	Median (IQR) min	Median (IQR) min	*P* value
Overall (T1-T4) DDI	259(161-432)	195(138-321)	<0.05
Emergency (T1-T4) DDI	225(149-320)	175(126-241)	<0.05
PACU (T5-T6)	313(220-517)	170(135-240)	<0.05
NICU admission	118(20%)	76(13%)	<0.05
NICU discharge by 7 day	26(22%)	46(61%)	<0.05

Abstract F 37

"Clinical Outcomes of Peripartum Cardiomyopathy in African American Women"

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Background: Peripartum cardiomyopathy (PPCM) is rare and potentially fatal. The incidence of PPCM is 4-times higher in African American (AA) women than in white women. It is unknown if differences exist in the clinical course or outcomes of African-American women compared to non-African (non-AA) women. We hypothesized that AA women would have worse clinical outcomes than non-AA women.

Methods: We performed a multi-institutional retrospective chart review of all pregnant women diagnosed with PPCM at four academic medical centers from 1999 to 2011. Potential cases were identified from billing data using appropriate ICD9-CM codes (674.51, 674.52, 674.53, 674.54, and 674.5). For inclusion, patients needed to meet criteria for PPCM based on NHLBI guidelines: 1) new heart failure (HF) in the last month of pregnancy or within 5 months of delivery, 2) HF without identifiable cause, 3) absence of heart disease prior to the last month of pregnancy, and 4) left ventricular (LV) systolic dysfunction by echocardiography.

Left ventricular ejection fraction was recorded at the time of diagnosis (EF1), hospital discharge (EF2), and approximately 1 year after diagnosis (EF3). The composite outcome measure was maternal death, or severe morbidity defined as heart transplantation, stroke, pulmonary embolus, LV assist device implantation, LV thrombus, and severe end organ failure. The effect of race on EF for each time point was examined using t-test, and categorical variables were compared using the chi-square test.

Results: We identified 171 cases of PPCM; 54 were AA and 118 were non-AA (81% white, 10% Hispanic, 1% Asian, 7% unknown). Baseline clinical characteristics and associated conditions are shown in Table1.

While EF at presentation was not different between the two groups, AA women had lower mean EFs at hospital discharge (31 ± 14 vs. 36 ± 15; p =0.04), and at 1 yr follow up (42 ± 18 vs. 50 ± 14; p =0.01) than non-AA women. AA women also had a higher rate of the composite outcome than non-AA women (32% vs. 18%; p =0.03).

Conclusion:
While it is known that AA have a higher incidence of PPCM, our findings suggest that AA also have worse outcomes and a more severe clinical course than non-AA women.

	AA	Non-AA	p-Value
	n=53	n=118	
Age (yrs)	28.8 ± 6.9 (n=52)	32.5 ± 7.5 (n=114)	0.003
Gravidity	3 ± 3 (n=45)	2 ± 2 (n=111)	0.011
Parity	2 ± 2 (n=47)	2 ± 1 (n=113)	0.081
Gestation Age (wks)	38.5 ± 6.5 (n=33)	38.2 ± 5.2 (n=93)	0.814
Hypertension (%)	50 (n=41)	50 (n=103)	0.980
Twin Gestation (%)	13 (n=48)	16 (n=113)	0.674
Maternal Weights (lbs)	203 ± 53 (n=44)	172 ± 46 (n=101)	0.001
C-Section (%)	49 (n=47)	64 (n=108)	0.062
Fetal Weight (g)	3123.8 ± 756 (n=21)	3326.5 ± 676 (n=48)	0.298
EKG Abnormality (%)	54 (n=46)	44 (n=105)	0.154
LOS (days)	7.1 ± 9.2 (n=47)	8.8 ± 11.8 (n=93)	0.350
EF1 (%)	27 ± 13 (n=47)	29 ± 13 (n=114)	0.339
EF2 (%)	30.9 ± 14 (n=40)	36.2 ± 15 (n=107)	0.041
EF3 (%)	41.8 ± 18 (n=41)	50.5 ± 14 (n=97)	0.007
Maternal Morbidity (%)	32 (n=50)	18 (n=115)	0.027
Maternal death (%)	6 (n=49)	4 (n=118)	0.461

Abstract F 38

Evaluation of a New B. Braun Flexible Springwound Catheter for Labor Epidural Analgesia

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Introduction: Efforts to improve the efficacy of labor epidural analgesia have led to the design of different types of epidural catheters. Flexible versus rigid catheters (1), and multiport versus uniport catheters (2), have been associated with better analgesic outcomes. However, flexible catheters have been associated with breakage during removal (3), and better analgesic outcomes with multiport catheters were demonstrated using rigid and not flexible catheters. At our institution we have been using a relatively new flexible catheter (B. Braun Perifix FX springwound catheter) for labor epidural analgesia, and with 22,000 catheter placements to date we have anecdotally not experienced catheter breakage. We hereby report select data from a preliminary analysis of an ongoing prospective, controlled, randomized, blinded study of the efficacy of the multiport versus uniport B. Braun Perifix FX springwound catheter for labor epidural analgesia.

Methods: Fifty nine healthy ASA I-II parturients of mixed parity, with a singleton term cephalic gestation, in spontaneous or induced labor, requesting labor epidural analgesia, were randomized to receive either a multiport (Group B, n=34) or uniport (Group A, n=25) B. Braun Perifix FX springwound catheter. All parturients were seated, and using a midline approach and loss of resistance to air to access the epidural space the allocated catheter was left 5 cm in the epidural space. Following negative aspiration and test dose for intravascular or intrathecal placement 15 ml of 0.1% bupivacaine plus fentanyl 2 mcg/ml were administered to initiate labor analgesia, followed by a continuous infusion of the same solution for maintenance of labor analgesia. A blinded investigator collected primary and secondary data to include complete analgesia (primary outcome), defined as complete relief of pain during contractions following the initiation of labor analgesia; paresthesias; intravascular cannulation; maternal satisfaction with labor analgesia; and catheter breakage. Data were analyzed using Chi square and Student's t-tests with variance, and a p value < 0.01 was considered statistically significant.

Results: There was no difference in maternal age, weight, height or gestational age between the two groups. The incidence of complete analgesia was 85% in Group B and 100% in Group A (p=0.04). There were no paresthesias or intravascular cannulation in either group. Maternal satisfaction with labor analgesia was rated as good to excellent in 85% and 92% of parturients in Group B and Group A, respectively (p=0.37). There were no catheter breakages in either group.

Conclusions: There were no significant differences in complete analgesia; paresthesias; intravascular cannulation; maternal satisfaction with labor analgesia; or catheter breakage between the multiport versus uniport B. Braun Perifix FX springwound catheter.

1. Anesthesiology 2006; 105: A904.
2. Anesth Analg 1997; 84: 1276-9.
3. Anesth Analg 2006; 102: 1595.

Abstract F 39

Right Atrial Thrombus in the Postpartum Coagulopathic Patient

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Introduction: A right atrial thrombus in the setting of puerperal coagulopathy.

Case Description: This is a 36 yo G10 Para 9009 at 26 5/7 who presented to our institution with abdominal pain. The patient's history was significant for a placenta previa and 2 prior C sections. She had recently been admitted for management of a concealed abruption, however had left against medical recommendation. On representation, the patient had non-reassuring fetal testing and underwent repeat low transverse C section. At completion of the surgery, there was a greater than expected amount of blood on the perineum. The uterus was re-explored with a manual sweep, and a Bakri balloon was placed. She was transferred to the ICU.

On post op day 1, the Bakri was left in place while she received product replacement. The patient developed chest pain and an echo performed demonstrated a thrombus extending from the IVC to the right atrium. Lower extremity dopplers were normal. With IR consultation, the decision was made for full anticoagulation. Given the concern for uterine bleeding, a bilateral UAE was performed prior to initiation of the heparin drip. The Bakri was removed post UAE and full anticoagulation was initiated. The patient's hemoglobin subsequently decreased from 7.4 to 6.1. A CT noted a 5 x 2cm rectus hematoma, with active extravasation from the right inferior epigastric artery. The thrombus of the IVC and right atrium appeared to originate from the right ovarian vein. Given her coagulopathy, the patient remained a poor surgical candidate. She underwent radiologic embolization of the bilateral inferior epigastric arteries. A suprarenal filter was placed through the right IJV to prevent propagation of the larger clot in the right ovarian vein. The patient was transitioned to Lovenox and achieved standard postoperative milestones. She was discharged home on post op day 10 with a plan for anticoagulation and eventual IVC filter removal.

Conclusion: We report a case of a puerperal patient who developed a right ovarian vein thrombosis with extension into the vena cava and right atrium. In the setting of coagulopathy, preemptive embolization of the uterine arteries allowed us to address the bleeding from the uterine bed prior to beginning therapeutic anticoagulation. Extravasation of the inferior epigastric arteries was identified by CT scan, which allowed for prompt radiologic embolization of the offending arteries.

Abstract F 40

Rebound Intracranial Hypertension After Epidural Blood Patch in a Patient With Cystic Hygromas

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Epidural blood patch for postdural puncture headache is generally safe and well tolerated. Rebound intracranial hypertension after epidural blood patch has not been widely reported. A 35-year-old woman, G2P1, received lumbar epidural analgesia for labor and vaginal delivery. The next day, the patient developed a classical postdural puncture headache that responded to conservative therapy. Eleven days later, the patient returned with worsening symptoms of postdural puncture with bilateral cystic hygromas. After 48 hours of conservative therapy, the patient elected for an epidural blood patch, which was successful. One week later, the patient returned with recurrent headache and visual changes. Imaging demonstrated new bilateral subdural hematomas. The patient underwent a second blood patch. Her symptoms resolved. Two weeks later, the patient presented with headache, diplopia and neck stiffness. Exam revealed papilledema. Repeat imaging showed chronic subdural hematomas and new subarachnoid bleeding with evidence of intracranial hypertension. Acetazolamide therapy improved her symptoms over the following weeks. Our patient's subdural hygromas probably occurred due to passive effusion of fluid into the space within the cranium due to decreased intracranial pressure. Hygromas may evolve into subdural hematomas if intracranial hypotension is not corrected, which is what we suspect happened here. (1,2) Concerns have been raised about performing epidural blood patches in patients with subdural hematomas due to the potential for rebound hypertension, especially in patients without age related atrophy who are less able to compensate for an increase in CSF. (3,4) The mechanism of late rise in ICP may be related to an increase in CSF production brought about by the prolonged depletion or disturbed CSF production and absorption mechanisms. (5) Epidural blood patches in patients with cystic hygromas or subdural hematoma may be vulnerable to rebound intracranial hypertension.

1. Lee KS. The pathogenesis and clinical significance of traumatic subdural hygroma. Brain Inj 1998: 12: 595-603
2. Verdu M, Alonso B, Burguillos S, Martinez-Lage J. Postpartum Hygroma after Epidural Analgesia. Anesthesiology 1999; 91:869-72
3. Zeidan, O. Farhat, H. Maaliki, A. Baraka. Does Postdural puncure headache left untreated lead to subdural hematoma? Case report and review of the literature. International Journal of Obstetric Anesthesia (2006) 15, 50-58
4. Gomez-Rioz MA, Serradilla LN, Bilateral interhemispheric subdural hematoma after accidental lumbar puncture and epidural blood patch. Arch Gynecol Obstet 2012. 286:531-532

Abstract F 41

Failed Neuraxial Analgesia After Intrathecal Chemotherapy

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A 33 year old G1P0 presented at 32 weeks EGA for induction of labor due to severe preeclampsia. The patient had a history of non-Hodgkin lymphoma (NHL), for which she had received intrathecal (IT) chemotherapy four years prior to presentation. She was encouraged to have an epidural placed early in her labor course given the concern for development of coagulation abnormalities.

A combined spinal epidural technique was performed at the L4-L5 interspace, with 2.5 mg of bupivacaine and 15 mcg of fentanyl administered intrathecally. Forty-five minutes after the IT dose, the patient noted a loss of sensation to cold at the L1 level on the right and T12 level on the left. The epidural catheter was then dosed with 10 mL of 0.125% bupivacaine. Fifteen minutes later the patient described bilateral sensory loss to T5 when tested to cold sensation.

Four hours after initial placement the patient was noted to have no discernible dermatomal level despite an additional dose of 15 mL of 0.125% bupivacaine. The epidural catheter was removed and replaced at the L3-L4 level. After uneventful placement the epidural pump was set to dispense 8 mL/h of 0.11% bupivacaine with fentanyl 2 mcg/mL. Forty-five minutes later, the patient noted loss of sensation to cold at the T12 level bilaterally. However, the sensation to pinprick was decreased by only 50%, and she continued to perceive the stimulus as sharp in the anesthetized region. Upon further questioning she also stated that the cold stimulus had decreased by only 50%.

Although neuraxial analgesia is the best modality for pain control during labor and delivery, this technique might not be reliable in patients that have previously received IT chemotherapy. IT chemotherapy is indicated for patients with a diagnosis of acute leukemia or lymphoma and is used as prophylaxis against or treatment of CNS involvement [1]. One case of failed neuraxial anesthesia after IT chemotherapy has been previously described. Possible mechanisms for failed neuraxial analgesia include generation of septal walls or thickened tissue barrier caused by the chemotherapy-induced intrathecal inflammation[2].

Given that IT chemotherapy is a common therapy for patients with leukemia and lymphoma, a thorough history of possible IT treatment should be conducted. A study to delineate the effects of neuraxial anesthesia on patients who previously received IT chemotherapy would be of interest, but the actual prevalence of these patients is rare. Nevertheless, the anesthesia provider should have a high-index of suspicion for suboptimal neuraxial anesthesia in a patient who received IT chemotherapy.

References:

1. Pui CH, T.E., Central nervous system disease in hematologic malignancies: historical perspective and practical applications. Seminars in Oncology, 2009. 36(4 Supplemental 2)): p. S2-S16
2. Westphal M, G.T., Booke M, Failed spinal anesthesia after intrathecal chemotherapy. European Journal of Anesthesiology, 2005. 22: p. 235-236

Abstract F 42

Anesthetic Management for Cesarean Delivery in a Parturient with Hereditary Hemorrhagic Telanglectasia (Osler-Weber-Rendu Syndrome) and Pulmonary Embolism: A Case Report

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Introduction: Hereditary hemorrhagic telangiectasia (HHT) is a genetic disorder of autosomal dominant pattern. It is manifested by recurrent epistaxis in early age, but arteriovenous malformation (AVM) in solid organs may remain silent until later. We present a case of anesthetic management for CD in a parturient with HHT. Her first pregnancy had been complicated by splenic AVM rupture and the second by pulmonary embolism (PE).

Case: A 34 y/o, G3P1 at 34 wks of gestation (GA), was referred for anesthesia consult. Her HHT was suspected at age 16 with recurrent epistaxis and family history. At age 25, she had a stroke from cerebral AVM rupture. Her first pregnancy at age 32 was complicated with ruptured splenic AVM at 31 wks GA, required emergency CD and splenectomy. She had chronic anemia, asthma, depression, ADDH, and smoking. Current pregnancy has been uneventful and repeat CD was planned at 39 wks GA. Vitals were normal and SpO2 100% in both sitting and supine. Physical exam was unremarkable with no telangiectasia on lips or buccal mucosa. MRI was negative for spinal AVM. At 38 wks GA, she was admitted with 3 wks history of sudden onset and worsening SOB, audible wheezing, and hemoptysis . While exacerbation of asthma or new onset pulmonary AVM was suspected, V/Q scan was ordered to rule out PE. Surprisingly, it showed high probability of PE without any evidence of pulmonary shunt. Anticoagulation with heparin was added to prednisone and bronchodilator with clinical improvement. She was taken to OR 5 days later for elective repeat CD under CSE anesthesia. Preop PTT was normal, and Hgb and platelets 8.9 gm/dL and 191K, respectively. She remained stable intraoperatively with EBL 1.3 L. Epidural was removed at the end. Postop analgesia was provided by bilateral TAP block. PRBC 2 u were given for postop Hgb 6.8 gm/dL. Heparin, resumed 5 hrs after removal of epidural, bridged to enoxaparin 100 mg daily. She made uneventful recovery and discharged home on POD #3.

Discussion: Clinical diagnosis of HHT requires 3 or more features among the Curacao criteria, ie., recurrent epistasis, telangiectases, visceral lesions such as GI telangiectasia or AVMs, and family history.1 Pulmonary AVM is the most common, up to 48%. Due to late-onset penetrance, clinically silent patients may present with sudden, catastrophic complications, such as hemorrhagic stroke, hemothorax, or high output heart failure, from rupture of AVM. Therefore, in the suspected, it is important to screen for AVMs, pulmonary in particular, which could be safely treated with embolization but otherwise potentially life-threatening. The surveillance in parturient with HHT is even more important since the physiologic changes during pregnancy may cause disease progression and severe complications.2 Spinal AVM occurs in 1 % on patients with HHT and should be ruled out before regional anesthesia is considered.

References 1. Am J Med Genet 2009;91:66-7. 2. Can J Anesth 2009;56:374-8

Abstract F 43

Traumatic Epidural Catheter Removal in a Laboring Patient with Acute Psychosis

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Introduction: The prevalence of postpartum psychosis is 1:1000; intrapartum it is unknown.(1) Acute psychosis can have negative consequences for mother and fetus. We present an acutely psychotic laboring patient who traumatically removed her epidural and IV prior to delivery.

Case report: A 27 y/o G3P1 presented at 40 wks with gestational HTN for IOL. PMH included hepatitis C, cocaine and heroin abuse (methadone maintenance), anxiety, and depression (no meds). She became “stiff” to antipsychotics in the past. After receiving an epidural, our patient became very agitated upon visualization of a bloody show. She ripped out her IV and epidural and ran through the labor ward naked, repeatedly banging her head against the wall until physically restrained. Psychiatry recommended treatment with IM medications including haloperidol, lorazepam, and diphenhydramine. She remained agitated and combative, eventually delivering a healthy boy by SVD (APGARs 8,9). Her psychosis rapidly resolved. A head/spine CT ruled out acute spinal/intra-cranial injury. CPK rose to 5000 μg/ml, presumably from physical exertion, restraining efforts, and possibly a mild neuroleptic malignant syndrome (NMS) reaction. The entire epidural catheter was located in three pieces at two separate locations on the L&D ward. She was discharged home on POD#2 with a diagnosis of Psychosis NOS (Not Otherwise Specified).

Discussion: Acute psychosis during labor is not well studied. Untreated depression during pregnancy can have deleterious effects on mother and baby. These include a higher incidence of gestational HTN/preeclampsia, smoking, cocaine, and alcohol abuse, more painful labors and increased use of labor analgesia (higher catecholamine levels), higher rates of instrumentation and C-section, and more SGA babies (lower APGARs, higher NICU admissions).(2,3) Depressive symptoms can worsen leading to acute psychosis.

With no IV or epidural, sedation and labor analgesia were limited. Despite our patient’s prior reaction to antipsychotics, she received IM haloperidol, lorazepam, and diphenhydramine. Fetal side effects include sedation, hypotonicity, and lower APGAR scores. Elevated CPK post delivery may have been a mild NMS reaction from haloperidol, although no muscle rigidity or elevated temperature developed. IM ketamine is also an option for sedation or GA for C/S but may exacerbate psychosis.(4)

Traumatic epidural catheter removal can cause serious sequelae including retained catheter pieces, infection, arachnoiditis, and other neurologic problems. Locating the entire epidural catheter, albeit in pieces, avoided CT/MRI imaging. Management of a retained epidural catheter piece includes monitoring for neurologic symptoms, signs of infection, and possible surgical removal.(5)

References:

1. BJP 1998;172:521-26
2. CJP Nov 2004;49:726-35
3. Psychosom Med 2001;63:830-4
4. Neuropsychopharmacology 1995;13:9-19
5. J of Clin Anesth 2007;19:310-14

Abstract F 44

Skin Ischemia Caused by Subcutaneous Administration of Methylergonovine

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Introduction: Anesthesia providers play an active role in the treatment of uterine atony during cesarean deliveries. In the case presented, a patient received methylergonovine IM for uterine atony. Postoperatively she was found to have a skin reaction in the location of methylergonovine injection. Similar reactions have not been described in literature.

Case Report: A 25 year-old at 40 weeks gestation underwent c-section for fetal intolerance to labor. Anesthesia was via a routine spinal and the case proceeded uneventfully. After delivery of the fetus, the obstetrician noted poor uterine tone despite oxytocin administration. Methylergonovine 0.2 mg IM was given for persistent atony.

Assessment of the patient postoperatively revealed a localized, raised, 7x10cm area of purple discoloration surrounded by erythema at the site of injection. The area was cool and non-indurated. She was treated conservatively with a warm compress and had near complete resolution in 24 hours.

Discussion: Methylergonovine, an ergot alkaloid, has complex pharmacologic properties12. It is a selective antagonist of serotonergic receptors in smooth muscle, partial agonist of α-adrenergic receptors and weak antagonist of dopaminergic receptors in vessels1. It increases the strength, frequency and duration of uterine contractions.

Methylergonovine increases blood pressure after oral, IM and IV administration3. Side effects include hypertension, headache, nausea and vomiting. Serious complications attributed to administration of methylergonovine have also been reported.

Several case reports describe coronary vasospasm. IM,IV, and oral administration has led to myocardial infarction in susceptible patients45. There is, however, no reference in current literature describing cutaneous vasospastic effects in patients receiving methylergonovine. Our injection was likely into subcutaneous rather than IM. We postulate intense α-adrenergic stimulation in the vessels near the injection site caused the area to become acutely ischemic and present as described.

Infiltration of vasoconstrictive agents subcutaneously is known to cause tissue ischemia and necrosis. Treatment of vasoconstrictive agent infiltration includes elevation of the affected extremity, warm compress to promote vasodilation, saline washout, and local injection of an α-blocking agent such as phentolamine. We recommend proper visualization of the injection site and using an appropriate length needle to ensure delivery of methylergonovine into the intramuscular compartment.

References:

1.M.D. Consult Drug Monograph: Methylergonovine. http://www.M.D.consult.com/das/pharm/body/382508057-1336/0/full/1450.
2.Novartis Pharmaceuticals Corporation: Methergine® http://www.pharma.us.novartis.com/product/pi/pdf/methergine.pdf
3.Svanstrom MC, et al. Brit J Anaes 2008;100(5):683-689.
4.Liao, J., et al. The American Journal of Cardiology 1991;68:823–824.
5.Lin YH, et al. Acta Obstet Gynecol Scand 2005;84:1022.

Abstract F 45

Pregnant Patient with a Large Anterior Mediastinal Lymphoma

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Perioperative management of the patient with an anterior mediastinal mass (AMM) is an anesthetic challenge due to tracheobronchial tree obstruction, compression of the pulmonary artery and heart, and superior venal caval syndrome (SVCS)(1). We describe the management of a patient who is 14 weeks pregnant with a massive AMM causing SVCS requiring thoracic biopsy and later, dilatation and curettage (D&C) in order to begin chemotherapy.

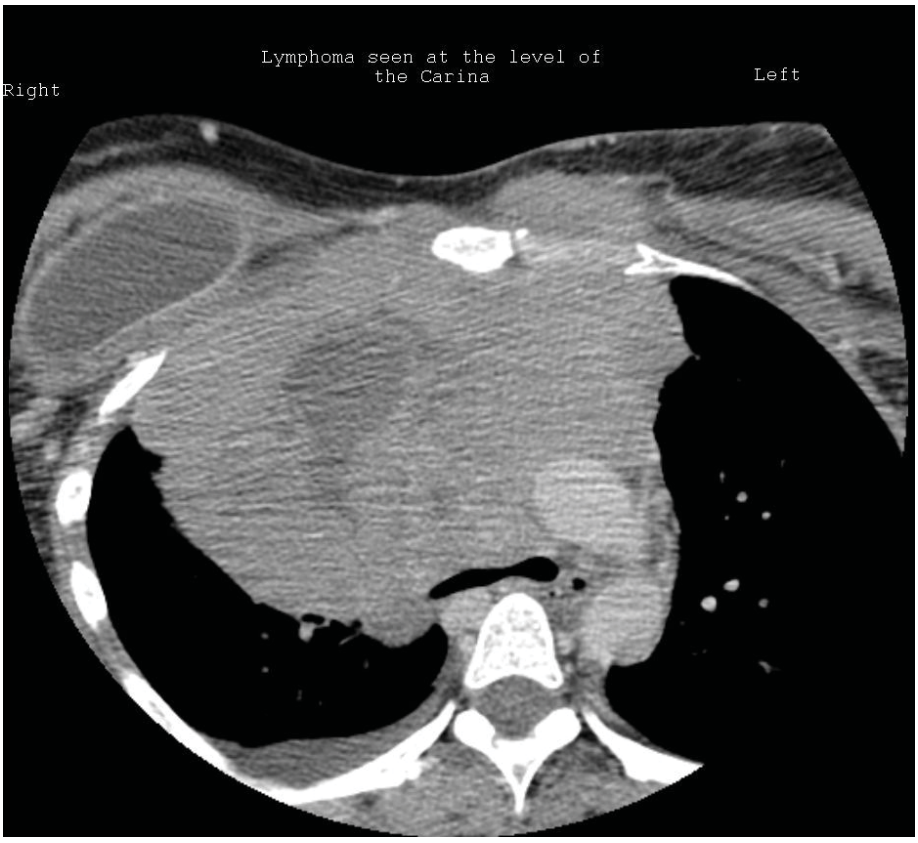
The patient is a 31 y.o. G1P0 at 14 weeks whose physical exam revealed massive engorgement of chest veins, neck and facial swelling. Chest CT showed a large AMM extending to the anterior chest wall with compression of the carina and both mainstem bronchi. The SVC was obliterated by the surrounding mass. Incisional biopsy of the mass was performed under ketamine and local infiltration with lidocaine. Ketamine 25 mg was given followed by 10-20 mg q10min prn for a total of 160mg. Later that evening, she reported disturbing nightmares.

Surgical pathology showed primary large B-cell lymphoma. In order to begin chemotherapy, the decision to terminate pregnancy was made. The patient returned to the operating room four days later to have a D&C. The patient was still anxious and was adamant that she not receive ketamine again. A saddle block with concurrent dexmedetomidine (DEX) infusion and midazolam sedation was planned. Hyperbaric spinal bupivacaine 9 mg and DEX 1mcg/kg i.v. over 30 minutes were administered. A total of 7 mg of midazolam was given. As the saddle block was too low, paracervical block was also required. Sedation was maintained with DEX 0.33 mcg/kg/hr. The patient maintained spontaneous ventilation and the case was uneventful.

These two anesthetics highlighted several issues. While spontaneous ventilation should be maintained (2) and ketamine is a reasonable choice, its psychotropic effects were very unpleasant for the patient. Avoiding midazolam because of the pregnancy may also be questioned. DEX may be the preferred method of IV sedation due to its lack of neuropsychiatric side effects in this population. DEX also has a very safe respiratory profile and does not exhibit psychomotor effects associated with ketamine. However, DEX can cause hypotension and bradycardia, both of which would be undesirable in a patient with SVCS.

1. Buvanendran, A., et al Anesth Analg, 2004. 98(4): p. 1160-1163.
2. Chan, Y., Anesthesiology, 2001. 94(1): 167-169.

Additional Files:



Abstract F 47

Uterine Rupture in a Parturient with Gray Platelet Syndrome

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Introduction: Anesthetic management of women with thrombocytopenia in labor and delivery has been a source of controversy. There are no formal recommendations on an acceptable lower limit of platelet counts required to safely administer neuraxial anesthesia. We present the case of a parturient with Gray Platelet Syndrome (GPS) resulting from a novel mutation requiring an urgent cesarean delivery.

Case: A 19 year-old Gravida2 Para1 Hispanic female presented to our institution at 39 weeks gestation in active labor. Her pertinent history included a diagnosis of thrombocytopenia at thirteen years of age with reported menorrhagia, petechiae, gingival bleeding, and easy bruising. Peripheral blood smear demonstrated giant platelets with the absence of alpha-granules. A genetic mutation analysis was sent but pending at the time of delivery. A complete blood count demonstrated a platelet count of 23,000/µL. Obstetrical anesthesiology was consulted secondary to concern for the patient's increase risk of uterine rupture. She was transfused a unit of single-donor platelets with an increase in her platelet count to 46,000/µL. After this transfusion, she was taken for an urgent cesarean section. Two large bore peripheral intravenous catheters were secured, a rapid fluid infuser was prepared, and blood products were ordered and made immediately available in the operating room. A rapid sequence induction was performed and the infant was delivered uneventfully with adequate hemostasis, despite a partial uterine dehiscence. The patient received 60 units of oxytocin and was hemodynamically stable. She was extubated in the operating room and transported to the recovery room. She developed post-partum hemorrhage requiring three units of packed red blood cells and was discharged home on postoperative day 3 with a platelet count of 54,000/µL. Genetic analysis later revealed a homozygous mutation of the NBEAL2 gene.

Discussion: GPS is a rare congenital thrombocytopenia characterized by the absence of alpha-granules in platelets1. The absence of alpha-granules results in decreased levels of fibrinogen, von Willebrand factor, and factor V; and abnormal secondary platelet aggregation2 resulting in a qualitative and often quantitative defect. Successful management of these patients must include communication among perinatology, anesthesiology, obstetrics, and hematology. Preoperative evaluation should include a thorough history and physical exam and the availability of blood and component-specific products. Perioperative management necessitates large-bore intravenous access and the availability of rapid resuscitation equipment. Given that GPS is both a quantitative and qualitative platelet disorder, we recommend avoiding neuraxial anesthesia.

References

1.Bain BJ. Bhavnani M. Gray Platelet Syndrome. Amer J Hematology. 86(12):1027, 2011 Dec.
2.Clements et al. Expanding perfusion across disciplines: the use of thromboelastography in GPS. Perfusion. 26(3):181-4, 2011 May.

Abstract F 48

Encephalocele: A Rare Contraindication to Neuraxial Technique

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Introduction: Fronto-ethmoidal encephaloceles are a rare occurrence in North America and are most commonly diagnosed in utero or shortly after birth. Congenital in nature, pathogenesis may be due to a late neurodevelopmental defect [1]. Hydrocephalus, developmental delay, seizures and vision problems are present in at least 60% of cases and encephalocele is often associated with facial defects [2], which may lead to difficult intubation [3]. To our knowledge there are no reported cases of this diagnosis in pregnancy.

Case: 31 y/o G9P1 at 34.1 EGA with chronic HTN, epilepsy, obesity (BMI 41), and medication non-compliance presented for cesarean delivery due to non-reassuring NST and worsening HTN. Her pregnancy was complicated by seizure at 20 wks EGA leading to the discovery of a 3.9cm by 2.9 cm encephalocele extending caudally from the cribriform plate and filling the posterior aspect of the right nasal cavity and a repeat cesarean section under general anesthesia was planned. The patient was brought to the OR and her BP was found to be 230/120 and a pre-induction a-line was placed. A nicardipine drip was started and labetalol, esmolol and nicardipine boluses were initiated. Following RSI with propofol and succinylcholine, the patient's airway was topicalized with LTA lidocaine and intubated using videolaryngoscopy. After delivery of the fetus, oxytocin was started at 36 U/hr for mild uterine atony. No additional uterotonic agents were necessary. Goal BP of 150-170 systolic was maintained with nicardipine, labetalol, volatile anesthetic and opioid. Prior to emergence a bilateral transversus abdominis plane (TAP) block was performed for post-operative analgesia. A slow, controlled emergence with divided doses of hydromorphone and a nicardipine infusion allowed a hemodynamically stable extubation without coughing. The nicardipine was titrated off over the next several hours and the patient was discharged on POD #4.

Discussion: Although this patient had a previous neuraxial anesthetic for cesarean delivery without incident, and no outward signs of elevated intracranial pressure apart from severe, intractable hypertension, the risk of dural puncture with subsequent loss of CSF pressure and herniation was determined to outweigh the benefit of avoiding general anesthesia. The pediatric literature contains reports of sudden cardiac arrest from decompression of CSF from encephalocele sacs [4,5]. Using a combination of anesthetic techniques we avoided neuraxial trespass and increases in ICP while maintaining hemodynamic stability in this uniquely complicated patient.

1. Hoving EW. Childs Nerv Syst 2000;16(10-11):702-6.
2. Stoll C et al. Genet Couns 2007;18:209-215.
3. Mahajan et al. J Neurosurg Anesthesiol 2011;23(4):352-6.
4. Ganjoo P, Kaushik S. J Neurosurg Anesthesiol 1993;5:137-138.
5. Rickett CH, et al. Int J Legal Med 2001;114:331-337.

Abstract F 49

The Evolution of Epidural Infusion Devices in Obstetric Anesthesia

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Advancements in modern pumps have made epidural analgesia better and safer for patients. Our paper reviews the development of epidural infusion devices into modern anesthesia practice. By 1949, Flowers, et al. had shown the efficacy of epidural infusion via catheter for labor analgesia and cesarean section[1]. The catheter was manually bolused--a labor intensive process more prone to complications ranging from total spinal to contamination. Crude continuous drip infusions failed due to the high resistance of the epidural catheter and variations in drip rate with changes in patient position. The need for mechanical devices to deliver consistent epidural infusions was recognized.

In the 1950s, three designs were patented: the drip rate, syringe, and volumetric pump. The first reported use of a mechanical epidural infusion pump was in 1963. Cox and Spoerel utilized an electric motor-driven syringe pump by Harvard Inst Corp with a set speed of 1.27 ml/min[2]. A mechanical timing device attached to the pump set the syringe in motion for 1 to 60 minutes every hour. In 1970, Spoerel further detailed the design of syringe and volumetric pumps for continuous or intermittent epidural infusions, and found intermittent devices superior for obstetrical analgesia[3]. Advancements in infusion pumps continued throughout the 1970's with multiple patents improving on reliability, pressure monitoring, air sensors and bolus options. The last prompted the development of patient controlled epidural analgesia(PCEA).

The origins of PCEA started with IV-PCA in the 1960's when Roe demonstrated that intermittent boluses of IV morphine were more effective than IM injections[4]. In 1971 Sechzer, the inventor of the IV-PCA, demonstrated the first mechanical IV-PCA system[5]. Subsequently, Evans described a prototype PCA syringe pump used for IV opioid administration during labor which developed into the first commercial PCA, the "Cardiff Palliator", in 1976[6]. Seeing the advantages of IV-PCA analgesia in labor, Dr. Gambling developed the first system of PCEA for labor in 1988 using an IVAC 530 pump and custom control device[7]. The IVAC 530 is a non-volumetric peristaltic pump controlled by an optoelectric drip counter[8]. While crude compared to modern designs because this pump could not account for drip size variation or detect distal occlusions, this design did establish the framework to the successful PCEA pumps used today.

The evolution of epidural infusion pump design since the early syringe drivers of Cox and Spoerel has contributed greatly to patient safety and accuracy of drug delivery. Our study acknowledges the contributions of the visionaries who brought this device into our everyday practice.

1. Curr Res Anesth Analg 1949; 28:181–9
2. Can Anaesth Soc J 1964; 11:72–82
3. Can Anaesth Soc J 1970; 17:37–51
4. Arch Surg 1963; 87:912–5
5. Anesth. Analg. 1971; 50:1–10
6. Lancet 1976; 1:17–8
7. Can J Anaesth 1988; 35:249–54
8. West. J. Med. 1985; 143:329–32

Abstract F 50

Missed Myocardial Infarction Presenting as Flash Pulmonary Edema Following Cesarean Section

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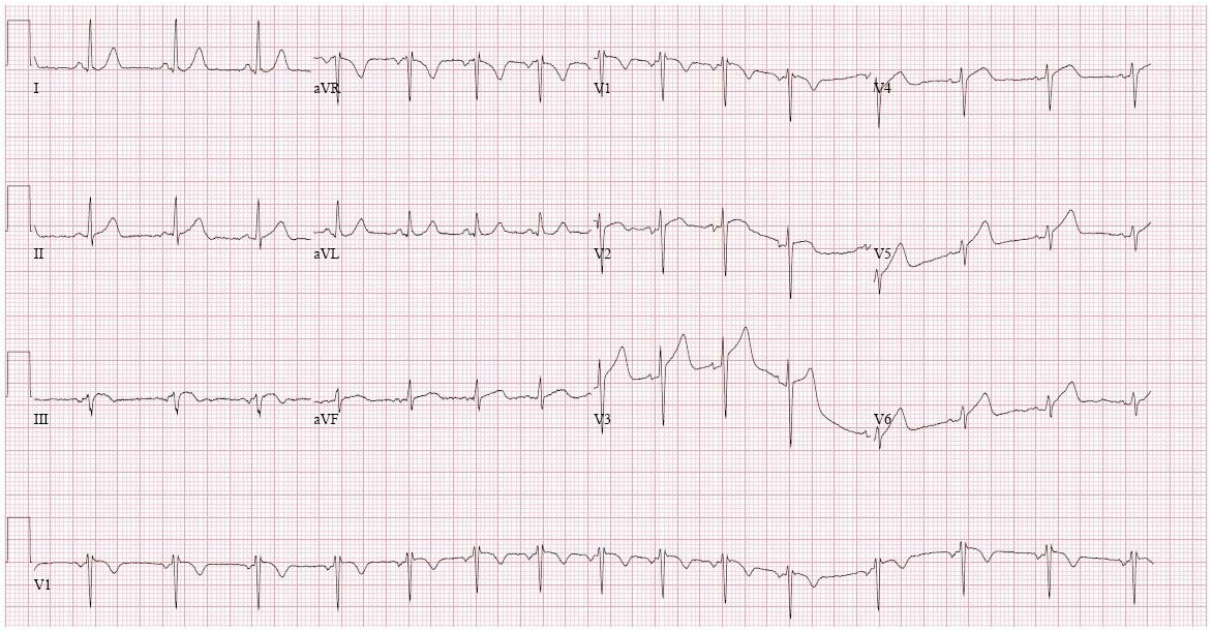
Acute maternal myocardial infarction (MI) occurs in fewer than 10 in 100,000 deliveries in the US (1). In the immediate peripartum period, when an anesthesiologist is most likely to be present, the cause of MI in 50% of cases is acute coronary artery dissection, which carries significant morbidity and mortality (2-3). Diagnosing MI in pregnancy is challenging, as the pretest probability is low, and normal manifestations of pregnancy like epigastric pain, nausea and malaise can hinder diagnosis.

We present a case of a 35-year-old gravida 2, para 1 female who was admitted with preterm contractions at 30 weeks gestation. Eighteen hours prior to delivery, she reported substernal chest pain, at which point an ECG was obtained as shown below. The tracing contained severe baseline artifact that limited interpretation. The patient was treated for the presumed diagnosis of “heartburn.” The following day, the patient required urgent cesarean section for a non-reassuring fetal heart rate pattern. Shortly after delivery, the patient developed dyspnea, hypoxia, tachycardia, and bibasilar rales. A chest x-ray revealed pulmonary edema and a second ECG showed loss of anterior R waves. Her troponin-T level was elevated. Coronary catheterization demonstrated complete occlusion of the left anterior descending artery due to coronary dissection, which was successfully stented. She was discharged home on aspirin, clopidogrel and metoprolol.

The management of acute MI in pregnancy requires a careful and multidisciplinary approach given the medical implications of therapy and intervention to the mother and fetus. A retrospective review of the initial ECG, taken the night before surgery, demonstrated mild anterior ST elevation, shown below. This case highlights an example of cognitive blindness, the phenomenon where critical cues are unrecognized due to a variety of human and environmental factors, that played a role in delaying diagnosis and management of this uncommon but treatable complication of pregnancy.

References

1. James AH, et al. Circulation 2006; 113:1564-71.
2. Sahni G. Cardiol Clin 2012; 30:343-67.
3. Shahabi S, et al. Upsala J Med Sci 2008; 113:325-330.



Abstract F 51

Persistent Paralysis After Spinal Anesthesia for Cesarean Delivery

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Anterior spinal cord ischemia has rarely been reported as a cause of permanent neurologic complications after neuraxial anesthesia in obstetric patients. We describe a parturient that developed anterior spinal cord ischemia after spinal anesthesia (SA) for cesarean delivery (CD).

We present the case of a 32-year-old G4P2A1 parturient of Ethiopian origin, who presented at 41(2/7) weeks for primary elective CD for breech presentation. This current pregnancy was uncomplicated and she had no significant medical history. Preoperative BP was 98/70 mmHg and haemoglobin (Hb) 108. Uncomplicated SA was performed at L3-4 with clear CSF on the first pass. Bupivacaine 12mg (0.75% hyperbaric), fentanyl 20mcg, and preservative-free morphine 150mcg were administered. Phenylephrine was then infused at 50 mcg/min. Block height was T4 at 5 min. Intraoperative course was uneventful except for symptomatic bradycardia (37-40 bpm) and hypotension (SBP 85mmHg) 15 min post SA, treated by decreasing the phenylephrine infusion, intravenous ephedrine 10mg and atropine 0.6mg. Blood loss was estimated at 750 ml and the lowest intraoperative SBP recorded (Innovian® Anesthesia, Draeger Medical) was 85 mmHg.

Initial postoperative vitals were BP 107/65, HR 82, SpO2 97%. Over 3 hours, 3 episodes of mild hypotension (SBP 85-90) were treated with fluid boluses. Clinical assessments revealed no excessive bleeding and postoperative Hb was 82. Seven hours after SA, the patient had persistent motor block, despite pain from her surgical incision. At nine hours, diffusion-weighted unenhanced MRI of the lumbosacral region was normal, finding no spinal cord compression or cord lesion. Fifteen hours after SA, Neurology found leg strength 0/5 bilaterally, decreased sensation to T6, no sensation to void, intact bowel function, vibration sense and proprioception. The deficits were consistent with a lesion above T6, impacting the anterior spinal cord while sparing the posterior tracts. Two more unenhanced spinal cord MRI studies within 48 hours failed to identify the pathology. Normal echocardiogram ruled out patent foramen ovale and a negative sickle cell screen ruled out vaso-occlusive crisis. Daily neurologic improvement was observed on postpartum days 7-14. At one year, persistent neurologic deficits included mild left hip flexor weakness, persistent T10-12 dyesthesia and left leg neuropathic pain.

Possible etiologies of anterior spinal cord ischemia include severe hypotension, arteriosclerosis, or mechanical interference with aortic blood flow (emboli or vasospasm). Three cases report spinal artery syndrome after neuraxial anesthesia in the obstetric population. Mild hypotension combined with a vasoconstricting agent and the hypercoagulable state of pregnancy may be contributory. Our case report highlights the importance of the clinical examination in parturients with a prolonged block after neuraxial anesthesia.

Int J Obstet Anesth 2000; 9: 99–124
South Med J 1990; 83: 695–697

Abstract F 52

Subdural Empyema During Pregnancy

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A 38 year-old African-American G6P5005 woman presented at 26 weeks gestational age with altered mental status and right-sided weakness. Magnetic resonance imaging (MRI) demonstrated an extensive bifrontal subdural empyema. The patient's medical history was notable for only chronic sinusitis. An emergent craniotomy was performed with evacuation of the subdural empyema and an intracerebral abscess plus removal of a frontal bone flap for osteomyelitis. An intraoperative culture grew Streptococcus anginosus (milleri) and six weeks of intravenous ceftriaxone and oral metronidazole began. However, a follow-up MRI five weeks after surgery demonstrated recurrence of the subdural empyema with a midline shift. She again had emergent drainage of the abscess. Her antibiotics were then changed to intravenous meropenem. A follow-up MRI demonstrated no residual subdural empyema. Six days after completing her antibiotics, the patient presented at 40 1/7 weeks gestational age for induction of labor secondary to fetal heart rate decelerations. On exam, the patient was alert and oriented with no focal neurologic deficits. An epidural catheter was placed for labor analgesia. The patient had an uncomplicated spontaneous vaginal delivery and had no complications from the epidural catheter placement.

Intracranial subdural empyema is a rare disease requiring surgical drainage that usually follows paranasal sinusitis and primarily affects adolescent and young adult men.(1,2) Twenty-nine patients described in two case series have the following characteristics: 90% of the patients were male, 65% of the bacterial isolates were streptococcal species, 45% of patients developed a second abscess and required a second drainage operation, and 45% of patients had residual focal neurologic deficits.(1,2) There are only three published case reports of intracranial subdural empyema in parturients, one of whom also had bacterial meningitis and two of whom presented post-partum with no antecedent infections.(3)

It is fortunate that our patient had recovered from her infection before delivery, for dural puncture is contraindicated in the presence of subdural empyema due to the risk of cerebral herniation, which has been reported.(1) If the infection had necessitated preterm delivery, labor without neuraxial anesthesia or cesarean delivery under general anesthesia would have been required.

1. Dill SR, Cobbs CG, McDonald CK. Subdural empyema: Analysis of 32 cases and review. Clin Infect Dis 1995;20:372-86.
2. Kombogiorgas D, Seth R, Athwal R, Modha J, Singh J. Suppurative intracranial complications of sinusitis in adolescence. Br J Neurosurg 2007;21:603-9.
3. Bhatoe HS. Puerperal subdural empyema. Postgrad Med J 1996;72:317-318.

Abstract F 53

Multidisciplinary Management of a Fontan Patient on the Labor Floor

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Introduction: The Fontan repair was originally developed in 1971 for children with compromised biventricular circulation. Increasingly, these patients have survived to child-bearing age. The physiologic alterations present unique management challenges in the puerperium. Studies suggest that complications are common, with most being obstetrical rather than maternal.

The Case: We present the peripartum planning and management of a 32 year old G2P0 with a history of tricuspid atresia s/p Fontan repair. Despite pharmacological therapy, her repair was complicated by recurrent presyncopal episodes from atrial flutter requiring cardioversion and anticoagulation. She had chronic hypoxemia (baseline room air saturation= 89%) and right to left shunting through an ASD. A multidisciplinary team of providers from High Risk Obstetrics, Obstetric Anesthesia, Cardiology, Critical Care, and Nursing met to discuss physiologic challenges, mode of delivery, and anesthetic plans. Of particular concern was maintenance of adequate preload and vascular access, avoidance of arrhythmias, and management of anticoagulation. The plan was elective induction at 36 weeks with a forceps assisted vaginal delivery under epidural analgesia. LMWH was held and a radial arterial line, large bore peripheral IV and PICC line terminating in the subclavian vein were placed. Optimal epidural analgesia was attained via careful titration to avoid significant decreases in preload. Generous maintenance fluids were administered and baseline antiarrhythmic medications were continued. Soon after an uneventful 36 hour labor and delivery of a healthy fetus, she was monitored in our surgical ICU for 18 hours and then transitioned to a telemetry floor until discharge on PPD #3.

Critical Care Decisions: Patients with Fontan repair present significant challenges and can require intensive-level peri-delivery care. Although our ICU provides excellent access to critical care and anesthesia resources, this site is more remote from the Obstetric and Neonatology infrastructure. We have developed a system whereby the team of multidisciplinary providers who will actively care for these patients create a detailed plan that maximizes peripartum time on the labor floor when feasible. Key to success is the integration of an ICU nurse into the labor floor team and an ICU back-up plan. In this manner, we can provide cost-effective, high level care in the most suitable locations in the hospital at the appropriate times during these High Risk patients' labor, delivery, and postpartum periods.

References:
1) Pregnancy and Delivery in Patients With Fontan Circulation: A Case Report and Review of Obstetric Management. Nitsche JF, et al. Obstetrical & Gynecological Survey: Sep. 2009; 64(9):607-14.
2) Pregnancy outcomes after the Fontan repair. Canobbio MM, et al. J Am Coll Cardiol. 1996 Sep; 28(3):763-7.
3) The Fontan Patient. Bailey PD, et al. Anesthesiology Clin 27. 2009; 285-300.

Abstract F 54

Management of a Parturient with Acute Respiratory Distress Failure with Spinal Anesthesia for Cesarean Delivery

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Acute Respiratory Distress Syndrome (ARDS) is a rare presentation in parturients(1). We present a successful use of spinal anesthesia on a preterm parturient with severe preeclampsia and ARDS. There have been very limited data available on the use of spinal anesthesia on pregnant patients with ARDS.

Case Report: A 27 year old female G1P0 at 29 weeks of gestation (BMI 29 kg/m2) was admitted to the antepartum unit with a productive cough and hypertension. Her blood pressure was 160/110 mmHg. Physical examination was otherwise normal. Work up showed WBC of 14.1k/uL and proteinuria 0.69g/day. All other labs were normal. Chest X-ray after informed consent showed a left lower lung infiltrate. The patient was given labetalol, azithromycin, ceftriaxone, and betamethasone in anticipation of preterm delivery. Over two days, her cough worsened and she developed dyspnea. She was given oxygen by face mask to maintain SpO2 in the 90s. Her chest X-ray showed progression of left lower lung infiltrates. The decision was made to do an emergency cesarean delivery in view of severe preeclampsia and worsening pneumonia. Her SpO2 was 74% on room air, and in the 90s with non-rebreathing face mask. BP was 171/124 mmHg. After considering the risks associated with general anesthesia, we proceeded with spinal anesthesia with epidural catheter placement. The patient was instructed on deep breathing, and we planned to use Non-Invasive Mechanical Ventilation (NIMV) during surgery, if needed. Spinal anesthesia was given with 40mg Lidocaine 2%, 100mcg epinephrine, and 25mcg fentanyl, achieving an anesthetic level of T6. She maintained SpO2 in the 90s throughout the procedure. A healthy baby was delivered, and the mother was transferred to the ICU for further management. Postoperative chest X-ray showed bilateral pulmonary opacities. Echocardiogram was normal. She was started on NIMV and antibiotics. Magnesium sulfate was administered for 24 hours. The patient was weaned off NIMV over two days and was transferred to the floor on post-operative day 7.

Discussion: We decided to administer spinal anesthesia to avoid the complications related to general anesthesia: difficult airway with low O2 reserve, aspiration, decreased FRC, and hemodynamic changes with severe preeclampsia. Erdogan, et al have demonstrated the use of spinal anesthesia with NIMV in a patient with pulmonary edema for cesarean delivery(2). Since spinal anesthesia can also affect respiratory reserve, we decided to use low dose lidocaine and administer epidural anesthesia if needed. Our patient was cooperative with the deep breathing and did not require NIMV intraoperatively.

Reference:
1) Catanzarite, et al ARDS in pregnancy and the puerperium: Causes, courses, and outcome. Obstet Gynecol 2001; 97:760.
2) Erdogan, et al Non-invasive mechanical ventilation with spinal anesthesia for Cesarean delivery. Int J Obstet Anesth 2010 Oct; 19(4):438.

Abstract F 55

Pushing Boundaries in Obstetric Anesthesia: Blind vs. Ultrasound-Guided Epidural Placement in a Marfan Syndrome Patient

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Introduction: We present the case of a parturient with Marfan syndrome (MFS) and prior scoliosis correction surgery. Following a failed epidural, an ultrasound (USG)-guided technique resulted in a successful epidural catheter (EC) placement and forceps-assisted vaginal delivery, with patient hemodynamic stability throughout labor.

Case Report: An 18-year-old G1 presented at 38 weeks gestation for labor induction. She had MFS, aortic root dilation, and Harrington Rod placement and removal. Surgical reports were unobtainable; however, the patient remembered her neurosurgeon stating that epidural anesthesia was possible. By transthoracic echocardiography, the aortic root at the sinus of Valsalva was found to be 3.8 cm. The obstetric plan was forceps-assisted vaginal delivery to avoid second stage pushing. An arterial line was placed. A midline epidural performed blindly at the L3-4 level failed to provide analgesia. Though the L3-4 interspace felt adequate on palpation, good tissue demarcation could only be identified with USG at L2-L3 (Figure 1). The EC was replaced at L2-3. After 10 hours of labor, a low forceps-assisted vaginal delivery was performed. The patient had good pain control, and remained hemodynamically stable throughout her hospital course.

Discussion: Scoliosis, a major Ghent diagnostic criterion, occurs in 60% of patients with MFS.(1) Compared to idiopathic scoliosis, scoliosis correction in MFS involves extensive spinal level fusions.(2) Dural ectasia, generally from L5 to S2, is associated with absent posterior epidural fat pad with bulging of the dural sac that occur in 95% of MFS patients.(1) MRI exam in 307 patients with scoliosis showed a mean epidural space width < 1mm in the concave side. (3) Ultrasound guidance was necessary to identify an optimal intervertebral space for successful provision of epidural analgesia in this patient. While aortic root dissection (associated with aortic root > 5 cm) was unlikely, our goals of hemodynamic stability and excellent pain control required successful epidural analgesia.(1)

References:

1.Shirley ED,et al.Marfan syndrome. J Am Acad Ortho Surg 2009;17:572-81
2.Gjolaj JP,et al.Spinal deformity correction in Marfan syndrome versus adolescent idiopathic scoliosis: Learning from the differences. Spine 2012;37:1558-65
3.Liljenqvist UR,et al.Analysis of vertebral morphology in idiopathic scoliosis with use of magnetic resonance imaging and multiplanar reconstruction. J Bone Joint Surg Am 2002; 84:359-68

Abstract F 56

Perioperative Management of a Pregnant Patient with Factor XI Deficiency and Carrier of Factor IX Deficiency: A Case Report with Literature Review

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Introduction: FXI deficiency (Hemophilia C) is a rare, autosomal recessive trait (1); FIX deficiency (Hemophilia B) is a less rare x-linked recessive trait (2). Our patient represents a “near miss”, a cesarean section (C/S) planned under spinal, but discovered by accident to be both Factors IX and XI deficient. While the incidence of epidural/spinal hematoma is small, the possibility of permanent paralysis merits a clear understanding of the risk.

Case: A 28-y/o G2P0010, at 39 5/7 wks, presented to L & D complaining of contractions. C/S was planned for the next day due to breech presentation. She had no allergies, PMH included hepatitis C, depression, and heroin abuse, currently taking methadone 300mg daily. Admission vitals were stable, physical and airway exam normal. Our patient related no history of abnormal bleeding/ bruising, but was a poor historian. Without prior labs, coagulation studies were requested. Unexpectedly, the aPTT was elevated at 49 (rr: 26.7-37.1s)(3). A hematology consult resulted in a normalized aPTT mixing study with deficient FIX (50, rr 80-149 [%])(3) and FXI level assays (28, rr 73-137 [%])(3).

The multidisciplinary care plan (Anesthesia, Hematology and Obstetrics) included transfusion of 4 units FFP to normalize the aPTT for 24 hrs. Was this “good enough” to perform a safe neuraxial block? After a detailed discussion of the risks/benefits with her, our patient agreed to a C/S under GA. Following RSI with 15mg ketamine, 200mg propofol, 100mg succinylcholine, and an uneventful intubation, anesthesia was maintained with propofol, fentanyl boluses, IV acetaminophen and ketorolac. EBL was 450 mL, she was extubated (no postop bleeding) and mother and baby were discharged 4 days later.

Discussion: Our patient has both deficiencies of Factor IX (Hemophilia B carrier) and Factor XI (Hemophilia C), diagnosed by accident. We were unable to find a case report of a patient with both. Additionally, the safe use of neuraxial anesthesia in patients with either deficiency is controversial (4). Although debate exists whether FXI is physiologically low in pregnancy (5), review of the literature suggests that the aPTT is most often shortened in pregnancy (4), not prolonged. Guidelines have been developed for the safe use of neuraxial anesthesia in patients on heparin and LMWH (6), but are less clear with factor deficiencies. Because neuraxial anesthesia is preferred in the pregnant patient, the need for clinical research and guideline development for factor deficiencies is critical.

References:

1. NEJM 1991;325:153-158.
2. Encyclo Med Geno and Proteo 1st ed. 2004; Ch 87. ISBN 9780203997352.
3. Bray, P., Dir, TJUH Lab. Clin Test TJUH Cardeza Fdn, 1015 Walnut St Phila PA 19107.
4. Obstet Anesth Princ and Prac 4th ed. Chestnut D, ed., 2009. Ch 2: 21-23. ISBN: 978-0-323- 05541-3.
5. Best Prac & Research Clin Obstet and Gynae 2010;24:339-52.
6. Reg Anesth & Pain Med 2010;35:64-101.

Abstract F 57

Initial Experience With a Hand-Held Device for Transthoracic Echocardiography in Labor and Delivery

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The ability to assess maternal cardiac status quickly, accurately and non-invasively on Labor & Delivery can prove invaluable in certain clinical situations. Since July 2012, we have utilized the Vscan Portable Ultrasound (GE Healthcare, Waukesha, WI) on our Labor & Delivery unit for basic transthoracic echocardiography.

By focusing on the left parasternal long and short axis views, which are relatively easy to obtain even in pregnancy, we have managed to collect data pertaining to maternal cardiac structure, fluid status, estimated cardiac output, and overall global function of the heart, including: 1) Reduced ventricular end-diastolic and end-systolic diameters during post-partum hemorrhage, which return towards normal after recovery; 2) Increase in cardiac output following Cesarean delivery and oxytocin administration; 3) Reduced ejection fraction in cardiomyopathy; 4) Left ventricular hypertrophy in a patient with pre-eclampsia and chronic hypertension; 5) Left atrial enlargement with mitral valve disease; 6) Normal anatomy.

While it may be too early to assess the impact such technology may have in guiding patient care in the long term, at minimum it has served as a valuable teaching tool for faculty, residents and medical students in our Obstetric and Anesthesia departments. Residents from both disciplines have learned to obtain the two basic views and make meaningful observations, suggesting that hand-held transthoracic ECHO may indeed be the “next stethoscope.”

Abstract F 58

Spinal Subdural Empyema and Meningitis Following an Epidural Blood Patch

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Introduction: Spinal subdural empyema (SSE) is a rare but serious condition requiring prompt diagnosis and emergency treatment. To our knowledge, this is the first report of SSE following an uncomplicated epidural blood patch in an obstetric patient.

Case report: A 41 year old primigravida with no significant past medical history requested epidural analgesia for induction of labour at 41 weeks of gestation. This was sited under full asepsis and provided effective pain relief. However, post partum she developed a persistent postural headache with no associated neck stiffness, photophobia or focal neurology. She was apyrexial, but there was an evidence of a perineal wound infection. Following the diagnosis of a post dural puncture headache an epidural blood patch was performed under full asepsis. Her headache resolved and she was discharged home. The patient was re-admitted 9 days post delivery with a new onset of headache and pyrexia. This time headache was constant, non-postural and severe with associated earache and neck stiffness, but no photophobia or vomiting. On examination of the epidural site there was no visible sign of local infection with minimal tenderness was on palpation. MRI brain was normal but MRI lumbar spine revealed a collection extending from L1 to S1 along the posterior epidural space with deviation of some nerve roots but no evidence of neural compression. In view of these findings a diagnosis of spinal subdural empyema and meningitis was made. The patient was immediately transferred to the neurosurgical unit where she was treated conservatively with antibiotics for a total of 6 weeks. Following the completion of the treatment further imaging demonstrated complete resolution of the empyema and the patient made an excellent functional recovery.

Discussion: Spinal subdural empyema is a rare entity associated with high morbidity and mortality. Its development can be secondary to haematogenous spread of infection from another region, infected CSF and direct spread into the subdural space, contamination during lumbar puncture or regional anaesthesia, or haematogenous inoculation during the course of meningitis(1). Epidural blood patch is a procedure which carries a risk of serious complications such as spinal subdural haematoma (2). In our patient we could not identify any clear pathogenic mechanism of this complication. However, following this incident we have audited our management of post dural puncture headache and our blood patch procedures are now only performed in the operating theatre. Despite normal observations, evidence of any source of infection involves a multidisciplinary discussion prior to a blood patch.

References:
1.Velissaris D, et al. Spinal subdural Staphylococcus Aureus abscess: case report and review of the literature. World J Emerg Surg 2009,4:31
2.Tekkök IH, et al. Spinal subdural haematoma as a complication of immediate epidural blood patch.
Can J Anaesth.1996;43(3):306-9

Abstract F 59

Peripartum Anesthetic Management in Patients With Chronic Spinal Cord Injury

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Introduction: Chronic spinal cord injury impacts multiple organ systems and complicates peripartum obstetric anesthetic management. The current literature describing anesthetic management of this patient population during pregnancy is limited (1).

Methods: The records of all women admitted for delivery at Mayo Clinic, Rochester, Minnesota between January 2001 and May 2012 were searched using ICD-9 codes or free-text query for terms relating to spinal cord injury. Only patients with upper motor neuron symptoms at the time of delivery were included. Data pertaining to labor, delivery, and post-partum management were abstracted from each patient's medical record.

Results: Nine deliveries occurred in 8 patients with chronic spinal cord injury. Median time from cord injury to delivery was 13 years (range = 2-19 years). Six women underwent trial of labor. All patients who had successful vaginal delivery had epidural analgesia. Cesarean delivery (CS) was performed in the remaining 3 women because of fetal distress (n=1) or arrest of dilation (n=2). In these patients, surgical anesthesia was provided with epidural (n=1), spinal (n=1), and general (n=1) anesthesia (GA). Three women underwent elective CS under epidural (n=1), spinal (n=1), and GAl (n=1)a. Of these, 2 were performed for obstetric reasons and one was performed to avoid complications of severe autonomic hyperreflexia (AH). In this latter patient, epidural placement failed and the CS was performed via GA.

Four subjects had a history of AH prior to pregnancy and collectively had 5 deliveries. 1 patient had 2 vaginal deliveries both via epidural anesthesia and 3 patients had CS: 2 with epidural analgesia and 1 with GA. Three of the 5 deliveries were performed with invasive arterial pressure monitoring. Three of 4 patients experienced symptoms of AH in the peri-delivery period. One patient had symptoms only during second stage of labor (ie, headache and hypertension) that was treated with an epidural bolus and intravenous hydralazine. Two patients with AH who underwent CS had postsurgical symptoms in their postpartum room remote from delivery. These episodes were self-limited and did not require treatment. No other adverse maternal peripartum or neonatal events were noted.

Discussion: Spinal cord injury complicates peripartum anesthetic management. Sixty-seven percent of the pregnancies in this study resulted in a CS. This is higher than the national average of 32.3 percent reported by the Centers for Disease Control in 2009 (2). Epidural analgesia may be useful to attenuate AH but does not eliminate the risk of AH, especially during the second stage of labor. Further, AH episodes are common after delivery.

References:

1. Cross LL. Paraplegia. 1992;30:890-902.
2. http://www.cdc.gov/nchs/fastats/delivery.htm.

Abstract F 60

Anesthetic Considerations for a Parturient with Pulmonary Artery Hypertension Medically Managed with Epoprostenol

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Introduction: Pulmonary artery hypertension (PAH) is a disorder in which constriction of pulmonary arteries leads to increased pulmonary artery resistance (1). To prevent decompensation during labor and delivery, medical management of parturients with severe PAH often requires a pulmonary vasodilator. We report the successful anesthetic management of a parturient with a history of congenital PAH medically managed with epoprostenol, a potent pulmonary vasodilator with significant side effects.

Case Report: A 20 year-old G1P0 at 30 weeks gestation was admitted for preterm labor. Past medical history was significant for corrected congenital tetralogy of fallot, pulmonary valve atresia with a pulmonary artery stent. Transthoracic echocardiogram revealed a fenestrated VSD patch with a left to right shunt, and severe PAH with a PAP of 68 mmHg. Because of her history of severe PAH, increased risk for acute decompensation and sudden death during labor and delivery, a multidisciplinary team management labor plan was for ICU admission, early epidural placement, arterial line for blood pressure monitoring and arterial blood gas evaluations, central line for epoprostenol infusion, and assisted forceps vaginal delivery. A CSE was placed at 3 cm cervical dilatation; with 20mcg of fentanyl administered intrathecally and an initial epidural bolus of 5mL 0.08% bupivicaine with 2mcg/mL fentanyl. A PCEA infusion of 0.08% bupivacaine with 2 mcg/mL fentanyl was started at a continuous rate of 4 mL/hr and PCEA dose of 4 mL every 8 mins. Betamethasone was given for fetal lung maturity and a magnesium infusion for preterm fetal neuroprotection. Epoprostenol (2ng/kg/min) was initiated via the central line and later increased to 4ng/kg/min. Over the course of 24 hrs, her cervix became fully dilated. The epidural was re-dosed for delivery with 3cc of 1.5% lidocaine and 100mcg of fentanyl, along with bilateral pudendal nerve blocks performed for an uncomplicated assisted vaginal delivery. A live born infant was delivered, immediately intubated and transferred to the NICU. On postpartum day (PPD)#2, she was started on PO sildenafil (a long-term pulmonary vasodilator) at which time the epoprostenol infusion was titrated and discontinued PPD #4. She was discharged home on PPD#6.

Discussion: Epoprostenol is an IV prostacyclin requiring central administration that has demonstrated improvement in cardiopulmonary function by reducing pulmonary vascular resistance. Epoprostenol is associated with significant side effects necessitating ICU monitoring (2). Abrupt discontinuation of epoprostenol can cause severe rebound hypertension (3). Epoprostenol also inhibits platelet aggregation therefore coagulation studies are needed prior to regional anesthesia and central line insertion.

References:
(1) Int J Clin Pract. 2011 Suppl; 172:6-14
(2) Lung. 2012; 190: 155-160
(3) Pulm Med. 2012; 2012: 709407

Abstract F 61

Can Pregnancy Be Heartless?: The Successful Peripartum Anesthetic Management of a Parturient with a Left Ventricular Assist Device

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Mechanical cardiac replacement therapy, or the so-called “artificial heart,” is being used with increasing frequency as a bridge to transplant. It is so successful that many patients live close to normal lives outside of the hospital while supported by these devices. This is well illustrated by the patient reported here- a young woman with end-stage cardiac failure who became pregnant, and carried the pregnancy to a term vaginal delivery while being supported by a left ventricular assist device (LVAD). This is the first such case ever reported. (Other details of the case have been previously described from the cardiology perspective(1)). Our discussion illustrates the unique perioperative and peripartum issues posed by LVADs during pregnancy, particularly in the setting of persistent uncorrected RV cardiomyopathy. We report the successful anesthetic management of the labor and delivery of a parturient with bi-ventricular end stage heart failure on continuous LVAD support.

A 26 year old G7P2 female with non-ischemic dilated cardiomyopathy required the placement of a HeartMate II LVAD as a bridge to transplant. After device implantation, she became pregnant, and was advised about the risks to her and the fetus of continuing the pregnancy. However, she declined termination. She instead underwent cervical cerclage placement at 14 weeks gestation under general anesthesia in the setting of coagulopathy from acquired von Willebrand’s syndrome (AVWS)(2). At 34 5/7 weeks of gestation, she developed intermittent abdominal pain that was presumed to be early labor. She was brought to the OR and received fresh frozen plasma to reverse AVWS. A radial arterial line, PA catheter, and a slowly loaded epidural were placed, the latter in order to mitigate sympathetically mediated hypertension, tachycardia, and possible cardiac decompensation associated with labor pain. After more than 24 hours of a trial of induction and labor augmentation, RV filling pressures precipitously rose and her existing mitral regurgitation worsened, but she responded well to intravenous infusions of milrinone and nitroglycerin. She underwent an assisted-vaginal delivery and a healthy male infant was delivered without complications.

Cardiac output was well-mainatined by the LVAD throughout pregnancy and labor. However, since only the LV was replaced mechanically, some RV decompensation was observed and treated. Further complicating this case was the potential for excessive bleeding. This may be partially attributable to a phenomenon known as acquired von Willebrand’s syndrome (AVWS), characterized by a loss of high molecular weight multimers of von Willebrand’s factor. It has been suggested that blood is exposed to artificial shear stress from VAD cannulas, tubes, and rotors, and that this is the most likely contributing factor to the development of AVWS(2)

1. Journal of Heart and Lung Transplantation 2011; 30:1065-7
2. Journal of the American College of Cardiology 2010; 56:1207-13

Abstract F 62

Induction of Labor in a Parturient with Chronic Abdominal Aortic Dissection and Superimposed Severe Preeclampsia

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A 20 year old G3P2001 at 33 weeks gestation, presented with abdominal pain and breech presentation. The patient had a history of cesarean delivery (CD) and a vaginal birth after CD. She also had a significant medical history of chronic hypertension, Takayasu’s arteritis, supra renal aortic stenosis, status post angioplasty with subsequent type IIIb aortic dissection. The patient was non-compliant with anti-hypertensive medications and the chronic aortic dissection was managed conservatively. Cardiology was consulted and she was admitted to the labor and delivery unit for close observation and blood pressure (BP) management. On admission, BP and heart rate were 166/94 mmHg and 105/min respectively. On day two, fetal heart tones were reassuring and metoprolol 25 mg daily, PO, was started for a target BP of 100-140s/70-90s. For close monitoring and vascular access, a left radial arterial line and two large bore peripheral intravenous catheters were placed. On day three, severe superimposed preeclampsia was diagnosed after 24 hour urine protein was greater than 300mg and blood pressure lability was observed, 110-174/64-110. Metoprolol was increased to 50 mg twice a day, PO, and magnesium sulfate infusion was initiated. Secondary to blood pressure lability, superimposed severe preeclampsia, and the chronic aortic dissection, a repeat CD was scheduled. The patient adamantly refused a CD. In preparation for induction of labor and vaginal delivery, a left dorsalis pedis arterial line was placed (for pressure gradient comparison) and the cardiothoracic surgical team was consulted to be on standby. On day four, a nicardipine infusion was initiated at 2mg/hr for tight blood pressure control and a combined spinal and epidural technique was used for labor analgesia. An intrathecal bolus of 150 mcg of duramorph, 5 mcg of fentanyl, and 1.25 mg of bupivacaine was administered, followed by 0.0625% bupivacaine with 3mcg/ml fentanyl via an epidural catheter at a rate of 20 ml/hr, with 5 ml boluses for breakthrough pain. The patient was taken to the operating room for vaginal delivery at 9 cm cervical dilatation when she described perineal pressure and discomfort. During delivery, she was encouraged to resist the temptation to bear down. Analgesia was augmented with incremental epidural doses of 3% chloroprocaine. Nicardipine was titrated to a goal systolic pressure of 120s to 140s. A forceps assisted vaginal delivery was carried out and the neonate was admitted to the neonatal ICU. Postoperatively, the patient’s BP was invasively monitored for hemodynamic shifts. On day five, the patient was weaned off the nicardipine infusion to oral nifedipine, invasive monitoring was discontinued, the epidural catheter was removed, and she was discharged to the wards. The patient refused permanent sterilization despite extensive discussion of the risks and benefits.

Abstract F 63

Successful Use of Epidural Analgesia for Labor and Delivery in a Parturient with Guillain-Barre Syndrome

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Introduction: Guillain-Barre Syndrome (GBS) is an acute demyelinating polyneuropathy manifesting with progressive motor weakness and ascending paralysis. Due to the rarity of GBS during pregnancy, there are no established guidelines for the use of regional anesthesia and analgesia for labor or Caesarean delivery. We report a successful use of labor epidural analgesia in a parturient with resolving GBS without worsening of any neurological symptoms.

Case Description & Management: A 32 yr old G3P2 parturient, had been admitted at 28 weeks of gestation with symptoms of weakness in both lower and upper extremities, progressing to inability to walk, bilateral facial paralysis, difficulty in swallowing and fecal & urinary incontinence. The diagnosis of GBS was confirmed by CSF analysis and nerve conduction studies showed mixed axonal and demyelinating neuropathy. She was transferred to ICU and treated with IV-Immunoglobulin. The patient's symptoms slowly improved and she was discharged home on day 28 with some residual weakness. In her 37th week of gestation, she was admitted to L&D in labor with residual numbness and tingling sensation in both feet and facial paresis. A decision was made to place labor epidural, which proceeded without complication and patient delivered a healthy female baby without worsening or relapse of any neurological symptom or autonomic instability. She was discharged home on the 3rd post-partum day.

Discussion: Generally, it is perceived that patients with pre-existing neurologic disease may be at increased risk of subsequent neurologic injury and worsening of symptoms from neuraxial anesthesia and analgesia and are often denied epidural analgesia. Both epidural and spinal anesthesia and analgesia have been used successfully in a few cases with active or resolving GBS, though one case of worsening of neurologic symptoms after labor epidural anesthesia in a Guillain-Barre patient has been reported [1, 2]. Our patient did not have any new or deterioration of any existing neurological symptoms following epidural analgesia.

Conclusion: Since controversies exist in the use of regional anesthesia and analgesia in patients with active or resolving GBS, we believe that our experience of successful use of labor epidural in this parturient with resolving GBS without worsening of any neurological symptoms will add valuable information in literature for future reference.

References

1. Kocabas S, Karaman S, Firat V, Bademkiran F. Anesthetic management of Guillain-Barre syndrome in
pregnancy. J Clin Anesth. 2007 Jun; 19(4):299-302
2. Wiertlewski S, Magot A, Drapier S, Malinovsky JM, Pereon Y. Worsening of neurologic symptoms
after epidural anesthesia for labor in a Guillain-Barré patient. Anesth Analg 2004; 98:825-7

Abstract F 64

Obstetric and Anesthetic Management of a Parturient with VACTERL Syndrome

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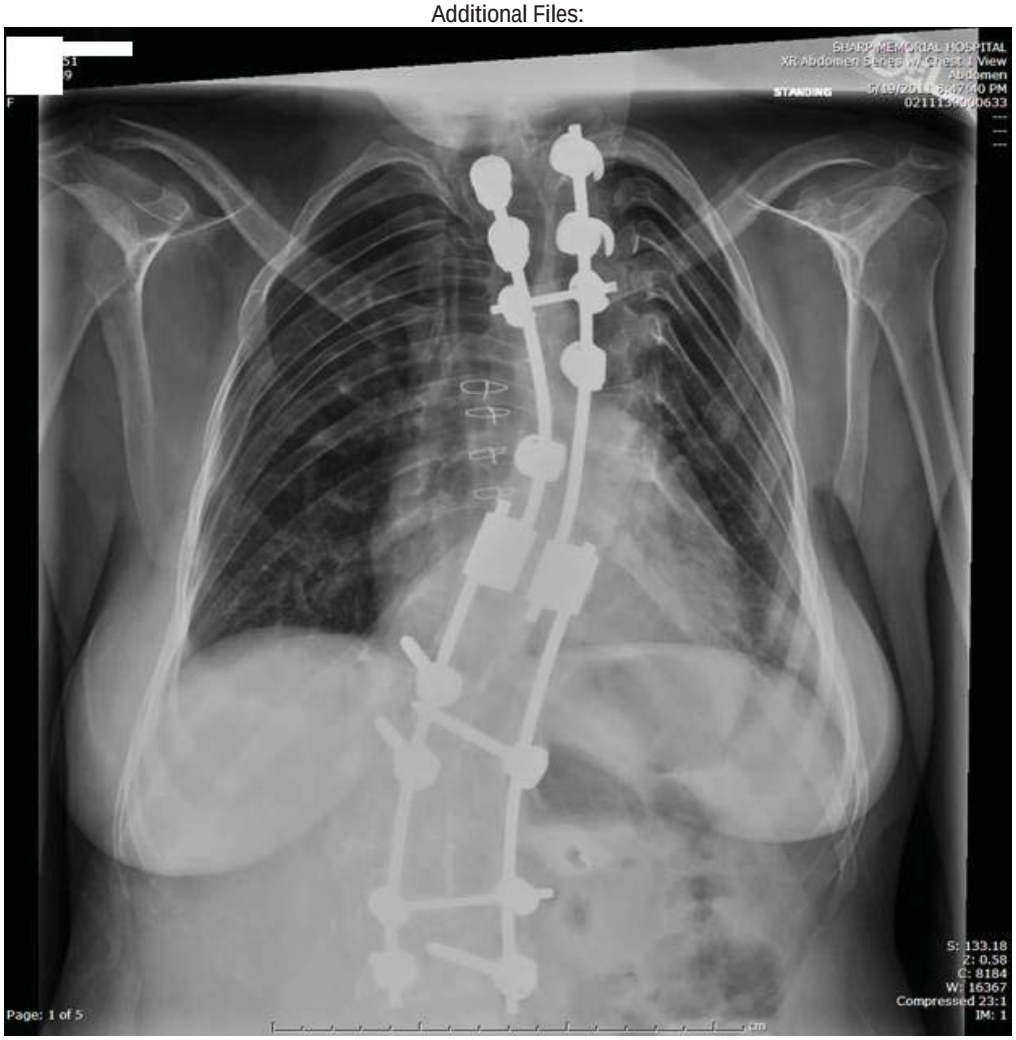
This case report describes the obstetric and anesthetic management of a cesarean delivery in a woman with VACTERL association. VACTERL is an acronym for Vertebral defects, Anal atresia, Cardiac anomalies, Tracheo-Esophageal fistula, Renal and Limb defects. There is no consensus on the factors that contribute to the phenotypic manifestations. One published letter describes the anesthetic management of a parturient with VACTERL association. (Luce V et al. Anesth Analg 2004; 98: 874). Our patient presented early and was followed by a perinatologist, cardiologist, and pulmonologist. Her features included surgically corrected Tetralogy of Fallot and tracheo-esophageal fistula; severe scoliosis requiring Harrington rods (see X-ray); and congenital absence of a left thumb. She had no anal atresia or renal dysfunction. She had significant restrictive lung disease from persistent thoracic scoliosis and a short thorax.

Functionally, she remained NYHA 1 despite an admission to hospital at 30 weeks' gestation for pneumonia that responded well to intravenous antibiotic therapy. Despite reduced lung volumes on pulmonary function testing she was mostly asymptomatic from the pulmonary standpoint. During pregnancy, echocardiography revealed persistent right ventricular hypertrophy and reduced systolic function, with moderate to severe pulmonic insufficiency, but no evidence of pulmonary hypertension. She also had evidence of mild tricuspid regurgitation with mild right atrial enlargement, but left ventricular systolic function was normal.

In view of a contracted pelvis it was decided to proceed with a primary cesarean delivery at 36 weeks' gestation. The cardio-respiratory anomalies and a Mallampati IV airway, dictated a combined spinal epidural anesthetic after placing a pulmonary artery catheter and arterial line under sedation. Despite CSF flow through the spinal needle after difficult epidural needle placement with ultrasound guidance, the spinal anesthetic did not work. We then used general anesthesia, with a Glidescope® to facilitate endotracheal intubation. This was performed uneventfully and the cesarean delivery proceeded without complication. The patient was managed in an intensive care unit postoperatively for short-term invasive hemodynamic monitoring and made a good recovery. Further details of her obstetric issues and anesthetic care will be presented in the poster.

Additional Files:



Abstract F 65

Type II Von Willebrand Disease and Known Difficult Airway in A Twin Pregnancy

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Introduction: Von Willebrand disease (VWD) is the most common inherited bleeding disorder. Type II VWD results from dysfunctional von Willebrand factor (VWF) and replacement therapy is indicated during pregnancy to avoid peripartum hemorrhage and to allow neuraxial anesthesia (1).

Case Presentation: A 39 year old G6P0 presented with preterm contractions at 28 weeks with a twin gestation. Her type II VWD initially presented as heavy menses. Her airway exam was Mallampati class 2, full range of motion, and normal thyromental distance but narrow chin. She had 2 abdominal surgeries complicated by difficult intubation at outside institutions. At our institution she had one awake fiberoptic intubation for a myomectomy and one direct laryngoscopy under general anesthesia with a grade 3 view requiring a bougie for an exploratory laparoscopy.

Prior to CS, hematology recommended replacement therapy with antihemophilic factor/VWF complex (Humate P), which is effective immediately following transfusion. Obstetric anesthesia discussed with MFM the concern for delay if an emergency CS became indicated given the bleeding disorder requiring replacement therapy prior to neuraxial anesthesia and the difficult airway preventing rapid induction of general anesthesia. Four days after admission, twin A developed a category 2 tracing with persistent variable decelerations, and the decision was made to perform a CS at that time. She received Humate P 60 U/kg immediately prior to spinal anesthesia with bupivacaine 12mg, fentanyl 20mcg, and morphine 0.2mg. Supraglottic airways, a video laryngoscope, and a fiberoptic bronchoscope were immediately available. The patient delivered two infants with Apgars 8 and 9. Due to peri-incisional discomfort, she received intravenous midazolam 2mg and fentanyl 80mcg. The estimated blood loss was 1200mL, the surgery was finished in 89 minutes, and she had an uneventful recovery from anesthesia. Humate P was redosed 12 hours post delivery and antifibrinolytic therapy was started with aminocaproic acid. There was no postpartum hemorrhage, and she was discharged home after four days.

Discussion: Type II VWD results from a qualitative defect in VWF. Since desmopressin promotes release of VWF from endothelial storage, it is less likely to be effective in type II VWD. Instead, VWF replacement therapy is used perioperatively. The recommendations for neuraxial anesthesia in the setting of VWD are not well established, but neuraxial technique is thought to be safe when VWF and factor VIII levels are ≥ 0.5 IU/mL (2). Although this patient's prior abdominal procedures could have prolonged surgical duration, spinal anesthesia instead of CSE was selected to decrease the risk of epidural hematoma. While general anesthesia was ultimately avoided, the choice of spinal anesthesia definitely increased the risk of having to manage a difficult airway intraoperatively.

References:
1) Pacheco LD, Am J Obstet Gynecol 2010
2) Choi S, Anesth Analg 2009

Abstract F 66

Cesarean Section for a Patient with Pseudoachondroplasia

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Patients with Pseudoachondroplasia can present with significant challenges to the OB anesthesiologist. We present here a case of a 23 years old G2P1001 at 39 weeks gestation with pseudoachondroplasia and a medical history significant for asthma scheduled for a repeat elective C section.

Pseudoachondroplasia is a rare rhizomelic type of skeletal dysplasia which develops secondary to a mutation within genes encoding for cartilage oligomeric matrix protein (COMP) on chromosome 19. COMP is found in the extracellular matrix of the cartilage, tendon, and ligaments.

Most families have demonstrated an autosomal dominant inheritance pattern, but few germline/somatic mutations have been suggested.

The children are invariably normal at birth, and they usually present either around 2 years of age with a delay in walking or a little later with an abnormal waddling gait or lower limb deformity. Over the years, the rhizomelic type of dwarfism becomes apparent with progressively increasing morbidity.Physical examination of these patients reveals normal facies and intelligence. The adult height usually ranges between 82–130 cm with marked shortening of limbs. Associated deformities include limited neck extension, foramen magnum stenosis and atlanto-axial instability. Diagnosis is by Radiology and clinical signs.

We present here a case of a 23 years old pseudoachondroplasic dwarf presenting at 39 weeks gestation for a repeat elective C section.

She had regular follow up with the OB /GYN team during her current pregnancy from which one of the progress notes documented a questionable history of subglottic stenosis. Her physical exam was essentially normal except for a height of 3 feet 11 inches and weight of 142 lbs.Airway exam was Mallampati 1, with free range of movement of the neck, no signs or symptoms of cervical instability,and no radiology records on file. Her prior anesthetic history revealed a somewhat difficult epidural for her previous C section performed for cephalopelvic disproportion a year ago. Keeping this in mind, our plan was to do what had been done before and had worked for her, i.e. an epidural anesthetic. Accordingly, an epidural was placed without much difficulty and was dosed incrementally with 2% lidocaine with 1:200,000 epinephrine administered via the epidural catheter. The sympathetic block did not progress beyond T 12 level. Subsequent attempts to place a subarachnoid block were unsuccessful and the plan to convert to general anesthesia was made. Keeping in mind the propensity of these patients for cervical instability, and despite the absence of any obvious clinical signs and symptoms, in-line stabilization during endotracheal intubation was done. The baby was delivered with Apgar scores of 8 and 9 at 1 and 5 minutes respectively. The patient had an uneventful anesthetic and was successfully extubated at the end of the procedure. The post operative course was uneventful as well and she was discharged home on post operative day 3.

Abstract F 67

Cesarean Section for a Patient with Hypertrophic Obstructive Cardiomyopathy

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Hypertrophic obstructive cardiomyopathy(HOCM)is the most common genetic cardiovascular disorder transmitted as an autosomal dominant trait. It is characterized by asymmetric hypertrophy of the interventricular septum,resulting in obstruction of the left ventricular outflow tract (LVOT). The hallmark of the condition is the dynamic obstruction of the LVOT, which can be precipitated by sympathetic stimulation and a decrease in preload and afterload to the left ventricle, and can lead to sudden death. Aortocaval compression due to the gravid uterus decreases the preload and labor pains increase the heart rate and hence pregnant patients with HOCM may have an increased risk of LVOT obstruction. We present here the case of a 25 years old Spanish speaking female, diagnosed with HOCM at the age of 11 years, now 39 weeks pregnant, with a positive history of chest pain on exertion, shortness of breath and palpitations, wearing a life vest with no adverse events like NSVT on record,who presented for a repeat elective cesarean section. She was regularly followed up with both the OB/GYN and the Cardiology/EP clinics during her current pregnancy. The EP Cardiologists recommended delivery of the fetus prior to the placement of an Automatic Implantable Cardioverter Defibrillator (AICD). On physical examination,the patient's height was 5 feet, 2 inches and she weighed 172 pounds. Her airway exam was Mallampati 1, with free range of motion of the neck. Auscultation of the heart revealed a systolic ejection murmur, and transthoracic echocardiogram revealed an Ejection fraction of 70% with grade 2 diastolic dysfunction and severe LVOT obstruction. There was mild systolic anterior wall motion of the mitral valve leaflet. Her medications included Metoprolol 25 mg twice a day and Prenatal vitamins. After discussion with the EP cardiologists, the plan to remove the life vest for the cesarean section was made.. R2 pads were placed on the patient and connected to the defibrillator and she was monitored throughout the procedure. After obtaining good peripheral access by means of two large bore indwelling catheters, we infused a liter of saline to optimize preload. She was administered Metoprolol 25mg orally preoperatively. A left Radial arterial line was placed preoperatively for closer monitoring of the blood pressure. A continuous lumbar epidural block was performed without difficulty in the operating room and was dosed incrementally with 2% Lidocaine with 1:200,000 Epinephrine until a T4 level was achieved. An intravenous infusion of Phenylephrine was run throughout the procedure and titrated to effect. The baby was delivered, and had an Apgar scores of 9 and 9 at 1 and 5 minutes respectively. The intraoperative course was uneventful and the life vest was put back on the patient in the Recovery area. An AICD was placed the following day by the EP cardiologists under monitored anesthesia care. The patient was discharged home on on post operative day 5.

Abstract F 68

Pheochromocytoma and Twin Gestation

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Introduction: Pheochromocytoma is rare in pregnancy with an incidence of 0.002% and a maternal and fetal mortality rate greater than 50% when undiagnosed (1,2). We present a case of a parturient with pheochromocytoma and monochorionic-diamniotic twin gestation who underwent adrenalectomy at 22 weeks, developed a cardiomyopathy, severe preeclampsia, delivered at 23 3/7 weeks, and subsequently recovered.

Case: A 28 year old female, G2P1 at 22 weeks with a history of chronic hypertension and twin gestation presented for adrenalectomy secondary to pheochromocytoma. The patient was admitted at 19 6/7 weeks and was placed on alpha adrenergic blockade, phenoxybenzamine, for 13 days, along with labetalol and hydralazine. She was taken to the operating room where an awake arterial line was placed revealing blood pressures of 190s/110s, not correlating with the non-invasive blood pressure cuff readings of 150s systolic. She was immediately placed on a nicardipine infusion, which lowered her blood pressure into an acceptable range, and was transferred to the ICU, where her blood pressure was controlled for the next 24 hours. She was taken to the OR the following day at 22 weeks and underwent an uneventful open adrenalectomy. Postoperatively she developed cardiomyopathy and severe preeclampsia with a possible progression to HELLP syndrome. Prior to this, she had been ruled out for preeclampsia on many occasions. She underwent induction and delivery under epidural anesthesia at 23 3/7 weeks. The patient decided, after thorough discussion with her physicians, that the twins would not be resuscitated due to extreme prematurity. The patient's symptoms of edema, dyspnea and visual impairment all resolved and she was discharged home.

Discussion: Pheochromocytoma is a neuroendocrine tumor, usually of the adrenal medulla, which secretes catecholamines (3). If a parturient is diagnosed prior to 24 weeks, it is recommended to perform a laparoscopic adrenalectomy after the establishment of adequate alpha blockade. If diagnosed after 24 weeks, it is recommended to allow the pregnancy to continue under medical therapy until fetal maturity is reached at which time an elective cesarean section may be performed during or before tumor excision (3). Pheochromocytoma-induced cardiomyopathy is exceedingly rare and the exact mechanism is unknown (2). This case is unusual in that it was a twin gestation in which the mother not only had a pheochromocytoma but also had it removed, developed catecholamine-induced heart failure, severe preeclampsia and went on to recover. The relationship, if any, between pheochromocytoma and the development of preeclampsia and/or cardiomyopathy has limited description in the literature to date; however, it is an area that may warrant further investigation.

References:

1. Dugas G, et al. Can J Anesth 2004; 51: 134-8.
2. Olivia, R, et al. Hypertension 2010; 55: 600-6.
3. Lenders JWM. European Journal of Endocrinology 2012; 166: 143-50.

Abstract F 69

Vitreous Hemorrhage: A Rare Cause of Visual Change Following Subarachnoid Block for Cesarean Section

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A healthy 34 yo G2P1 presented for repeat Cesarean Section. An uneventful spinal was placed in the sitting position using a 24 G Sprotte needle placed through an introducer. Spinal fluid was clear and velocity of flow through the needle appeared normal. The patient was given 11.25mg of hyperbaric marcaine, 25mcg of fentanyl, and .25 mg of duramorph.

Immediately on assuming the supine position with LUD, she complained of visual changes in her left eye. Limited ophthalmic exam showed nothing grossly abnormal. Following a T-4 sensory block, the patient underwent an uneventful C-section.

Visual changes persisted on arrival in PACU described as a “black spot” in the center of her visual field in the left eye with intact peripheral vision. Ophthalmology consult and exam revealed a best-corrected visual acuity of 20/20 right eye and 20/800 left eye. Intraocular pressures, pupils, and anterior segment were normal. Dilated fundus examination was within normal limits in the right eye and was remarkable in the left eye for a large central preretinal hemorrhage obscuring the view of the macula and part of the optic nerve. Preretinal hemorrhages were also scattered in the mid-periphery. The optic disc margins were sharp and retinal vessels were normal. No posterior vitreous detachment was present. Macular OCT and B scan ultrasound revealed no subretinal fluid or abnormality other than the preretinal hemorrhage. A head CT was within normal limits.

Discussion: Ocular complications following neuraxial anesthesia are extremely rare. There have been reports of vitreous hemorrhage following lumbar and caudal epidural steroid injection and epiduroscopy. A proposed mechanism is transmission of a sudden increase in cerebrospinal fluid pressure to the optic nerve sheath due to large volumes (20-10mL) injected obstructing intraocular venous return or rupture of retinal blood vessels(2). A sudden decrease in cerebrospinal fluid pressure following a therapeutic high volume LP may also lead to vitreous hemorrhage. The rapid decrease in intracranial pressure could cause traction on the optic nerve and/or associated venous structures, resulting in an occlusion of venous drainage and subsequent vitreous hemorrhage(3).

To our knowledge, this is the first report of vitreous hemorrhage following a spinal anesthetic. Findings suggest this may be a spontaneous vitreous hemorrhage due to Valsalva retinopathy. Pregnancy is known to exert several hormonal, immunological and hematologic changes that increase the risk of hemorrhage and Valsalva retinopathy(1). In this case Valsalva may have occured during patient positioning in an attempt to arch her back, or by taking a deep breath and holding it during needle placement.

Prognosis for this condition is generally good with 80% of cases having visual recovery between 6 weeks to 6 months(2).

1)J Med Case Reports, 2008,2:101
2)Pain Medicine, 2005;6:367-374
3)Am J of Emerg Med, 2008(5):633

Abstract F 70

The Curious Case of Ventricular Tachycardia During Cesarean Delivery

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Introduction: Cardiac disease remains the leading overall cause of death in pregnant women reported at 2.31 per 100,000 maternal deaths [1]. Cardiac disease has the potential to remain undiagnosed, and may declare itself with cardiovascular compromise during peripartum period. Arrhythmias in pregnancy are common, and may be associated with hemodynamic, hormonal, autonomic imbalance, hypokalaemia and emotional changes.

We describe a case of a patient undergoing an urgent cesarean delivery (CD) for labor arrest, who developed severe bradycardia and subsequent ventricular tachycardia (VT) post-delivery.

Case report: A 32 year old primigravida at 40 weeks gestation presented with a history of multiple vasovagal attacks but no other significant past medical history. A CD was carried out for labor arrest after oxytocin augmentation. She consented to be enrolled into a carbetocin dose finding study. Lidocaine 2%, 20mL with 1:200,000 epinephrine and 50mcg fentanyl was used as an epidural top-up to achieve a T4 bilateral block. After delivery, carbetocin (blinded dose between 20 and 140mcg) was administered IV over one minute. Uterine tone was deemed adequate and hemodynamics were stable. During exteriorization of the uterus, the patient experienced acute dyspnea and chest discomfort associated with a sinus bradycardia of 32bpm from 90bpm. Atropine 600mcg IV was given. 20 secs later, the rhythm changed to monomorphic VT at 210bpm.

Oxygen, $MgSO_4$ 2g IV, KCl 20mmol/L IV and Amiodarone 150mg IV were administered. Rhythm reverted to sinus tachycardia after 5 min. Electrocardiogram in sinus rhythm revealed global ischemia and profound inferolateral ST segment depression, which resolved spontaneously within 40 min. The patient was fully conscious, and did not require intubation or vasopressor support.

A transthoracic echo was normal, with no regional left ventricular wall motion abnormality. ABG revealed normal pO_2, Potassium 3.4mmol/L and lactate 4.1mmol/L. The patient was monitored in CCU. The Troponin T reached a peak of 381ng/mL, 12 hours post event. CT coronary angiogram showed small caliber coronaries but no evidence of stenosis, dissection or thrombosis. She remained stable postoperatively with no adverse events.

Discussion: Differential diagnoses included atropine induced VT associated with rate related ischemia, carbetocin induced coronary vasospasm, coronary dissection or thromboembolism. This patient had previous history of vaso-vagal syncope, potentially exacerbating a vagal response to exteriorization of the uterus and increasing sensitivity to atropine [2]. This case seeks to raise the awareness of the need for vigilance during CD with drugs causing potential coronary vasospasm (uterotonics, vasopressors etc) and arrhythmias (antimuscarinics) as well as vagal stimulating maneuvers, even in patients without structural heart disease.

References:

1) BJOG 2011;118: 1–203.
2) J Anaesthesiol Clin Pharmacol 2011; 27: 541–543.

Abstract F 71

Anesthetic Management for ECT during Different Stages of Pregnancy

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The most common major mental illness during pregnancy is major depressive disorder. Untreated depression has been associated with poor maternal and neonatal outcome including poor prenantal care, inadequate weight gain, premature delivery, substance abuse, disengaged parenting behaviors, and suicide. Pharmacological therapy is complicated; many psychotropic medications are teratogens and there is a risk of neonatal toxicity (O'Reardon et al). Electroconvulsive therapy (ECT) is therefore an attractive treatment option and sometimes a first line therapy (Maletzky et al). Literature on ECT in pregnancy suggests that it is effective with low risk to the woman and fetus. Of 329 cases reviewed, there were 20 maternal complications, 18 related to ECT, and 25 fetal complications (Anderson et al). We report on four cases from first trimester to postpartum in which anesthesia was safely delivered.

Case #1 is a 22yo at 7.5 weeks and case #2 is a 31yo at 14 weeks. For the first and second trimester, we preoxygenated and induced with propofol and succinylcholine. The patient was masked until spontaneous ventilation returned. Methohexital and propofol are commonly used anesthetics for ECT because of rapid onset, short duration, and while they cross the placenta, are not teratogenic. Succinylcholine is the most commonly used muscle relaxant and is metabolized by pseudocholinesterases and although these levels decrease with pregnancy, it is not clinically significant.

Case #3 is a 35yo at 35.5 weeks and case #4 is a 33yo 9 days postpartum. For the third trimester and postpartum, we gave sodium citrate, preoxygenated, and induced with propofol and succinylcholine with cricoid pressure. An endotracheal tube was placed, patient ventilated on manual spontaneous mode, and extubated at the end. Pregnant women are predisposed to aspiration due to increased intragastric pressure and decreased lower esophageal sphincter tone and case reports have described intubation for ECT during the third trimester. Anticholinergic agents are commonly used in ECT to prevent bradycardia due to parasympathetic stimulation.

We have described the anesthetic management of 4 cases throughout various stages of pregnancy. Pharmacologic management, full stomach precautions, and hemodynamic changes in ECT were each considered and the anesthetic plan was tailored to the particular risks of the fetus and mother. With care, anesthesia for ECT may safely and effectively be administered during pregnancy.

References

Anderson, et al. ECT in pregnancy: a review of the literature from 1941 to 2007. Psychosom Med. 2009 Feb;71(2):235-42.
Maletzky, et al. The first-line use of electroconvulsive therapy in major affective disorders. J ECT. 2004 Jun;20(2):112-7.
O'Reardon, et al. Acute and maintenance electroconvulsive therapy for treatment of severe major depression during the second and third trimesters of pregnancy with infant follow-up to 18 months. J ECT. 2011 Mar;27(1):e23-6.

Abstract F 72

Anesthetic Management of a Parturient with Heterotaxy Syndrome: A Case Report

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Introduction: Heterotaxy syndrome (HS) is infrequently found in adults, especially in the pregnant population. It is a congenital disorder caused by failed embryonic development of normal left-right asymmetry and is associated with a wide range of cardiac and extracardiac congenital anomalies in the gastrointestinal and bronchopulmonary systems, the axial skeletal and the CNS (1). Pregnancy outcomes in women with heterotaxy syndrome have not been reported (2), but require a multidisciplinary approach.

Case: A 25-year-old primigravida at 34 weeks EGA presented for anesthetic evaluation. Her medical history was significant for HS characterized by right pulmonary agenesis, tracheal defect requiring patch repair as a neonate and tracheostomy from age 2 months to 2 years old. Other abnormalities included dextrocardia, asplenia, deafness, and microgastria with recurrent aspiration pneumonia. Her most recent episode of pneumonia was 3 days prior to admission. Echocardiography demonstrated an EF of 70% with mild tricuspid regurgitation and mild pulmonary hypertension. PFTs indicated FEV1 at 26% of predicated, and FVC at 47%. Chest x-ray revealed complete opacification of the right hemithorax with compensatory hyperinflation of the left lung and mild right tracheal deviation. She was a thin frail female at 145cm (4'7") and 41.4kg with a marked kyphoscoliosis.

A multidisciplinary approach to our patient's care was developed by Anesthesiology, OB and social services. Given her history of tracheomalacia and prior tracheostomy, ENT was consulted for lower airway evaluation. The risks and benefits of vaginal delivery vs C/S and GA vs neuraxial analgesia were discussed with her; vaginal delivery under epidural was chosen. An epidural was placed at 5cm cervical dilation without difficulty. The epidural was initiated and maintained with a reduced amount of local anesthetic due to her short stature, but a second epidural was necessary because of intravascular migration. She had an uncomplicated SVD of a baby boy without obvious anomalies. She required oxygen after delivery but did not again develop pneumonia .

Discussion: Our patient's history of recurrent pulmonary aspiration, right lung agenesis, prior tracheostomy and mild pulmonary hypertension predisposed her to airway difficulties and pulmonary complications if C/S under GA became necessary (short stature, small unproven pelvis). Early epidural placement was essential to ensure time for troubleshooting (3) in an effort to avoid GA. Our understanding of her cardiac, pulmonary and skeletal defects along with an informed delivery plan led to a favorable outcome.

References:

1. J of Cardiothoracic and Vascular Anesthesia 2010; 24:834-844.
2. Diagnosis and Management of Adult Congenital Heart Disease, 2nd ed. Gatzoulis MA, et al editors. Saunders, 2011.
3. Anesth Analg 2009;109(6):1930-4.

Abstract F 73

The Development of Non-Web Based Maternity Database as a Quality Improvement Tool at Ridge Regional Hospital, Ghana

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Introduction: Kybele®'s partnership with Ghana health service towards improving maternal care is ongoing. Numbers of deliveries have grown from 1900 deliveries in 2004 to over 11,000 in 2012, a five - fold increase at Ridge Hospital. Staffing numbers have only doubled. Monthly paper-based data generated by the midwives was unsustainable and labor-intensive. Quality improvement (QI)metrics to assess progress of system change implementations (referral patterns, case fatality ratios, stillbirths from referral centers and within Ridge system, cesarean section delays, reduction in NICU admissions, maternal death) is required. As internet access is often unreliable, a non-web database was created.

Methods: Monthly maternal demographic summary and QI metrics are collected from patient folders and log books in maternity wards, operating rooms, and NICU. New wide-screen 23" computer, fan and semi-private room is created to improve working condition for data entry personnel. The database was developed on Microsoft Access 2010 platform. Intermittent internet connection allowed distance access to database and improvement made with minimal disruption to daily data acquisition. Authors C. Petermann and P Herlihy, both Microsoft access experts, contributed pro bono to database revisions. The database is backed-up daily on a usb drive.

Results: A comprehensive locally-applicable maternity application was created that has incorporated government-required data and the continual QI metrics. Changes to database due to new metrics identified are undertaken while the database is not in use, due to the time zone differences. Midwives can now concentrate on midwifery responsibilities. Currently, government and hospital auditors and departmental researchers utilize the database as a reliable generator of useful summary data.

Conclusions: Non web-based locally-generated database allows customized relevant data acquisition. Fluctuating internet availability means web-based database entry is unavailable. Internet can be reserved for long-distance remote improvement of software. Universal knowledge and availability of Microsoft Access allows easier internet-based support. Non Microsoft Access based platforms may have restricted customization and higher financial costs that are too burdensome to small low resource hospitals. A non web based local database can be easily installed in small local maternity units within the same area where the same type of data is collected.

Abstract F 74

Isoimmunization: A High Risk Pregnancy

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Introduction: Isoimmunization in pregnancy occurs when a mother with Rh-negative blood is exposed to blood of a fetus that is Rh-positive. Rh sensitization will lead to the production of maternal antibodies against the Rh-positive RBC. An Rh-positive fetus or neonate may then be at risk of developing hemolytic disease. These antibodies may not be problematic during a woman's first pregnancy, since the sensitization may not occur until delivery, but subsequent pregnancies may present increased risk to the Rh positive fetus. Rh negative mothers benefit from early prenatal visits and on-going care, often from an Obstetrician trained in Maternal Fetal Medicine (MFM) to deal with problems that might arise.

Case Presentation: SA is a 25-year-old female, G6P2122, who presented to labor and delivery with decreased fetal movement at 34 weeks gestation. The patient's prenatal course was significant for Rh isoimmunization and percutaneous umbilical cord blood sampling (PUBS) and fetal blood transfusion on 5 different occasions starting at 26 weeks gestation. Regional analgesia, combined spinal epidural (CSE), was used on each occasion and fetal paralysis administered when requested by MFM. On this admission the decision was made to induce labor and a CSE was placed upon patient request. Three hours later the patient was taken for an emergent cesarean section do to nonreassuring fetal heart rate (NRFHR) and epidural anesthesia was used. The surgical course was uneventful and a male neonate was delivered with APGARS of 3(1minute) and 7 (5 minute). The neonate was transported to the NICU and given a blood transfusion.

Discussion: This case is a woman with known Rh sensitization and a fetus that demonstrated severe fetal anemia on numerous occasions during the pregnancy. Regional analgesia was employed for each PUBS and fetal transfusion, which provided optimal conditions for mother, fetus and MFM performing the procedures. When the patient presented to Labor and Delivery at 34.2 weeks gestation with complaints of decreased fetal movement the decision was made to induce labor. Four hours after admission a CSE was placed for labor analgesia upon patient request. The decision was made to proceed for a Cesarean delivery 1.5 hours after initiation of analgesia due to a NFHR. After delivery the neonate was anemic on admission to the NICU and given a blood transfusion. It is apparent that the fetus had a low reserve do to the maternal isoimmunization and resultant anemia.

Conclusion: Regional analgesia and anesthesia for pregnancies complicated by maternal isoimmunization is important in providing maternal comfort and optimal conditions for PUBS, fetal transfusion, and delivery.

References:
Nicolaides KH, Rodeck CH. Maternal serum anti-D antibody concentration and assessment of rhesus isoimmunisation. BMJ 1992; 304:1155
Wallerstein H (1946). Treatment of severe erythroblastosis by simultaneous removal and replacement of blood of the newborn. Science, 103, 583-4

Abstract F 75

Anesthetic Management for Cesarean Section of a Patient with Severe Preeclampsia and Aortic Dissection

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Introduction: We present our management of a patient with severe preeclampsia and aortic dissection for cesarean section (C/S).

Case Report: A 40 year old G10P9 female presented at 37 weeks gestation with severe range blood pressures. The patient was a poor historian and a thorough review of previous visits was conducted.

Her past medical history was significant for chronic hypertension (HTN). She admitted to noncompliance with her medications. Blood pressure (BP) now was 170s/100s.

A review of records found a CT scan from the previous pregnancy which demonstrated a Type A aortic dissection at 34 weeks gestation. Intraoperative TEE at that time revealed the dissection was actually Type B and the patient was discharged for medical management after her cesarean section. The Type A appearance on CT was attributed to scatter from the patient's body habitus. The patient was lost to follow-up.

Past Surgical History: C/S x 3

Meds: unknown anti-HTN medication, daily albuterol

Social: daily alcohol and tobacco use, frequent cocaine use (last smoked 2 days prior; no signs or symptoms of acute intoxication or withdrawal)

On physical exam: Height: 67 inches. Weight: 300 pounds. VS: Temp 36.4, Pulse 94, Resp 24, BP 188/120. Airway: Mallampati 2, poor dentition with multiple missing upper and lower teeth. Lungs: Clear to auscultation bilaterally. Heart: S1S2 normal. (+) systolic murmur. Hemoglobin 10.7 g/dL. Platelets 202 x 10^9/L.

CT Scan: Type A dissection extending beyond the renal arteries. Infrarenal abdominal aortic aneurysm measuring 4 cm maximally.

Severe preeclampsia was suspected. Blood pressure control was with labetalol and lorazepam. Magnesium was used for seizure prophylaxis. Multidisciplinary conversations were held involving MFM, anesthesiology, cardiology, trauma surgery, and vascular surgery. It was decided to deliver the patient via C/S, monitor patient in the ICU in the postoperative period, and once stable transfer to a nearby hospital for management by vascular surgery.

By the time the patient was ready to the OR her BP had been slowly decreased to 140/75. Bypass equipment was in the OR. An epidural was placed at L4-L5 and slowly dosed with 2% lidocaine to achieve a T4 block. The patient did not tolerate the pulling and pressure sensations as the surgeons worked through adhesions. In order to allow for optimal control of BP, GA was induced. The remainder of the case and postoperative course was uneventful. EBL was 800 ml. Epidural preservative free morphine was given for postoperative pain control.

Discussion: Type A dissection involves the aorta proximal to the origin of the left subclavian artery. Type B dissection is confined to the descending aorta. Type A dissections are usually managed surgically and Type B are usually managed medically. Anesthetic goals involve minimizing aortic root shear forces and wall stress. This involves slowly decreasing blood pressure and preventing catecholamine release secondary to pain.

Abstract F 76

A Parturient with Hyperthyroidism and Propylthiouracil-Related Liver Failure

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A 24 year old G3P1011 at 16 weeks and 6 days with a history of hyperthyroidism was found to be in acute liver failure, likely due to propylthiouracil (PTU) toxicity. She was admitted to the Intensive Care Unit (ICU) and scheduled for an urgent total thyroidectomy the next day. Fetal heart tones were within the normal rage pre-operatively. The patient, with standard monitors applied, was pre-medicated with 100 μg intravenous fentanyl and pre-oxygenated for four minutes. The bed was positioned for left-uterine displacement and anesthesia was induced with rapid-sequence: propofol 200 mg and succinylcholine 100 mg while holding cricoid pressure. After tracheal intubation, an arterial catheter was placed, and inhalation anesthesia was maintained with sevoflurane. The patient maintained normal hemodynamics throughout and was extubated uneventfully at the operation's end. She was monitored in the post-anesthesia care unit for two hours, fetal heart tones were once again normal, and then she returned to the ICU. She was discharged on post-operative day one and completed an uneventful recovery. She remains pregnant today.

Graves' disease is the most common cause of hyperthyroidism. Its signs and symptoms include tachycardia, heat intolerance, increased perspiration, anxiety, tremor, and weight loss. In the pregnant patient with poorly-controlled hyperthyroidism the incidence of the following complications is increased: spontaneous abortion, premature labor, low birth weight, pre-eclampsia, heart failure, and stillbirth.

The thionamide medications PTU and methimazole (MMI) are recommended for treatment of hyperthyroidism during pregnancy. There have been case reports of MMI teratogenicity, although this is controversial. The symptoms of moderate to severe hyperthyroidism are often managed acutely with beta adrenergic blockade. However, hyperthyroidism control with PTU and discontinuation of beta blockers should be achieved as soon as possible due to beta blockade effects on the neonate: possible bradycardia, respiratory depression, growth restriction, and hypoglycemia. The patient was on PTU, considered generally safe in pregnancy despite its ability to cross the placenta.

A rare but serious complication of PTU therapy is acute, severe liver failure. The patient was markedly jaundiced and had very elevated transaminase, bilirubin, and alkaline phosphate levels. Her INR and platelets were within normal limits. Treatment for PTU-induced liver failure is supportive and includes discontinuation of the offending medication; total thyroidectomy was necessary to control her hyperthyroidism. It is important for obstetric anesthesiologists to be aware of the symptoms of hyperthyroidism, its treatment modalities and their potential complications. This patient presented a unique set of circumstances and required a multidisciplinary team approach.

Refs:

1. Davis et al. Am J Obstet Gynecol 1989; 160(1):63
2. Roti et al. J Clin Endocrinol Metab. 1996;81(5):1679

Abstract F 77

Cesarean Section for a Patient with Severe Preeclampsia, Morbid Obesity and Rapidly Worsening Pneumonia

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Scott Levin D.O. - Temple University Hospital - Philadelphia, P.A.

Severe preeclampsia during pregnancy can present numerous challenges to both the obstetrician and the anesthesiologist. Compounding problems like rapidly progressing bilateral lobar pneumonia and morbid obesity can make the management of these patients a daunting task. We present here the case of a 33 years old female 29 weeks pregnant with severe preeclampsia who presented to labor and delivery with one week history of worsening shortness of breath, productive cough with fever, and substernal chest pain. Given her strong family history of thromboembolism, she was admitted to the hospital with a working diagnosis of pulmonary embolism and a heparin infusion was started empirically. Spiral CT scan of the chest did not exhibit any evidence of pulmonary embolism. Chest X Ray showed retrocardiac consolidation bilaterally with para bronchial cuffing suggestive of pneumonia. A transthoracic echocardiogram showed an ejection fraction around 60-65%. An ultrasound showed the fetal presentation to be breech. On examination, the patient was a very pleasant Hispanic female, with a height of 5 feet, and she weighed 290 pounds. She had a short thick neck and her airway exam was Mallampati 3, with a large tongue. After admission, her oxygen requirement increased steeply as her pneumonia worsened and she experienced difficulty lying flat. She had a history of a prior cesarean section done at an outside hospital. In view of her worsening condition, and the fact that she had been receiving betamethasone for fetal lung maturity, the plan to deliver her baby by cesarean section was made. The heparin infusion was stopped 12 hours prior to surgery. The patient expressed a strong desire not to be intubated. She was kept on 10 liters of oxygen with aquanox. Since heparin infusion had been stopped and her last dose of subcutaneous heparin was 12 hours ago, the plan to perform an epidural block for cesarean section was made. Two large bore intravenous lines were placed preoperatively. The epidural catheter was incrementally dosed with 2%lidocaine with 1:200,000 epinephrine until a T4 level was achieved.The patient was placed in twenty degrees head up position throughout the procedure. The oxygen supplement with 10 liters of oxygen with aquanox was continued throughout the procedure. The baby delivered was immediately transferred to the neonatal intensive care unit for further management. The patient had a smooth intraoperative course and continued to improve postoperatively. Her oxygen requirements decreased substantially and she was discharged home with 2 liters of oxygen via nasal cannula on post operative day 6.

Abstract F 78

Septic Pelvic Thrombophlebitis with Rare Associated Pulmonary Embolism

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Background: Sepsis and embolic events are leading causes of maternal mortality worldwide. Septic pelvic thrombophlebitis (SPT) is a rare complication of the puerperium, with an incidence of 1 in 3000 deliveries. We describe a case of SPT associated with overwhelming septic emboli, obfuscating preoperative evaluation prior to hysterectomy.

Case: A 28 year old healthy G3P1 had an uncomplicated vaginal delivery. On postpartum day 6 she presented with altered mental status and bleeding gums. Evaluation showed fever, tachycardia, leukocytosis, platelets 5k, acute kidney injury, and liver failure. She was intubated and started on antibiotics and vasopressors for septic shock and also diltiazem for acute-onset atrial fibrillation. Foul smelling vaginal discharge was noted and after endometrial biopsy, concern was raised for primary group A streptococcal endometritis. Urgent hysterectomy was planned.

On arrival to the operating room the team was notified by page that a previously obtained renal artery ultrasound (US) showed an inferior vena cava (IVC) thrombus. Vascular surgery was consulted and remarked on disseminated clots on a liver US. A bedside transthoracic echocardiogram revealed signs of possible right ventricular thrombus. Surgery was aborted given these findings which suggested the possibility of early-DIC induced pulmonary embolism (PE) as an explanation for her clinical picture.

A CT chest was negative for massive PE but showed evidence of septic pulmonary emboli, and a head CT revealed a small punctate hemorrhage in the right frontal lobe. Cyclical fevers continued, and hysterectomy proceeded; laparotomy revealed a necrotic uterus, ischemic left ovary and thrombi within the ligaments. An IVC filter was placed and she was started on therapeutic heparin. She had persistent fevers and tachycardia and on day 18, she progressed to PEA arrest; although pulse was regained following six minutes of chest compressions, the event resulted in anoxic brain injury.

Discussion: SPT is characterized by a persistent postpartum fever with or without abdominal pain. Intimal damage of pelvic veins is thought to lead to thrombogenesis. Early reports of SPT named surgical excision of the thrombosed vein as the treatment of choice; current therapy consists of antibiotics conjunction with systemic anticoagulation.

Pulmonary emboli occur in only 2% of SPT cases and usually do not cause hypoxemia. Mortality is very low; a study that included 69 cases of SPT out of 45,000 deliveries observed no deaths.[2] In this case, the patient's devastating systemic infection due to her overwhelming septic clot burden likely lead to her demise.

1. Wysokinska EM. Thromb Haemost. 2006;96:126
2. Brown CE. Am J Obstet Gynecol. 1999;181:143
3. Collins JH. Am J Obstet Gynecol. 1959;77:760

Abstracts ~ Saturday

Abstract S 1

The Incidence of Non-Invasive Blood Pressure Measurement Failure, as a Result of Shivering, During Delivery in the Operating Room: An Audit

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Introduction: Shivering related to spinals, epidurals or combined spinal-epidurals is common in pregnant women delivering via operative delivery (caesarean or forceps). Shivering can affect non-invasive blood pressure (NIBP) monitoring on the patient's upper arm to the extent that blood pressure measurements cannot be recorded. Investigating the incidence of NIBP failure as a result of shivering will help anesthesiologists learn more about this problem, and facilitate the design of a future project addressing this important concern. This prospective audit collected data about the incidence of failed (NIBP) as a result of maternal shivering during their operative delivery. Informed consent was waived due to the nature of the study and ethics committee approval was obtained.

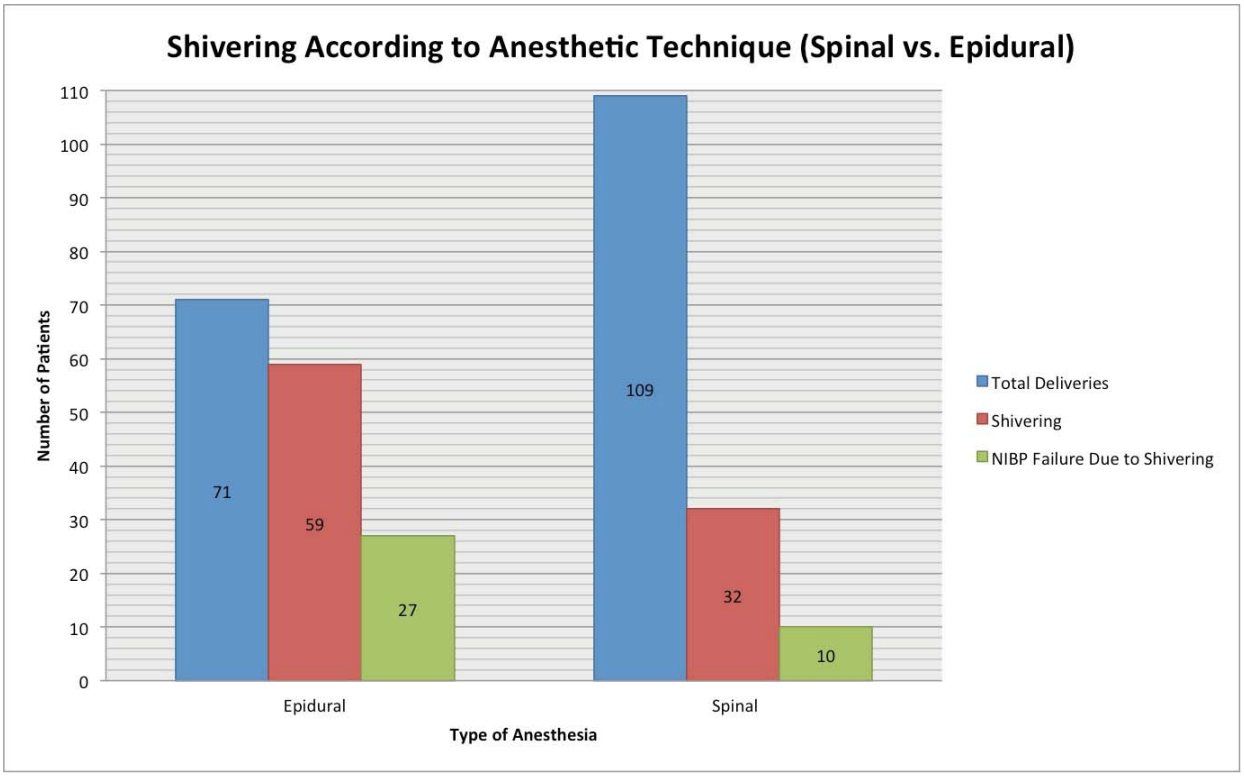
Material and Methods: Over four weeks, anesthesiologists recorded the occurrence of NIBP failure and shivering during operative deliveries (forceps and/or caesarean deliveries) through a data collection sheet. All deliveries taking place in the OR during this period of time were included. The only exclusion criterion was the use of arterial line to monitor blood pressure.

Results: One hundred and ninety patients were included, contributing to a high capture rate of 97% (total OR deliveries=196). Overall incidence of shivering was 51%. The majority of shivering patients were the ones that had a functioning labour epidural and received an epidural top-up for forceps or cesarean delivery (63.4%). Incidence of shivering on epidural patients was as high as 83%. Failure due to this shivering occurred in 38% of epidural patients. On the other hand, spinal anesthesia patients shivered in only 29% of the cases, and NIBP failure due to shivering occurred in 9% of the spinal patients.

Conclusion: The results show significant occurrence of NIBP failure, predominantly in epidural anaesthesia. We have documented a critical issue affecting the standard of care for NIBP monitoring. Future studies should address how to reduce the incidence of NIBP measurement failure.

References

Thermoregulatory effects of spinal and epidural anesthesia during cesarean delivery. Saito T et al. Reg Anesth Pain Med 1998;23:418-23
Shivering and neuraxial anesthesia. Crowley L J, Buggy D J Reg Anesth Pain Med 2008;33:241-252
Incidence of failure of upper limb automated blood pressure measurement during caesarean section. M Hamad, R Freeman, I Wrench PD06 IJOA 2001;10:218



The Informed Consent Process for Labor Epidural Analgesia: A Prospective Survey of Patient Comprehension and Satisfaction

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Background: Women experiencing labor pain have been shown to retain the capacity to provide informed consent (1). However, patient and provider surveys have demonstrated wide variability in what information is disclosed to patients, its source, and what is retained (2,3). Although retention does not always correlate with comprehension, it serves as a surrogate for adequacy of informed consent. At our institution, the labor epidural consent process involves discussion of risks, benefits, and alternative modes of pain relief. However, the timing of the process is variable: women may be consented prior to labor onset, while in early labor, or immediately prior to placement of the labor epidural.

Aims:
1. Assess whether patients felt they received sufficient information to give informed consent and evaluate their satisfaction with the current consent process.
2. Assess whether patients understood the key risks and side effects associated with labor epidurals and determine if timing of consent in relation to timing of epidural placement is an independent factor for such understanding.

Methods: Patients who received epidural analgesia for labor and vaginal delivery were approached for study participation on postpartum day one. After IRB approval and verbal consent, a standardized survey was collected prospectively by a single investigator. Of note, the epidural consent was obtained per standard of care by multiple providers and was not controlled.

Statistical Analysis: Patient surveys were divided into 3 groups based the time interval between consent to epidural placement: Group 1 – immediate, Group 2 – < 3 hours and Group 3 – > 3 hours. Retention scores were calculated from responses to 10 questions regarding risks and complications, and reported as a percentage (0-100% scale). An interim power analysis calculated a sample size of 183 (61 per group) to detect a clinically important difference in total retention scores among the three groups using one-way ANOVA.

Results: Out of 83 patients approached, 65 completed the survey. Preliminary analysis showed that 97% of patients were satisfied with the process and felt they received sufficient information to provide informed consent. There was a trend towards greater retention of information among women who were consented earlier in their labor (group 1: 66.9 ± 16.4 %; group 2: 68.8 ± 12.0 %; group 3: 72.3 ± 14.4 %; p value 0.56) although it was not significant. Recruitment and analysis is ongoing.

Discussion: Prospective survey of postpartum patients in our institution who received labor epidurals indicates high level of satisfaction with the consent process. Our preliminary results suggest that patients consented earlier in labor have greater retention of information. Further survey collection may confirm this finding.

Ref:
1.Affleck PJ,et al.J Clin Anesth 1998;10:141-4
2.Jackson A,et al.Can J Anaesth 2000;47:1068–73
3.Bethune L,et al.Int J Obstet Anesth;2004;13:30-4

Obstetric Admissions to Major Urban Academic Medical Center Intensive Care Units: A 6 Year Review

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Although relatively uncommon, severe pregnancy induced disease or life threatening illness coincidental with pregnancy may require specialized intensive care for some women. This study examines utilization of the intensive care units resources by pregnant women over a 6 year period at a major urban academic medical center.

Objective: To review all pregnant women who required admission to major urban academic medical center Intensive Care Units (ICU) during pregnancy, childbirth or within 2 weeks postpartum.

Study Design: Retrospective chart review study in a tertiary care center. The records of all obstetric ICU admissions from January 1, 2005 to December 31, 2010 were reviewed.

Results: Over these six years 144 women required ICU admission (0.004% of all deliveries, 0.01% of all adult ICU admissions). The mean age was 30 years. 31% of the women were of Hispanic ethnicity, 20% White, 19% Black, 4% Asian, and 26% Other(probably not coded). Most of the women (64%) were admitted to the ICU postpartum. Obstetric hemorrhage (28%) and cardiac disease (23%) were the two most common reasons for admission. Together with hypertension, respiratory disorders, and infection, these accounted for close to 90% of all admissions. Preexisting medical conditions were present in 33% of all admissions; most common was obesity (16%) and cardiac disease (8%). Prolonged ventilation and/or inotropic support were generally not required. The most common intervention was arterial line insertion (80%) and mechanical ventilation for less than 24 hours (60%). Maternal mortality was 6%.

Conclusion: Postpartum hemorrhage and cardiac disease were the most common causes of admission to our hospital's Intensive Care Units. However, almost uniformly in both developed and developing countries, the second most common cause of admission to ICU was hypertensive disorders of pregnancy. It is possible that since in our tertiary/quaternary care hospital antihypertensive infusions and arterial and central venous line placement and monitoring can be performed in the high risk labor and delivery suite, a major indication/ trigger for ICU transfer is the requirement for ventilator support or pulmonary artery catheter monitoring, hence we do not see as many ICU admissions for hypertensive disorders of pregnancy. The admission rate to intensive care may be reduced by improving medical therapy of cardiac disease and educating the patients about the risks of pregnancy with congenital heart disease or cardiomyopathy.

References:

1. Keizer JL, Zwart JJ, Meerman RH, Harinck BI, Feuth HD, van Roosmalen J. Obstetric intensive care admissions: a 12-year review in a tertiary care centre. Eur J Obstet Gynecol Reprod Biol. 2006 Sep-Oct;128(1-2):152-6
2. Al-Suleiman SA, Qutub HO, Rahman J, Rahman MS. Obstetric admissions to the intensive care unit: a 12-year review. Arch Gynecol Obstet. 2006 Apr;274(1):4-8

Table 1. Characteristics of Admission by Intensive Care Unit Level

	Medical ICU	Surgical ICU	Cardiac Unit	Cardiothoracic ICU	Allen[2] ICU	Neurological ICU
Number of Women Admitted to ICU	19 (13%)	72 (50%)	18 (13%)	5 (3%)	24 (17%)	6(4%)
Mean duration of ICU Stay (days)	3.2	2.8	4.7	5.2	1.9	15
Mean duration of Hospitalization (days)	16	7	14	10	3	19
Maternal Mortality n=10	3	4	1	1	0	1
Pressor/Inotropic support n=42	6 (32%)	20 (28%)	5 (28%)	5 (100%)	4(17%)	2 (33%)
Blood Products Transfusion n=41	4 (21%)	30 (42%)	2 (11%)	2 (40%)	3 (12%)	0
Assisted Ventilation >24 hrs n=20	5 (26%)	8 (11%)	1 (6%)	3 (60%)	0	3 (50%)
Assisted Ventilation<24 hrs n=68	9 (47%)	54 (75%)	0	2 (40%)	3 (13%)	0
Invasive monitoring:						
Arterial line n=85	11 (58%)	48 (67%)	15 (83%)	5 (100%)	2 (8%)	4 (67%)
Central Venous Line n=49	5 (26%)	30 (42%)	7 (39%)	5 (100%)	1 (0.04%)	1 (17%)
Pumonary Artery Catheters n=38	2 (11%)	10 (14%)	2 (11%)	5 (100%)	0	0
ECMO n=2	0	0	0	2	0	0
VAD n=1	0	0	0	1	0	0
Diagnosis	0					
Major Obstetric Hemorrhage n=41	3 (16%)	30 (42%)	0	0	11 (46%)	0
Preeclampsia/Eclampsia n=13	5 (26%)	3 (4%)	0	0	7 (29%)	0
Cardiac Disease n=33	3 (16%)	5 (7%)	18 (100%)	3 (60%)	2 (8%)	0
Sepsis n=16	2 (11%)	11 (15%)	0	0	2 (8%)	0
Wound infection n=8	2 (11%)	6 (8%)	0	0	0	0
Pulmonary Disease n=15	1 (5%)	10 (14%)	0	2 (40%)	1(4%)	0
Cerebral Disease n=6	1 (5%)	0	0	0	0	5(83%)
Liver/Pancreatic Disease n=4	1 (5%)	3 (4%)	0	0	0	0
Thromboembolism n=5	1 (5%)	4 (6%)	0	0	0	0
Miscellaneous [1] n=3		0	0	0	1 (4%)	1 (17%)

[1]Autoimmune, epilepsy, substance abuse

[2]Community hospital of New York Presbyterian

Abstract S 4

Perioperative and Transfusion Outcomes in Women Undergoing Cesarean Hysterectomy for Abnormal Placentation

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Introduction: Cesarean hysterectomy (CH) is commonly performed in women with placenta increta (PI) or placenta percreta (PP). Although the risk of major hemorrhage is well-known in women with PI and PP (1,2), the severity of hemorrhage and perioperative morbidity may differ according to the degree of placental invasion. We sought to compare hematologic, transfusion and perioperative outcomes between women undergoing CH for PI vs. PP.

Methods: After IRB approval, we identified 77 women who underwent CH for PI (n=43) or PP (n=34) from the NICHD MFMU Network Cesarean registry, which sourced data from 19 centers from 1999-2002. Hematologic indices, and rates of transfusion and perioperative morbidity were compared between PI and PP groups. Hematologic and transfusion data included: preoperative Hb and platelet (PLT) count; lowest postpartum Hb and PLT count; intraoperative and postpartum transfusion of RBC, FFP and PLTs. Data presented as n (%), mean (SD), median [IQR]. Students t-test, Mann-Whitney U test and Fishers Exact test were used for between-group analyses; P<0.05 as statistically significant.

Results: Rates of RBC transfusion were high in both PP and PI groups (> 73%), with a non-significantly higher proportion of PP patients receiving 5-8 units or >8 units RBC intraoperatively compared to the PI group (Table). Intraoperative and postpartum rates of FFP and PLT transfusion were less than 42% in both groups (Table). We observed a trend towards a higher incidence of general anesthesia in PP patients vs. PI patients. Compared to PI patients, PP patients had significantly higher rates of cystotomy (P=0.02) and postoperative mechanical ventilation (P=0.03), and non-significantly higher rates of ICU admission, coagulopathy, pulmonary edema, ureteral injury and ARDS (Table).

Discussion: Rates of morbidity in PP and PI patients undergoing CH are high. We observed a trend towards higher rates of RBC transfusion, perioperative morbidity and use of general anesthesia in PP women compared to PI women, which is likely to be related to differences in the degrees of abnormal placentation. For PI and PP patients requiring CH, further research is needed to optimize surgical approaches and establish massive transfusion protocols to reduce hemorrhage and surgical-related morbidities.

Refs: (1) BJOG 2009;116:648-54.(2) Acta Obstet Gynecol Scand 2011;90:1140-6.

Table. Transfusion and Perioperative Morbidity Data

	Placenta Increta (N=43)	Placenta Percreta (N=34)	p-value
	Transfusion Data		
RBC transfusion	36 (84%)	30 (88%)	0.7
Intraoperative RBC transfusion	32 (74%)	27 (79%)	0.8
# Number of units of RBCs transfused intraoperatively			
0	11 (26%)	7 (21%)	0.2
1-4	15 (35%)	13 (38%)	
5-8	11 (26%)	4 (12%)	
>8	6 (14%)	10 (29%)	
Postpartum RBC transfusion	18 (42%)	19 (56%)	0.3
Intraoperative FFP transfusion	13 (30%)	14 (41%)	0.3
Postpartum FFP transfusion	12 (28%)	6 (18%)	0.4
Intraoperative platelet transfusion	6 (14%)	10 (29%)	0.2
Postpartum platelet transfusion	4 (9%)	3 (9%)	1.0
	Other Perioperative Morbidities		
Cystotomy during procedure	6 (14%)	13 (38%)	0.02
Ureteral injury during procedure	1 (2%)	3 (9%)	0.3
Wound complication	4 (9%)	1 (3%)	0.4
ICU admission	14 (33%)	18 (53%)	0.1
Postop mechanical ventilation	6 (14%)	12 (35%)	0.03
Postop ARDS	1 (2%)	1 (3%)	1.0
Postop coagulopathy	5 (12%)	8 (24%)	0.2
Postop pulmonary edema	0 (0%)	3 (9%)	0.08

Data presented as n (%)
RBC = Red Blood Cells, FFP = Fresh Frozen Plasma, ICU = Intensive Care Unit, ARDS = Adult Respiratory Distress Syndrome

Abstract S 5

A Non-Traditional Texas "Two"-Step: Using "Handoffs" and "Huddles" to Enhance a Culture of Patient Safety in the Obstetric Suite

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Introduction: Effective communication is key to enhancing a culture of patient safety in any clinical setting-especially the dynamic obstetric suite. Poor communication has been cited as a common root cause of sentinel events. Regulatory bodies such as CMS, Joint Commission, and ACGME promote effective communication among healthcare providers. In this era where major changes in health care delivery are anticipated, it is paramount that anesthesiologists endorse improved communication, teambuilding, and patient safety. Recently, obstetric anesthesia checkout rounds at the authors' institution were restructured to include tools from TeamSTEPPS, an evidence-based program developed by Agency for Healthcare Research & Quality to enhance provider performance and patient safety. This ongoing IRB-approved "two"-fold QI study has aimed to implement modifications of TeamSTEPPS tools -handoffs mnemonic "I PASS the BATON" and multidisciplinary "huddles" -for use in obstetric anesthesia and to evaluate these practices.

Methods:
1. Prior to implementation, clinicians from multiple disciplines attended a conference introducing them to tools to be used. A 5-point teamwork pretest was administered; a posttest was given 6 months later.

2. To evaluate obstetric anesthesia handoffs practices, 47 handoffs have been observed thus far where trainees were randomized to use either a non-standardized method or the standardized handoff tool. Patient information transfer scores (PITS) were calculated and represent the percentage of information (from a checklist) transferred between trainees.

Results: An independent, two-sample t-test assuming unequal variances compared PITS between handoffs groups. PITS were significantly greater ($p<0.001$) among trainees who used the standardized tool (mean=92.6, sd=7.6) compared to those who did not (mean=69.5, sd=20.4). On average, trainees using the tool scored 23.1 points higher (95% CL: 14,32) than those who did not. The teamwork pretest mean score was 3.82 (sd=0.42); posttest data is not yet available.

Conclusion: This "two"-step demonstrates an efficacious use of standardized handoffs and huddles in obstetric anesthesia where communication has improved intra- and interdepartmentally. As the high-risk parturient population increases, good communication through the continuum of care will remain of critical importance to achieving optimal maternal/fetal outcomes.

References:
Segal N. A42 ASA Annual Mtng 2012
Nagpal K. Annals of Surg 2011

Abstract S 6

Noninvasive Hemoglobin Monitoring in Patients at High Risk for Excessive Bleeding During Cesarean Section

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Introduction: If accurate, noninvasive continuous hemoglobin monitoring by Pulse CO-Oximetry (SpHb) has the potential to detect blood loss during cesarean deliveries sooner than intermittent blood sampling. Our objective was to assess the accuracy of SpHb compared to laboratory hemoglobin measurement (Hb) in women at high risk of excessive bleeding during cesarean deliveries.

Methods: Women scheduled for cesarean sections (C/S) and determined to be at high risk for excessive perioperative bleeding were enrolled. As per routine, a preoperative Hb was collected for all enrolled patients. An adhesive SpHb sensor attached to a Pulse CO-Oximeter (R2-25 rev E, F, G, connected to a Radical-7, Masimo, Irvine, CA) was placed on a finger with good pulsatile signal and covered with a light shield. Anesthesia care was at the discretion of the attending physician. If during the procedure a patient required a blood transfusion, the anesthesiologist recorded the time the decision was made, the estimated blood loss, the expected Hb at that time and any changes in vital signs. Additionally, a blood sample was sent to the lab for Hb measurement (LH-750, Beckman Coulter Inc., Brea, CA). At the conclusion of the procedure a blood sample was sent to the lab for Hb measurement. This occurred no sooner than one hour after delivery of the placenta. Bias and standard deviation of the bias of SpHb to Hb were calculated and a Bland Altman graph was plotted.

Results: Twenty eight patients, aged 18-42 years, were enrolled. Six patients received a blood transfusion. After discarding 5 paired samples due to low signal quality, the bias and standard deviation of the bias for the 35 paired samples collected was 1.3±1.3 g/dL.

Bland Altman graph had limits of agreement of -1.1 to 3.8 g/dL (Fig 1).

Conclusion: Clinical estimation of blood loss, and estimation of Hb as a correlate, is difficult. This is especially true in patients undergoing C/S where physiologic changes of pregnancy must be taken into account when making decisions about transfusion. SpHb monitoring had clinically acceptable bias and trending but tended to overestimate Hb. We found SpHb monitoring to be a useful tool in our population of women at high risk of excessive bleeding during cesarean deliveries.

Obstetric Anesthesia Tangible Handoff

I	**Introduction**	Reporting MD: _____ Receiving MD: _____ Date/Time of Handoff:_____
P	**Patient** (Identifiers)	Name:_____ Age: _____ DOB: _____ (Place patient label in this space.) Location: _____
A	**Assessment**	Reason for admit:_____ Date/Time of admit: _____ WGA:_____ G___P____ Fetal weight: _____ Fetal position: _____ BP: _____ HR _____ RR____ SaO2 _____ Temp _____ Height: _____ Weight: _____ BMI: _____ Recent vaginal exam: ___/___/___ Placental location:
S	**Situation**	☐Spontaneous Labor ☐Induction of Labor ☐TOLAC ☐Cesarean Delivery: ☐Elective ☐Urgent Prior CD x ____ ☐Antepartum observation Prior CD reason:_____ ☐Missed abortion/IUFD
S	**Safety Concerns**	Allergies: _____ Blood Type: __/__ H/H: _____ Plts: _____ Critical labs: Airway exam: _____ ☐Concern for difficult airway ☐Patient had "wet tap" – How was this managed? _____ ☐Fetal decelerations – Time of event _____ ☐Other concern: _____
The		
B	**Background** **(See ★ on p.2.)**	Co-morbidities: ☐GDM ☐cHTN ☐gHTN ☐Preeclampsia Other:_____ Elaborate on co-morbidity: ★_____ Medications received:_____ ☐Oxytocin - Time started: _____ ☐Tocolytics given:_____
A	**Actions**	☐Anesthetic consent acquired ☐Patient desires neuraxial anesthesia Anesthetic technique: Time of placement: LOR @ _____ Catheter secured at _____ Epidural loading dose medication: _____ Volume: _____ Epidural infusion solution: _____ Rate:_____ Top-offs: _____ Current level: _____ Patient's VAS: _____
T	**Timing**	Critical orders or labs to follow-up:
O	**Ownership**	☐OB/MFM ☐Family Medicine ☐Midwife Nurse's name:
N	**Next** **(Recommendations)**	Plan:

Obstetric Anesthesia Tangible Handoff

★ If the parturient has one of the following disorders, please answer these questions:

Hypertensive Disease of Pregnancy	˘ What is the specific diagnosis (i.e., gestational hypertension, mild or severe preeclampsia, HELLP)? ˘ What is the disease severity (i.e., signs and symptoms)? ˘ What criteria establish this diagnosis (i.e., BP, critical lab results)? ˘ How is this diagnosis being managed (i.e., medications given)? ˘ Has GI prophylaxis been given? If so, what was given? Time of administration? ˘ Any effects on fetus (i.e., IUGR, decelerations)?
Diabetes Mellitus	˘ What is the specific diagnosis (i.e., gestational DM, preexisting type 1 or 2)? ˘ What is the disease severity (i.e., signs and symptoms)? ˘ What is the White classification? ˘ What criteria establish this diagnosis? ˘ How well is this patient being managed (i.e., recent glucose trend, HgA1C)? ˘ How is this patient being managed (i.e., treatment regimen, insulin drip)? ˘ Has GI prophylaxis been given? If so, what was given? Time of administration? ˘ Any effects on fetus (i.e., estimated fetal weight, anomalies)?
Abnormal Placentation	˘ What is the specific diagnosis (i.e., complete previa, accreta, percreta, increta)? ˘ What is the planned delivery date and plan (i.e., ureteral stents, C-hyst)? ˘ Will the patient accept blood products? ˘ What blood products are available? ˘ What does the patient have for IV access? ˘ What is the patient's most recent airway exam?
Other Disease State:	˘ What is the specific diagnosis? ˘ What is the disease severity? ˘ What criteria (i.e., critical labs, symptoms) establish this diagnosis? ˘ How is the diagnosis being managed (i.e. medications given; impact on labor and delivery)?

Effect of Oral Rehydration Therapy for Preventing Hypotension After Spinal Anesthesia for Cesarean Section

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Background: Preoperative fasting from the day before surgery has been a standard practice to prevent aspiration pneumonia in pregnant women undergoing elective cesarean section under spinal anesthesia [1]. Recent studies have shown that clear fluid is safely administered to those before cesarean section [2]. Oral rehydration is effective for treating dehydration, suggesting that it is also effective for maintaining the volume of extracellular fluid in pregnant women. It would also improve patients' satisfaction by preventing preoperative thirsty. However, there have been no studies examining the effect of oral rehydration therapy in pregnant women. We tested the hypothesis that oral rehydration therapy prevents a decrease of blood pressure as well as harmful side effects during spinal anesthesia for cesarean section in pregnant women.

Methods: We analyzed 260 pregnant women with ASA physical status I or II undergoing elective cesarean section under spinal anesthesia were randomly allocated to groups C and ORT (n = 120 and 140, respectively). Women in group C did not drink after midnight on the day of cesarean section. Women in group ORT was allowed to drink clear fluid until 3 hours before anesthesia, and consumed rehydration solution 500 ml 3 hours before anesthesia. The oral rehydration solution was 500 ml of clear water with OS-1® (glucose 1.8 %, sodium ion 50mEq/L, osmotic pressure 270 mOsm/L; Otsuka Pharmaceutical). Spinal anesthesia was performed with bupivacaine 11 mg, and vasopressor bolus was administered when mean blood pressure decreased below 70 mmHg. Patients' satisfaction was evaluated postoperatively by anesthesiologists who were unaware of the group allocation using a 5-grade scale. Primary outcome was the times of using vasopressor used for treating hypotension and the secondary outcome was the patients' satisfaction. Statistical analysis used was student' T and $\chi 2$ test. $P<0.05$ was regarded as statistically significant.

Results. There were no significant differences in the patients background data, neonatal Apgar score or the incidence of postoperative nausea and vomiting between the two groups. The frequency of vasopressors used was significantly smaller (83.4% vs 66.1%, P = 0.02) in group ORT than those in group C and patients' satisfaction was high in group ORT.

Conclusions. Oral rehydration therapy with rehydration solution 3 hours before anesthesia and to allow to intake clear fluid until 3 hours before anesthesia and is effective for preventing the incidence of hypotension after spinal anesthesia and improves patients' satisfaction. In addition, ORT does not adversely affect the neonate and is safe for the patient.

1. McIntyre JW. Evolution of 20th century attitudes to prophylaxis of pulmonary aspiration during anaesthesia. Can J Anaesth. 1998;45:1024-30.
2. Wong CA, Loffredi M, Ganchiff JN, Zhao J, Wang Z, Avram MJ. Gastric emptying of water in term pregnancy. Anesthesiology. 2002;96:1395-400

Cesarean Delivery in the Hybrid Operating Suite: A Promising New Location for High-Risk Obstetric Procedures

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Introduction: The rising cesarean delivery rate, attendant placental implantation abnormalities, and increasing general medical complexity in the obstetric population has driven innovation to optimize the care of parturients during delivery. Novel and multidisciplinary approaches and locations may enhance the options available for care (1-7). Increasingly, surgical or other interventional care during pregnancy and delivery may be seen in settings outside of the traditional labor and delivery environment.

Methods: After Institutional Review Board approval, the medical records of 10 patients who underwent cesarean delivery in our hybrid operating suite between December 2007 and May 2012 at Brigham & Women's Hospital were reviewed. Procedural details and outcome data including demographics, comorbid conditions, delivery indication, type of anesthesia administered, intraoperative interventions, estimated blood loss, transfusion requirement, intensive care unit (ICU) admission, and length of stay were recorded.

Results: The results are listed in Table 1. The most common indication for the use of the hybrid operating room was an increased risk of hemorrhage most commonly owing to abnormal placental implantation. Other indications included intracranial pathology and significant cardiac disease.

Conclusion: The hybrid operating room has demonstrated significant utility in interventional and surgical disciplines in which a combination of minimally invasive and open surgical procedures are required, along with the ability to perform advanced imaging techniques and interventions. Cesarean delivery for some high-risk parturients may best be facilitated in this setting where surgical conditions, imaging quality, and immediate availability of interventional equipment are optimized.

References

1. O'Rourke N, et al. Anesth Analg 2007;104:1193-1194.
2. Angstmann T, et al. Am J Obstet Gynecol 2010;202:38.e1-9.
3. Mok M, et al. Int J Obstet Anesth 2008;17:255-261.
4. Kodali B. Int J Obstet Anesth 2010;19:131-2.
5. Miller T. Health Facil Manage 2012;25:23-7.
6. Ramakrishna H, et al. J Cardiothorac Vasc Anesth 2012;24:7-17.
7. Iihara K, et al. J Stroke Cerebrovasc Dis 2012 Aug 29.

Patient	Indication	Anesthesia type	Additional interventions	Transfusion (u)			ICU admission	LOS (d)
				PRBC	FFP	PLT		
1	Suspected accreta	CSE	Ureteral stents	0	0	0	no	4
2	Suspected accreta	Epidural, GETA	Internal iliac artery catheters Uterine artery embolization Hysterectomy	8	6	2	no	4
3	Suspected accreta	CSE	Internal iliac artery catheters Bakri balloon	0	0	0	no	4
4	Suspected accreta Uterine dehiscence	Epidural	Internal iliac artery catheters Uterine artery embolization Foley balloon	3	2	0	no	5
5	Suspected accreta Uterine rupture	GETA	Hysterectomy	8	8	2	yes	6
6	Complete previa Jehovah's witness	CSE	None	0	0	0	no	4
7	Ovarian cyst	CSE	None	0	0	0	no	4
8	Ruptured Cerebral AVM	GETA	Craniectomy; Hematoma evacuation	3	2	0	yes	26
9	Cerebellar mass	GETA	Ventricular drain placement	0	0	0	yes	11
10	Severe aortic stenosis	Epidural	None	0	0	0	no	4

Table 1: Cases Performed in the Hybrid Operating Suite

CSE: combined spinal epidural; GETA: general endotracheal anesthesia; ICU: intensive care unit; LOS: length of stay; PRBC: packed red blood cells; FFP: fresh frozen plasma; PLT: platelets

Abstract S 9

A Comparison of Epidural Ropivacaine with Lidocaine for Cesarean Section (C/S)

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Introduction: Our practice has been to initiate epidural block with lidocaine, fentanyl and epinephrine for C/S. In this study, we compared the new long acting ropivacaine with lidocaine to determine if ropivacaine can be introduced for routine use for epidural anesthesia for C/S.

Methods: Following IRB approval, 88 parturients scheduled for C/S with epidural anesthesia were included. The pt's were randomly allocated: GI 45 patients received ropivacaine 0.75% with fentanyl 5 mcg/ml; and epinephrine 5 mcg/ml. GII 43 patients received lidocaine 2% with fentanyl 5 mcg/ml and epinephrine 5 mcg/ml. Both groups received the anesthetic solution by gravity technique [1] into the needle via 22 inches extension tubing before insertion of the "Braun" 18 g closed-end catheter (B. Braun Medical Inc.) 5cm into the epidural space. Following a standard lumbar epidural approach, all pt's received 3, 5, 5 & 5 ml of the anesthetic solution administered by gravity through the needle, followed by catheter insertion and administration of 3 ml via the catheter to a total of 21 ml. Values are mean±SD.

Results: Groups did not differ in age, weight or height, previous neuraxial blocks, distance of epidural space from the skin, time to T6-S5 sensory level, additional local anesthetic dose required, incidence of pruritus, sedation, nausea, vomiting, hypotension, and overall satisfaction. APGAR scores of babies in GI & GII were high & similar at both 1&5 min. All pt's had satisfactory treatment for C/S and post C/S pain Table I.

Conclusions: These data show that the addition of epinephrine and fentanyl to epidural ropivacaine solution administered for C/S by gravity technique via the needle is associated with longer time to incision, but without prolonging the duration of surgery, and with no effect on time to T6 sensory level, quality of the block and overall satisfaction when compared to lidocaine. This epidural ropivacaine technique may be applied routinely for our elective C/S.

Reference:

1. Cohen S et al. Anesth Analg 86:534, 1998

Table 1.

	Time to incision (min)	Time to T6-S5 Sensory level (min)	# pt's requiring additional dose n(%)	Duration of surgery (min)	Overall Satisfaction (0-10)
GI Rop/ fent/ep	42.6 ± 9	21.8 ± 3.3	6 (13.3%)	**87.6 ± 20	9.84 ± 0.4
GII Lido/ fent/ep	*33 ± 8	14.3 ± 4.8	7 (16.3%)	98.5 ± 15.2	9.81 ± 0.7

*GI<II, p<0.0001, **GI<II, **p.<0.003, Fisher's exact test

Maternal Obesity Associated with Clinically Increased Blood Loss and Postoperative Hospital Stay in Patients Undergoing Peripartum Hysterectomy

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Background: The incidence of peripartum hysterectomy has increased alarmingly over the last 2 decades, and carries multiple maternal risks as an innately complex surgery. Recent CDC data demonstrates that greater than 1/3 of the U.S. population is obese (BMI ≥ 30), and numerous studies have documented the increased risks of obesity during pregnancy. We sought to investigate if obesity is associated with perioperative complications in women undergoing peripartum hysterectomy.

Methods: Utilizing ICD-9 codes, we queried patients who underwent a peripartum hysterectomy from 2007 to 2012 at Abbott Northwestern Hospital in Minneapolis, MN. We categorized these patients into obese (BMI ≥30) and non-obese (BMI <30) cohorts. Our primary outcomes of interest included surgical and postoperative complications and estimated blood loss. Secondary outcomes recorded included transfusion of ≥4 units of blood, number of postoperative hospital days, and readmission. Surgical complications were defined as any type of ureteral injury, intentional or unintentional cystotomy, other damage to surrounding organs, and complications from interventional radiologic procedures. Postoperative complications included respiratory failure (defined as the inability to immediately extubate after surgery), pulmonary embolism or other thrombotic events, renal failure, requirement for additional procedures, post-operative ileus, bowel obstruction, ARDS, sepsis, infection, and febrile illness.

Results: We identified 63 patients during the 5 year time period who underwent peripartum hysterectomy. We excluded 3 patients who were outliers due to previable pregnancy and excessive blood loss (defined as greater than 20L), leaving 60 cases for analysis. We found that there was an increased EBL (4131 mL vs 3094 mL; p=0.11) and a longer hospital stay (6 days vs 5.1 days; p=0.16) among obese patients vs non-obese patients undergoing peripartum hysterectomy. Although not reaching statistical significance, this difference is clinically important.

Conclusion: Obese patients undergoing peripartum hysterectomy experience clinically increased blood loss intra-operatively and necessitate a longer postoperative hospital stay. Additional research to further explore this unique patient population is necessary.

	Transfusion of 4 or more units pRBC		Surgical complications		Postop complications		EBL (mL)	# Post op Hosp Days	Readmission	
	Yes	No	Yes	No	Yes	No			Yes	No
Non-Obese (BMI less than 30) (N=19)	9	10	3	16	8	11	3094	5.1	1	18
Obese (BMI 30+) (N=41)	25	16	12	29	18	23	4131	6.0	5	36
P value	0.322		0.346		0.896		0.105	0.155	0.654	

Abstract S 11

Maternal Predictors of Emergency Cesarean Section

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Introduction: US Cesarean section (C/S) deliveries increased 60% from 1996 to 2009, and one-third of births were by C/S in 2011 [1]. C/S carries increased morbidity, including wound complications, infection, hemorrhage, and thromboembolism [2,3]. Emergency C/S associates with ≈9-fold risk of maternal death compared to spontaneous vaginal delivery [4]. Obese nulliparous women and smokers more likely undergo emergency C/S [5]. What baseline characteristics can predict emergency C/S?

Methods: From 2007 to 2011, 2744 parturients underwent induction of labor at our institution. Among 18 demographic and process variables, stepwise multivariate logistic regression identified independent predictors of emergency C/S, with P<0.15 required to enter the model and P<0.05 to remain in it.

Results: These maternal factors predicted C/S: parity, hypertension, body weight, African-American race, intrapartum fever, age, forceps extraction attempt; and gestational age. Regression c-statistic= 0.828. The table displays odds ratios. Adding the process variable “late decelerations” as a predictor produced only 3 predictors: parity, body weight, and presence of late decelerations (c= 0.823).

Conclusions: Several maternal factors and gestational age predict emergency C/S, many of which correlate with late decelerations. Parity likely impacts results by representing the “proven” pelvis. Body weight achieved strong significance, but at only 0.6% per 10kg relative risk, particularly when compared to the 4.1% per year impact of maternal age. Smoking status, not determined, could not be tested in the current model.

References:

1. Hamilton BE. Births: Preliminary data for 2011. National vital statistics reports 2012; 61(5). Hyattsville: National Center for Health Statistics.
2. Declercq E. Obstet Gynecol, 2007;109:669
3. Burrows WR. Obstet Gynecol. 2004;103:907
4. Hall MH. Lancet 1999;354:776.
5. Haerskjold A. J Obstet Gynaecol 2012;32:543

Factor	Odds ratio	95% CI	P
Parity	0.196/ birth	0.161, 0.240	<0.001
HPT	0.412	0.274, 0.618	<0.001
Weight	1.006/ 10kg	1.003, 1.008	<0.001
Race*	2.736	2.017, 3.712	0.0011
Afebrile	0.298	0.178, 0.499	<0.001
Age	1.041/ yr	1.021, 1.062	<0.001
Forceps	5.192	1.933, 13.94	0.0011
GA	1.118/ wk	1.001, 1.248	0.0482

*African-American v. White
HPT, hypertension; GA, gestational age; CI, confidence interval

Regional Anesthesia for Caesarean Section in a Serbian Obstetric Hospital Before and After a Collaborative Teaching Program

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Introduction: Regional anesthesia is infrequently used for cesarean section (CS) in Serbia, irrespective of whether surgery occurs in university or non-university hospital settings. Factors for this may include poor parturient knowledge about regional anesthesia (RA), widespread belief that general anesthesia (GA) is always safe and poor availability of anesthesia personnel skilled in RA. Several years ago, the Departments of Anesthesia and Obstetrics and Gynecology at Clinical Center Vojvodina began an educational program for parturients regarding RA use for CS. The use of RA rose from 6% in 2006 to 24% in 2009; however, in 2011, only 14% of CS were performed with RA (260 of 1860 total).

Method: A four member team (two OB anesthesiologists, an obstetrician and a neonatologist) sponsored by Kybele visited our university hospital in September 2012 to provide education and training in RA and other aspects of perinatal care. We prospectively compared the use of RA for CS one week before the visit (R1), the week during (R2), one week (R3), two weeks (R4) and two months following the visit (R5). Chi square was used for comparisons between baseline (2011) and the respective groups.

Results: For R1, RA was used for 15.9% of patients (SA 11.4% and epidural anesthesia 4.6%) (P = 0.5). Neuraxial analgesia for labor (NA) was used in 10 patients. During (R2) 32.5% of CS were done under RA (P < 0.01) and NA was used in 21 parturient. During (R3) 22.2% of CS were done under RA (P = 0.03) and NA was used in only 3 parturient. During (R4) RA was used in 24.4% of CS (P = 0.01) and labor analgesia was used in only 2 parturients. Two months after the Kybele visit (R5) 29.2% of CS were done under RA (P < 0.01) and NA used in only 2 parturients

Conclusion: The collaborative program in obstetric anesthesia between Clinical Center Vojvodina and Kybele increased the use of RA for C/S, similar to the results reported by others1. Although not measured, we believe this was due to enhanced staff awareness of RA and better patient education in both RA and GA after the Kybele trip. The small number of NA cases is probably the result of additional cost that is associated with the procedure and limited availability of anesthesiologists. We have prepared a brochure about RA for CS and NA for labor to supplement our current patient teaching program. We plan a future Kybele team visit to see if this increases our RA and NA utilization.

Reference:

1.Kopic D et al. The impact of a teaching program on obstetric anesthesia practices in Croatia. IJOA 2009; 18:4-9.

Chronic Pain in the Obstetric Population: A Systematic Review

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Introduction: The occurrence of chronic pain in the obstetric population is well documented. About 32% of the approximately 4,000,000 annual births in the United States are by cesarean delivery. 1 Prevalence of rates of chronic pain after delivery varies widely among studies. This systematic review evaluates the incidence of chronic pain in the obstetric population.

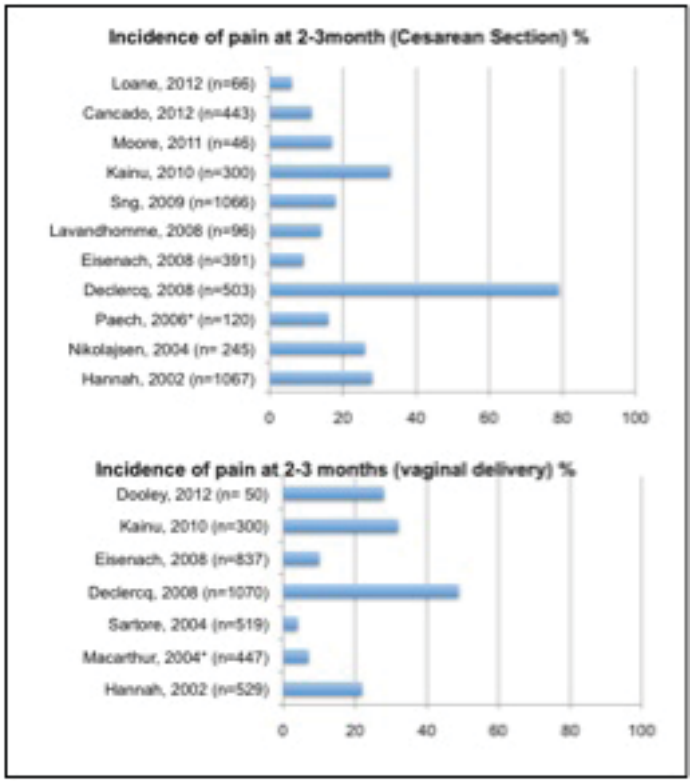
Methods: The authors searched MEDLINE; Embase; Cochrane Database of Systematic Reviews; Cochrane Central Register of Controlled Trials; The search terms Delivery, Obstetric, Labor, Obstetric, Pregnancy, Chronic Pain, Pain measurement, were used in combination with the medical subject headings pregnancy/ pregnant/ obstetric labour/ obstetric labor/ delivery/ obstetric delivery/ vaginal deliver/ cesarean deliver/ cesarean section/ chronic pain/ pain scale/ pain measurement/ pain assessment. Studies that reported the incidence of chronic pain at 2 to 12 months after delivery were included.

Results: Twenty-two studies including 7 RCTs and 15 cohort studies evaluating a total of 12,126 patients were identified (N= 4987 vaginal delivery; N=7139 cesarean delivery). The incidence of pain reported at 2-3 months varied between 4 and 79% (Figure 1). By 6 and 12 months the incidence of reported pain had reduced to between 1-18% and 0.3-12% respectively.

Discussion: Our study was conducted to systematically review the literature and evaluate the incidence of chronic pain in the obstetric population. We have found that there is a wide range of incidence of chronic pain ranging between 1-79%. 2-4 Several factors could contribute to this heterogeneity: lack of standardization to evaluate chronic pain; racial and ethnic differences among populations studied, low response rate to questionnaires and recall bias impact on retrospective designs. A recently published study by Eisenach et al.5 showed a very low rate of incidence (1.8% at 6 months and 0.3% at 12 months), suggesting that chronic pain as a result of vaginal or cesarean delivery tends to resolve with time. Additional systematic, prospective trials need to be conducted to further investigate the incidence of chronic pain in the obstetric population.
Figure 1. CS = cesarean section; *pain reported at 6 weeks

References
1) http://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_01.pdf#table02 2) Pain 2008 140(1):87-94 3) JAMA 2002 287(14):1822-31 4) Birth 2008 35(1):16-24 5) Anesthesiology 2013 118(1):143-51.

Additional Files:



Obstetric Anesthesia “Dashboard” –A Novel Method of Clinical Audit Enhancing Patient Safety and Quality Assurance

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Introduction: The Obstetric anesthesia dashboard is the visual presentation of patient data with color coding. We developed a unique “Anesthesia dashboard” to analyze the obstetric anesthesia related adverse events either for labor analgesia or operative procedures. The green color indicates the acceptable performance, orange - deviation from the acceptable, where as red alerts the anesthesiologist to introspect and review the performance, thus improving the peri operative outcome.

Objective: To develop an Obstetric anesthesia dashboard that
1. Provides effective audit of the cases done over an year on a monthly basis
2. Gives a quick access to the complications occurred and the insight to the effective management, improving maternal satisfaction
3. Gives an up- to- date information on the performance of the department

Method: The audit was conducted prospectively on 6844 cases which included Labor Epidurals; Obstetric and Gynecological surgeries in patients admitted between Jan 2012 to Jan 2013 at Fernandez Hospital Hyderabad, INDIA, a tertiary care center for Obstetrics and Perinatology.

Results: The criteria for the color coding are based on the standard literature review 1, 2, and 3.

The compilation of data in the Dashboard gave us an instant sight into the areas of improvement, enhancing our performance and effectively decreasing the complications. The inclusion of Academics, protocol adherence and feedback in the Dash Board helped to improve the resource utilization and reinforce the decision making on the clinical and administrative grounds. The illustration of dashboard is enclosed as an attachment*.

Conclusion: Anesthesia dashboard is a real-time actionable and efficient method of analyzing the perioperatve and procedural events. Besides providing ‘at a glance audit’, the visual indicators flagging problems and their consequences, helps timely introspection and corrective measures thus improving the standards of anesthesia care.Our dashboard reflects the overall performance of our department towards patient care and safety.

References:
1. The Royal College of Anaesthetists - Raising the Standard: a compendium of audit recipes
2. Pain management for women in labour: Cochrane Reviews 2012, Issue 3
3. Some immediate serious complications of obstetric epidural analgesia and anaesthesia: a prospective study of 145 550 epidurals. J. G. Jenkins et al, IJOA 2005;14:37-42

* Datasheet populated with actual data will be presented

Satisfaccion Y Calidad En Analgesia Del Parto

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Introducción: La OMS define Calidad de Asistencia como el proceso en que se recibe un conjunto de servicios y teniendo en cuenta factores del paciente y del servicio médico se logra el mejor resultado y la máxima satisfacción. Linder-Pelz la define como la valoración positiva de una serie de actuaciones sanitarias. Consideramos satisfacción como la confirmación de las expectativas del paciente e insatisfacción cuando los cuidados quedaron debajo de lo esperado. El número de partos con analgesia es un indicador de satisfacción en el mundo. El método más usado para estimarla es la encuesta de opinión. El objetivo primario es valorar la satisfacción.

Metodos: Se realizó un estudio descriptivo longitudinal, prospectivo mediante encuesta de opinión a todas las madres con analgesia del parto desde julio a noviembre de 2012.

Resultados: Obtuvimos 151 encuestas. La mediana fue de 21 años. El 52% primigestas, secundigestas 23%. El 64% presentaba secundaria incompleta, 13% primaria incompleta. Desconocían la técnica 112 pacientes. La mayoría de las pacientes recibió la información momentos antes de realizarles la analgesia. El 98% consideraron fueron informadas correctamente. El 22% presentó dolor leve durante la punción y 78% no le resultó dolorosa. Un 28% de las pacientes se sintieron calmadas parcialmente, 71% estuvieron calmadas totalmente. El 97% sintió apoyo por el equipo en todo momento. Se realizarían analgesia del parto en un próximo embarazo el 93%. De las pacientes que presentaron dolor leve o moderado, el 88% se la harían nuevamente. De las calmadas parcialmente, 90% volvería a solicitar analgesia. Recomendaría la técnica un 98%. Disfrutaron más este parto que el anterior el 71%.

Discusion: Encontramos un alto porcentaje de satisfacción, 93% se realizarían nuevamente analgesia del parto, 98% la recomendaría a otra persona y 71% tuvieron una experiencia mas positiva al parto anterior. De las que no se calmaron totalmente o que el procedimiento les resulto doloroso el 90% optarían por ella nuevamente. La satisfacción es una variable difícil de evaluar, es subjetivo y depende de muchos elementos aparte del alivio del dolor, como el apoyo, el 98% se sintió apoyada en todo momento. A pesar de las limitaciones inherentes a la metodología, se pueden realizar las siguientes conclusiones.

Conclusiones: La satisfacción de la mujer en la experiencia del nacimiento de su hijo es un fenómeno complejo, integrado por múltiples componentes, que influyen en la satisfacción de la paciente.

Referencias:

Gill-Wey B., et al. Satisfaction maternelle de la prise en charge anesthesique Durant läcouchement: un etude de cohorte retrospective. Can J Anesth 2011;58:936-43.
Gredilla E., et al. Satisfacción materna con la calidad de la analgesia epidural para control del dolor del trabajo de parto. Rev Esp Anestesiol Reanim. 2008;55:160-64.
Salinas H., et al. Indicadores de calidad de asistencia en obstetricia. Rev Chil Obstet Ginecol 2006;71: 114-120.

Maternal Cardiac Output is Improved with Lateral Tilt Positioning Only in a Subset of Term Parturients

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Introduction: Aortocaval compression by the gravid uterus is a recognized contributor to decreased cardiac output (CO), especially after neuraxial block placement (1). It is common clinical practice to tilt the operating room (OR) table to mitigate the effects of this compression. Recent meta-analysis (2) suggests there is no conclusive evidence as to the utility of this positioning in the OR. The goal of our controlled prospective study was to primarily evaluate hemodynamic changes and secondarily factors predictive of improvement of CO associated with differing degrees of lateral tilt in term non-laboring parturients.

Methods: After IRB approval and informed consent, enrolled patients were placed on an OR table positioned sequentially for hemodynamic measurements: sitting (beach chair), supine, Left tilt (LT) 5 º, LT 10 º, sitting, supine, right tilt (RT) 5 º , RT 10 º. Positioning was confirmed using an inclinometer. Each position was maintained for 3 min, then CO, cardiac index, stroke volume, systemic vascular resistance, heart rate, blood pressure, and EKG were assessed continuously for 1 min via transthoracic bioimpedance (PhysioFlow CO Monitor, NeuMedx, Bristol, PA). Priori power analysis suggested a sample size of 30 was needed to detect a 20% improvement in CO between supine and any other position with power of 0.80 and α= 0.05. P<0.05 was considered significant.

Results: 29 of 30 planned subjects were enrolled. Overall changes in CO, CI, SV, BP and HR between supine position and each tilt position were minimal and not statistically significant. Tilting from supine positions did not always result in an increase in CO. With 10 º LT, only 62% showed an average of 7.2% increase in CO from the supine position. With 10 º RT, only 35% showed an average 5% increase in CO from the supine position. Changes in CO in the LT position did not correlate with changes in the RT position (R= -0.2, P>0.05). Fetal weight and maternal BMI also did not correlate with changes in CO.

Discussion: Consistent with the findings of Cyna, et al (2), our preliminary findings showed that there was no consistent hemodynamic benefit with lateral tilt of the parturients. However, a subset of patients did show modest increases in CO with this change in positioning. This may be explained by the varied adequacy of existing collateral circulation in providing venous return. Further study is needed to identify subgroups of parturients who may benefit from this modest increase in CO (e.g. patients with uteroplacental insufficiency, preeclampsia or morbid obesity).

1. Danilenko-Dixon - Am J Obstet Gynecol 1996
2. Cyna – Cochrane Rev. 2006

Abstract S 17

The Use of Postpartum Hemorrhage Protocols in United States Obstetric Anesthesia Units

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Introduction: Postpartum hemorrhage (PPH) is the leading cause of maternal death worldwide. Delays in recognition and management of PPH can lead to maternal morbidity or death. Protocol-driven care has been associated with improved outcomes in many settings, and many have advocated for protocol-driven management of PPH. The objective of this survey was to identify the current level of PPH protocol availability and key components in US academic obstetric anesthesia units.

Methods: A survey was developed by an expert panel in this IRB approved study. Domains included: hospital characteristics, availability of PPH protocol, protocol components and utilization patterns. The electronic survey was emailed to 104 directors of US academic obstetric anesthesia units. Univariate statistics were used to characterize survey responses. Probability distributions were estimated using the binomial distribution. Delivery volume and rapid response team (RRT) availability were stratified by PPH protocol availability and compared using a two-tailed t-test. $P<0.05$ significant.

Results: The survey response rate was 58%. The median rate of PPH was 5% (IQR 3-7%). The median annual delivery volume for units with PPH protocol was 3900 v. 2300 for units without PPH protocol (P=0.002), with no difference in cesarean delivery (CD) rate (P=0.73). A PPH protocol existed in 67% of units (95% CI: 53-78%). Of those without a PPH protocol, 56% planned to create one. A massive transfusion protocol (MTP) existed in 95% of units with a PPH protocol and in 90% of units without (P=0.22).

An 18-guage IV is routinely placed for vaginal delivery in 83% units, and for CD in 88% of the units. Blood is routinely crossmatched (T&C) for elective CD in 18% of responding units, and for 2% of anticipated vaginal deliveries. Crossmatched blood is stored in the blood bank (43%) or at a location of anesthesiologists' discretion in 38% of the units.

In the setting of massive PPH, 85% of labor and delivery units receive a blood refrigerator or cooler. A fixed blood component transfusion ratio is in place in 79% of the units, with 48% using a 1:1 PRBC:FFP ratio and 35% using a 1:1:1 PRBC:FFP:PLT ratio. A PPH code team or RRT is available in 57% of units, with no difference between units with or without a PPH protocol (56% v. 60% respectively, P=0.77). A dedicated hemorrhage cart exists in 18% of responding units. The most common cart items are supplies for initiating venous or arterial access, and materials for obtaining/sending labs.

Discussion: We found that while PPH protocols were not universal, MTP protocols were present in nearly all of the responding units. Considerable variability exists in the components of the PPH protocols, specifically as it relates to mobilization and utilization of blood/component therapy and the use of a team to respond to PPH. Future work should evaluate how the presence and components of a PPH protocol may impact maternal outcomes.

Abstract S 18

Novel Statistical Analysis Shows No Statistically Significant Effect of Epidural Analgesia on the Probability of Cesarean Section

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We revisited the question of whether epidural analgesia has a statistically significant effect on the probability of Cesarean section. Nygen et al (2010, Matern Child Health J) argued the answer was yes based on (1) an observational study involving propensity scores, (2) a belief that randomized trials are not convincing due to dilution from crossovers and (3) a belief that before-and-after studies are not convincing due to bias from temporal changes. We countered these arguments in three ways. First, we noted that the propensity score methods can be substantially biased by unmeasured confounders, particularly intense pain in labor. Second we performed a meta-analysis of 16 randomized trials using principal stratification to remove dilution from crossovers. Third we performed a paired availability design involving 11 before-and-after studies to average random temporal changes while adjusting for different changes in availability of epidural analgesia. For the latter two methods we compared four novel extrapolation methods (denoted FLQS, REF2, REF, and RE). Figure 1 compares point estimates and 95% confidence intervals for the effect of epidural analgesia on the rate of Cesarean-section in the likely biased propensity score analysis (PS), the meta-analysis of randomized controlled trials (RCT) and the paired availability design (PAD). Based on the results in Figure 1, we concluded that epidural analgesia has no statistically significant effect on the probability of Cesarean section with a reasonably narrow confidence interval.

Simulation Study Assessing Knowledge of Preeclampsia/Eclampsia Management in a Tertiary Referral Center

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Introduction: Preeclampsia/eclampsia is a leading cause of direct maternal deaths.1 ACOG guidelines (2011) detail key interventions and emphasize administration of antihypertensive medication in the setting of acute severe preeclampsia to reduce cerebral complications, and magnesium for seizure prophylaxis/treatment.2 The aim of this study was to assess the knowledge of labor and delivery staff at a tertiary referral center in the management of preeclampsia/eclampsia using simulation.

Methods: 13 multidisciplinary teams consisting of obstetricians, anesthesiologists and nurses participated in this IRB-exempt study. Each group encountered the same scenario that involved a preeclamptic parturient who progressed to eclampsia with a recurrent non-terminating seizure. Time points of key interventions were recorded. The participants were unaware of the scenario topic prior to the drill and that interventions were timed. 7/13 of the groups were randomized to have a cognitive aid available throughout the drill. Participants were made aware of the cognitive aid immediately prior to the drill, however the aid was not reviewed prior to the drill.

Results: Key interventions are outlined in the Table. 11/13 groups attempted to lower the blood pressure, however only 7/11 of the groups used the correct 1st-line antihypertensive medication (labetalol 20 mg IV or hydralazine 5-10 mg IV) per ACOG guidelines. All groups requested and administered the correct bolus dose of magnesium (4-6 g IV) following the onset of the first seizure. Only 2/13 groups took appropriate action to lower the blood pressure to a 'safe range' prior to induction of anesthesia and 4/13 anesthesiologists made drug modifications for induction of anesthesia and intubation. None of the 7 groups randomized to have a cognitive aid utilized it.

Discussion: Our results suggest excellent magnesium utilization, however the use of antihypertensive medication is not universally appreciated or compliant with current guidelines. The importance of blood pressure management to reduce maternal morbidity and mortality in the setting of preeclampsia needs to be emphasized during staff education. Interestingly, availability of a cognitive aid does not ensure its utilization in an emergency. This study suggests that for cognitive aids to be utilized and effective, it is essential that physicians and nurses are familiar with them prior to an event.

References: 1)BJOG 2011;118(Supp.1):1–203 2)Obstet Gynecol 2011;118:1465–8

Table: Results of Key Treatment Interventions for a Preeclamptic/Eclamptic Patient

Treatment interventions	Groups n = 13 Participants n = 96
Antihypertensive medication requested following diagnosis	85%
Time taken to request antihypertensive medication following diagnosis (s)	170 [88-231]*
Time taken to administer antihypertensive medication following request (s)	123 [77-296]
Correct drug/dose/route of 1st-line antihypertensive administered	64%
Time taken to call an anesthesiologist following onset of first seizure (s)	22 [5-39]
Time taken to request magnesium sulfate following onset of first seizure (s)	48 [13-65]
Time taken to administer magnesium sulfate following request (s)	263 [180-345]
Correct dose/route of magnesium sulfate administered: 4 g 6 g	 85% 15%
2nd-line anticonvulsant used for recurrent non-terminating seizure	62%
'Safe' blood pressure range obtained prior to inducing anesthesia	15%
Drug modifications made for rapid sequence induction	31%

Values presented as median [IQR] and percentages
s = seconds; g = grams
* 11/13 groups treated the hypertension; 2/11 *before* the seizure onset, 9/11 *after* the seizure onset

SPOILT Audit - In Utero Resuscitation for Category 1 Caesarean Sections

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Introduction: Intrauterine resuscitation (IUR) of the fetus is aimed at improving fetal condition during labour and before an emergency delivery. Our departmental guidelines suggest that IUR should be attempted before all category 1 caesarean sections (CS). Our unit uses an acronym- SPOILT -to describe IUR. It stands for: Syntocinon infusion discontinued, Pressure (hypotension) corrected, Oxygen applied, Intravenous fluid infusion (IVI) started, mother in Left lateral position, Tocolysis. We aim to improve oxygen delivery to the fetus so that 1)it's delivered in best possible condition,2)we gain time to deliver the safest anaesthetic.

Methods: We audited our pracice to see if SPOILT principles were applied in category 1 CS. We designed a questionnaire, anaesthetists completed a form for each category 1 CS, and collected data for 2 months (06-07/2011). We acquired a total of 17 responses; data were collected and correlated.

Results: In all cases syntocinon was discontinued appropriately. 65% of the patients arrived in left lateral position. 35% of the women had oxygen applied. IVI was started in 65% of patients. One patient had tocolysis initiated, 76% did not have it in place. Most of the cases (82%) were done by ST3-4 grade anaesthetists, 12% by consultants. There were 35% of general anaesthetics (GA), 35% of labour epidural top-ups, 18% spinals. 2 cases were converted to GA. Most of the newborns had Apgar scores of 9-10 in minutes 1 (9 newborns) and 5 (11 newborns).

Discussion: We could improve our compliance with SPOILT principles for category 1 CS. Our numbers are small which we attribute to the stressful environment related to emergency CS. We would have expected more than 65% of patients to arrive in the theatre with left lateral tilt in place. The little use of oxygen on transfer is likely due to the fact that portable oxygen is not routinely available in our labour rooms. There is a pipeline supply to each room and a large portable cylinder on wheels for the LS. However, often it is quicker to move the patient to theatre than wait for the cylinder to arrive. IVI was started in 65% only, possibly some cases had difficult IV access and cannulation was left to anaesthetist in theatre. There was a rather large number of GA (35%). In view of recent CMACE report we should emphasize the importance of early labour epidural top-up for conversion to anaesthesia, which, where appropriate, should start in the LS and might reduce the number of unnecessary GA. More education is needed and all specialities should feel responsible for initiating SPOILT manouvers. A size C or D oxygen cylinder could be kept in each room. Emphasis on IV access in the room is important and would allow early fluid resuscitation. A reaudit should be performed.

1.Centre for Maternal and Child Enquiries (CMACE).Saving Mothers' Lives: reviewing maternal deaths to make motherhood safer: 2006–08. The Eighth Report on Confidential Enquiries into Maternal Deaths in the United Kingdom.

Abstract S 21

The Use of Fetal Monitor Belt Position to Determine Lumbar Vertebral Level in the Parturient

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Introduction: Tuffier's line, which is the imaginary line drawn between the superior aspects of the iliac crests, has classically been used as a marker for the L4-5 interspace. Many authors have demonstrated a lack of accuracy using Tuffier's line as an anatomical landmark. (1,2). Thus, an alternative method for determining the intervertebral space is warranted. Owing to the inaccuracy of the palpation technique, we sought to determine if the skin marking left by the fetal monitor belt could serve as a reliable surrogate marker for vertebral space determination.

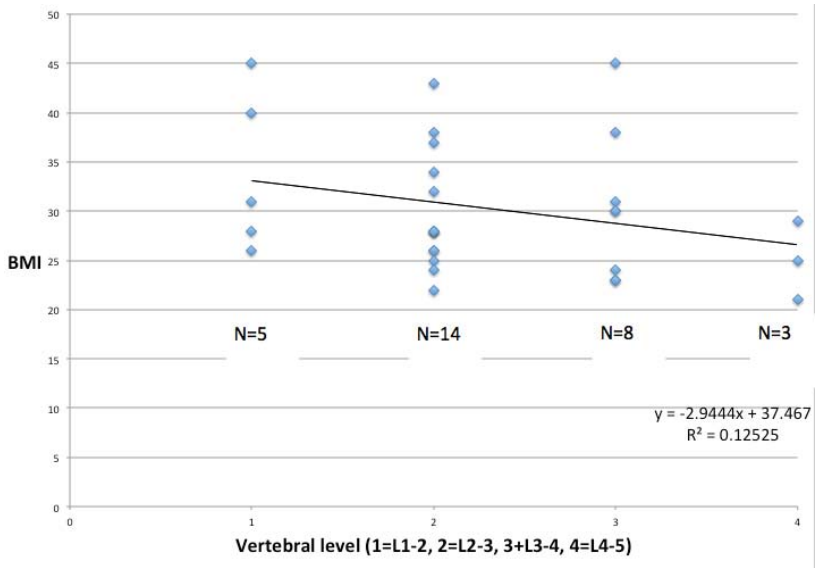
Methods: After IRB approval and verbal consent, 30 laboring parturients requesting epidural analgesia at term gestation were enrolled. With the woman in the sitting position, and after removal of the fetal monitor belt, the transducer belt skin marking was identified and marked. Lumbar ultrasonography was then performed using the Sonosite M-Turbo Ultrasound System with a C60x 5-2MHz curvilinear probe. The vertebral interspace corresponding to the belt location was noted. Demographic data including age, height, weight, BMI, parity, and gestational age was recorded.

Results: Fetal monitor belt location as determined by ultrasonography is displayed in Figure 1. The L2-3 interspace was the most common intervertebral space identified (46%). A non-significant trend towards a more caudal transducer belt location with increasing BMI, and vice-versa, was observed.

Conclusion: Transducer belt location may be an adjunct to palpation of the iliac crests prior to obstetric neuraxial anesthesia. Repeated palpation of the iliac crests can result in patient discomfort. (3) Thus, utilization of this simple and novel tool may decrease pre- and intra-procedure examination time and discomfort, especially in those patients in whom palpation of the iliac crests is difficult or repeated attempts at epidural catheter placement are needed.

References

Kettani A, et al. Evaluation of the iliac crest as anatomic landmark for spinal anaesthesia in pregnant women. Ann Fr Anesth Reanim 2006; 25: 501-4.
Margarido C, et al. The intercristal line determined by palpation is not a reliable anatomical landmark for neuraxial anesthesia. Can J Anesth 2011; 58: 262-266.
McDonald S, et al. See one, do one, teach one, have one: A novel variation on regional anesthesia training. Reg Anesth Pain Med 2002; 27: 456-59.



Sonoanatomic Predictors of Difficult Epidural Insertion in Term Pregnant Women: A Prospective Observational Study

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Introduction: Ultrasound (US) has been shown to improve efficacy and decrease complications of neuraxial anesthesia (1). There is a need to study whether specific sonoanatomic features can predict difficult placement of neuraxial blocks. While 2 studies have identified some predictors in geriatric patients (2,3), no data is available for the obstetric population. The purpose of this study was to identify sonoanatomic features of the L3-L4 interspace that may predict difficult epidural placement in pregnant women.

Method: We conducted a pilot study in 20 laboring women who requested epidural analgesia. The most common sonoanatomic features of the L3-L4 interspace in the paramedian saggital oblique (PSO) and transverse medial (TM) planes were identified. The US assessment was performed with a 5-2 MHz curvilinear transducer. The landmarks assessed in the pilot study are presented in Table 1. Following the pre-procedural US assessment, the attending anesthesiologist was informed of the puncture site and estimated depth to the epidural space. The following outcomes were assessed: the number of needle redirections, the need to change interspace and the patient's comfort during the procedure. The primary outcome was the number of needle redirections at L3-L4, which served to allocate patients into 2 groups - easy (<4 redirections) or difficult (≥4 redirections) punctures. The 2 groups were compared for differences in the sonoanatomical features of the L3-4 interspace using Fisher's exact test and Wilcoxon Rank Sum test as appropriate.

Results: The results are presented in Table 1. Variables that showed a difference between the 2 groups with a p value <0.15 or a magnitude >40% were selected. Three variables were identified according to those criteria (all in TM plane): visualization of the ligamentum flavum-dura mater (LF/DM) unit, symmetry of the articular processes, and the distance from the skin to the LF/DM unit. The sample size calculation for the final study (103 patients for 80% power at a significance level of 0.05) was based on this pilot study.

Discussion: Although we have identified the sonoanatomic features that may be related to difficult placement of epidurals at L3-L4, our hypothesis has to be confirmed in the final study. We are currently recruiting patients and the final results will be discussed during the conference.

References: 1) Anesthesiol Clin 2008; 26: 145-58; 2)Anaesthesia 2011;66:925: 3) Reg Anesth Pain Med 2013;38 :34-8.

Table 1. Sonoanatomic features in Normal and Difficult Puncture groups

	Normal n=15	Difficult n=5	Diff	% change	P-value
Paramedian Sagittal Oblique Plane					
Visualization of VB (flexed)	15(100)	4(80)	-20	-20	0.25
Visualization of LF/DM (flexed)	14(93.33)	5(100)	6.67	7.15	0.99
Distance skin-DM (flexed, cm)	5.04(0.86)	6.18(1.50)	1.14	22.62	0.13
L3-L4 inter-laminar distance (flexed, cm)	3.63(0.37)	3.39(0.36)	-0.24	-6.61	0.44
L3-L4 inter-laminar distance (flexed-neutral, cm)	0.29(0.31)	0.33(0.17)	0.04	13.79	0.63
Transverse Median Plane					
Visualization of VB (flexed)	14(93.33)	4(80)	-13.3	-14.28	0.44
Visualization of LF/DM (flexed)	12(80)	2(40)	-40	-50	0.13
Symmetric AP	11(73.33)	2(40)	-33.3	-45.45	0.28
Discontinued LF/DM	8(53.33)	3(60)	6.67	12.51	0.99
L3 SP projects vertically on the midline	14(93.33)	4(80)	-13.3	-14.28	0.44
L4 SP projects vertically on the midline	14(93.33)	4(80)	-13.3	-14.28	0.44
Distance skin-LF/DM (flexed, cm)	5.10(0.73)	5.94(0.98)	0.84	16.47	0.11
L3-L4 SP distance (flexed, cm)	2.97(0.61)	2.42(0.61)	-0.55	-18.52	0.2
L3-L4 SP distance (flexed-neutral, cm)	0.37(0.41)	0.08(1.28)	-0.29	-78.38	0.96

VB:vertebral body; LF-DM: ligamentum flavum-dura mater; SP: tip of spinous process, AP: articular process
Results are presented as mean (SD) or n(%); Diff= Rate for difficult group - Rate for normal group
% change= percent change from normal group to difficult group

Abstract S 23

How is the Internet Educating Our Obstetric Anesthesia Patients?

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Introduction: From 2000 to 2009, Internet users globally rose from 394 million to 1.858 billion. Health and medical information inquiries constitute 45% of all searches performed using the major internet search engines.1 This study was undertaken to compare online obstetrical anesthesia information provided by non-physicians (NP group) to physicians (P group) based sources in regards to rank, readability, design and content.

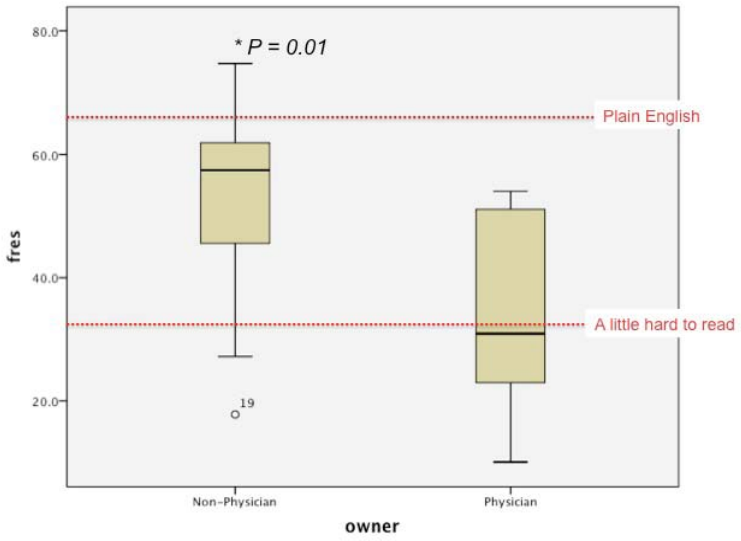
Method: Google, Bing and Yahoo were used to search terms - labor epidural - and - pain relief in labour - by 2 independent assessors. The first 10 websites retrieved for each search-term and engine were selected and ranked independently. Websites readability and design were assessed using the Fleisch Reading Ease Score (FRES)2 and the Minervation tool (LIDA).2-3 Websites content were assessed based on best evidence on epidural analgesia and end points: risk of cesarean delivery, stage of labor for epidural catheter insertion and its effects on breast-feeding.4 Student t test and Fisher's Exact test were applied (SPSS V17 package; statistical significance at P<0.05)

Results: In total, 27 websites met criteria for review (NP group: n=18; P group: n=9). Only one site appeared in all 6 searches (www.pregnancy.about.com); 21.4% (N=6) noted physician input (4 Anesthetists, 1 Pediatric Endocrinologist, 1 Obstetrician) and 32% (N=9) of sources cited references - 60% of those dated 2001 or older. FRES was s higher for NP group when compared to P group (P=0.01) (Figure1). The overall LIDA score was similar in between groups, but usability and reliability scores were higher in P group (P=0.02; P=0.01). The proportion of sites stating "labor epidural as risk factor to increase cesarean delivery rate", was significantly higher in the NP group when compared to P group (P=0.02).

Conclusions: Patient concerns regarding obstetric anesthesia are being answered through unregulated and potentially inaccurate internet sources. Physician based sources must improve their language for easier reading. As providers of this service, Obstetric Anesthetists and specialty professional organizations should consider how to effectively disseminate educational information to reach this target patient population.

Figure 1. FRES: Fleisch Reading Ease Score

References: 1) AJOG 2008;198:682.e1-5. 2) Cardiovasc Intervent Radiol 2012;35:1355-62 3) http://www.minervation.com 4) Wong C. ASA Refresher Courses in Anesthesiology 2010; 312:1-5.



Obstetric Factors Associated with Intrapartum Fetal Head Malrotation Under in Different Methods of Neuraxial Analgesia

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Introduction: Fetal head malrotation is one of the factors for dystocia and reported to increase the adverse obstetric and neonatal outcomes. Especially it is of great concern during intrapartum period for obstetric management. Epidural analgesia and/or its motor blockade have been proposed as a cause of increased incidence of intrapartum malrotation. We previously demonstrated that method of neuraxial analgesia or degree of motor block of the lower extremities did not affect fetal head malrotation in labor1. In this study, we tested whether obstetric factors correlated intrapartum fetal head malrotation under different degree of motor block in labor analgesia.

Methods: Singleton, low risk term deliveries with vertex position were enrolled. Prospectively, participants were randomly allocated to either 3 analgesic groups stratified by parity: intermittent epidural injection with bupivacaine, continuous epidural infusion with ropivacaine plus fentanyl, or combined spinal-epidural analgesia. Fetal head malrotation was defined occiput posterior position at any time of labor and delivery, and occiput transverse position before pushing and at delivery. Fetal head rotation was recorded at start of analgesia, before pushing, and at delivery. Modified Bromage score were recorded 30 min after neuraxial analgesia and at delivery. Multivariable analysis was performed for obstetric factors and maternal and neonatal outcomes.

Results: Three hundred and five women completed the study. Incidence of fetal head malrotation was as follows; 9.6%, 16.7%, 7.8% at start of analgesia, before pushing, and at delivery in primipara, and 14.1%, 18.8%, 6.0% in multipara, respectively. Fetal head malrotation at start of analgesia was strongly associated with fetal head malrotation before pushing (primipara: $P < 0.001$, multipara: $P = 0.002$). Early artificial rupture of membrane < 5 cm cervical dilatation was also associated with malrotation before pushing in primipara ($P = 0.02$), but not in multipara ($P = 0.56$). In cases with malrotation before pushing, instrumental delivery increased significantly in multipara (primipara: $P = 0.07$, multipara: $P = 0.002$), while cesarean delivery increased significantly in primipara (primipara: $P = 0.003$, multipara: $P = 0.19$). Labor induction, degree of motor block, method of neuraxial analgesia, Apgar score, NICU admission, perineal injury, or bleeding had no association with intrapartum fetal head malrotation.

Conclusions: The incidence of intrapartum fetal head malrotation was associated with existing malrotation at start of analgesia in this study. In primipara, artificial rupture of membrane before 5cm cervical dilation was also associated intrapartum fetal head malrotation.

Reference: 1) Okada H, et al. The effect of neuraxial analgesia on fetal head malrotation: Comparison of intermittent epidural injection, continuous epidural infusion, and combined spinal-epidural analgesia. 2011 SOAP annual meeting abstract #18.

Magnetic Resonance Image Grading of Suspected Placenta Accreta and Operative Hemorrhagic Morbidity

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Background: The incidence of placenta accreta is rising, primarily due to the rise in cesarean delivery rates. Antepartum diagnosis of placenta accreta has been shown to decrease maternal hemorrhagic morbidity; however, the relationship between MRI grading of suspected accreta with estimated blood loss (EBL) and blood product transfusion has not been established. We hypothesized that grades of severity of MRI findings will correlate with hemorrhagic outcomes (EBL, transfusion requirements), which could help preoperatively stratify patients at risk for severe hemorrhage.

Methods: 211 patients who delivered between Jan 2008 to Dec 2012 were identified by positive placental pathological diagnosis of “accreta,” “increta,” or “percreta.” This group was narrowed to include the 36 patients with antenatal MRI performed to evaluate for suspected abnormal placentation. 1 was excluded. MRI reports were reviewed by two dedicated body radiologists who developed and assigned a Likert scale number of 0-5 to each study, based on 24 commonly used phrases in radiology reports (e.g. “not completely excluded”=1, “diagnostic of”=5).[1] Pathology reports and histologic slides were also reviewed and assigned a stage of 0-4, ranging from no evidence of accreta (0) to full placenta percreta (4). EBL and total blood products transfused were compared among MRI and pathologic scores using the Kruskal-Wallis test. Sensitivity of MRI score for pathologic stage was calculated. A P< 0.05 was considered significant.

Results: 45% of patients suffered hemorrhage with EBL in excess of 3 L. There was no difference in EBL (P=0.35) or blood products transfused (P=0.40) among the MRI groups. Sensitivity of MRI grade for pathologic stage was 0.55 [95% CI 0.32-0.76]. Hemorrhage in excess of 3 L correlated strongly with high-stage pathologic findings (ROC AUC = 0.71 [0.549-0.875]).

Discussion: In patients with high antenatal suspicion for abnormal placentation, assigning a grade to suspected placenta accreta on MRI does not appear to predict hemorrhagic morbidity. Although antenatal MRI has been shown to be a useful complementary tool in improving diagnostic specificity and surgical preparedness, it may not be helpful to the anesthesiologist in determining patients at high risk for severe hemorrhage.

1. Khorasani R. Acad Radiol 2003;10:685–688
2. Oyelese Y. Obstet Gynecol 2006;107:927-941
3. Nguyen D. Semin Ultrasound CT MR 2012;33:65-77
4. Tikkanen M. Acta Obstet Gynecol Scand 2011;90:1140-6

	MRI Grade					
	0 (n=1)	1 (n=6)	2 (n=14)	3 (n=6)	4 (n=5)	5 (n=3)
EBL (L)	0.9	3.5 (1.1-8.5)	1.8 (0.5-5.0)	2.5 (1.2-40)	6.0 (0.2-12)	1.8 (1.3-8.0)
Total transfused (units)	0	11 (0-29)	1 (0-19)	4 (0-86)	16 (0-23)	2 (0-25)

Table 1. EBL and total blood products (units) transfused among MRI groups. MRI grades are as follows: 5=>90% confidence of placental abnormality, 4=75%, 3=50%, 2=25%, 1=<10%, 0=0%. Values are median (range).

Abstract S 26

Collecting Data on Intrapartum Characteristics Yields Worthwhile Improvements in Risk Prediction for Operative Delivery

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The use of risk factors to predict the probability of operative delivery (forceps or cesarean section) in a laboring woman could improve obstetrical decision-making. Recently Schuit et al. (2012, BJOG) constructed two risk prediction models for operative delivery: Model 1, a baseline model involving only antepartum characteristics, and Model 2, an extended model that added intrapartum characteristics. We questioned whether the improvement in prediction with Model 2 is worth the "cost" in time and money of increased data collection on intrapartum characteristics (induction of labor, oxytocin augmentation, intrapartum fever, rupture of membranes > 24 hours, epidural analgesia, and meconium-stained amniotic fluid).

A standard approach to answering this question is to compute receiver operating characteristic (ROC) curves for Model 1 versus Model 2 (Figure 1, left). The ROC curve plots true positive rate (TPR) versus false positive rate (FPR). To incorporate costs and benefits, we applied the following decision-analytic approach (Baker and Kramer, 2012, Discovery Medicine). Let T denote the risk threshold, here the risk of operative delivery at which a women would be indifferent between receiving elective Cesarean section or not. Because the risk threshold T summarizes the tradeoff between the benefit of a true positive and the cost of a false positive, it can be used to compute relative utility (RU) which is the anticipated clinical utility of prediction relative to the anticipated clinical utility of perfect prediction. The relative utility curve is a plot of RU versus T and is used to compare the performances of Models 1 and 2 (Figure 1, right).

Based on the maximum difference in RU curves between Models 1 and 2 (at T=.40), Model 2 is worthwhile over Model 1 if it is acceptable to trade the collection of data on intrapartum characteristics among at least 76 women for every correct prediction of operative delivery. Because this tradeoff is reasonable we recommend that clinicians collect data on intrapartum characteristics and use Model 2 to estimate the risk of operative delivery.

Abstract S 27

Anesthetic and Obstetric Outcome in Morbidly Obese Parturients: A Twenty Year Update

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Background: In 1993, Hood and Dewan published a large trial comparing obstetric and anesthetic outcomes of 117 morbidly obese (MO) parturients with matched controls (Anesthesiology 1993; 79:1210-8). The authors demonstrated a higher initial epidural anesthesia failure rate, as well as increased risk of obstetric complications and need for cesarean delivery (CD). Their results highlighted the importance of early epidural catheter placement with frequent assessment in MO parturients. The prevalence of obesity has increased dramatically during the past two decades. In theory, medical personnel have become more accustomed to the unique challenges of MO patients, including specialized equipment and skills with regional placement. We attempted to replicate the previous study to provide updated information on obstetric and anesthetic outcomes in the MO pregnant population.
Methods: Following IRB approval, the medical records of patients weighing > 300lbs (136.4kg) were retrospectively reviewed and compared to matched controls (next patient delivered by the same obstetrician with a weight <250lbs (113.6kg). To date, records have been retrieved for 9/24 months planned from 2011-12. T-tests and chi-square were used as appropriate ($p<0.05$ significant).

Results: 42% of 96 MO women required CD compared to 26% of controls (see Table). MO patients had significantly longer stage 1 labors and larger neonates. As expected, MO parturients were more likely to have a failed initial regional technique for labor analgesia. However, failure rates of regional anesthesia for CD were similar between groups. The CSE technique was more commonly used for CD in MO patients without an existing epidural. The overall regional procedure time was greater in MO parturients compared to controls.

Discussion: MO women continue to have larger neonates, higher rates of CD, and are also more likely to have failed initial neuraxial techniques for labor analgesia. Labor curves may also look substantially different in this population. Compared to twenty years ago, the CSE technique is now used commonly for surgical anesthesia in MO parturients. This practice change likely reflects anticipated ease of initial placement, rather than ability to extend analgesia, as surgical times did not differ between groups. Despite 20 years of additional experience and technological advances, pregnant patients weighing greater than 300 pounds continue to be at increased risk of obstetric and anesthetic complications

Do Epidural Catheters Placed with CSE Technique Delay the Recognition and Replacement of Failed Epidural Catheters as Compared to Those Placed with Traditional Technique for Labor Analgesia

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Background: Combined spinal epidural (CSE) is popular for labor analgesia. Cochrane review demonstrated the benefits of CSE having faster analgesic onset and lower requirement for rescue analgesia. However, some institutions recommend not using CSE labor analgesia in morbid obese patients or those at risk for cesarean delivery (CD) with concerns that recognition of epidural catheter (EPID) failure requiring replacement would be delayed with CSE versus EPID technique. The aim and the hypothesis of this study is to show the timing of epidural catheter replacement among failed epidural catheters placed with CSE is not delayed as compared with EPID technique.

Methods: After IRB approval and exemption of consent, a 6-month prospective data collection of CSE or EPID placement of labor analgesia is being performed utilizing anesthetic and quality assurance records to determine characteristics, timing, rates and predictive factors of failed epidural catheters. Epidural catheter failures needing replacement were divided into 2 categories – Inadequate or no block, and IV/CSF in catheter or technical failure (e.g unable to inject). Chi-squares, Fisher exacts test, unpaired t-test and logistic regression are applied as appropriate. $P<0.05$ is considered significant.

Results: Preliminarily, 3 of the planned 6 months of data collection were completed with 388 and 617 epidural catheters placed via EPID and CSE technique, respectively. Epidural catheter required replacement during the course of labor in 11.8% of EPID and 6.8% of CSE group ($P<.008$). In addition, 9 of the 74 failed catheters in EPID group and 3 of 45 in CSE group failed when needed for CD($P<.04$). Inadequate/No block failure comprised 78.2% of EPID failure, with replacement incurring 453± 402 min vs. 59.5% of CSE, with replacement at 249± 213 min after initial catheter placement ($P<.02$). Of all Inadequate/No block failure, 8% of EPID and 12% of CSE catheters were replaced within 1 hour of initial placement. Of all IV/CSF/Tech failure, 21.7% of EPID were replaced 8± 3min vs. 40.5% of CSE replaced at 18± 25min. The number of rescue top ups needed were higher in EPID vs. CSE placed catheters ($P<.0004$). Demographics and provider training level were similar between groups except for higher patient weight (182 vs. 196 lbs) in EPID group. When dichotomizing those above or below 250 lbs, the time to replacement and other failure characteristics were not different between those above or below 250lbs. Furthermore, logistic regression showed neuraxial technique (CSE vs. EPID) and/or number of top ups required, but not weight, uniquely predicted catheter replacement ($P<0.03$ and $P<0.001$, respectively).

Discussion: Our preliminary data suggests recognition and replacement of epidural catheter failures is not delayed with CSE vs. EPID technique. Future prospective randomized study would further validate the findings of this study.

Abstract #:S 29

Timeliness of Indicated & Urgent Cesarean Delivery (CD): An Inter-Professional Approach to Reducing Decision-to-In OR Time Intervals

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Background: A 11-15% annual delivery growth (2,773 in 2008 to 4,510 in 2012), a 30-35% CD rate, and limited space (2 ORs) affect our unit's CD case efficiency. In late 2011, our inter-professional OB QI Committee noted long delays in starting indicated CDs. A CD timeliness audit form was completed for all CDs beginning Feb 2012. Some decision-to-OR entry intervals (D-O) were excessively long for "indicated" (needing early delivery, no physiologic compromise) and "urgent" (non-life threatening compromise) categories (1). Beginning in July, interventions were implemented to shorten D-O: establish timeliness goals (<60min D-O for indicated) (Jul), emphasize contingency plans for a 3rd stat CD (Jul), direct OB-to-Anesthesia attending notification of CD decision and notification documentation (Oct). We studied the effect on CD start timeliness.

Methods: IRB approval. Anesthesia record & OB QI databases were used to record CD decision and in OR times for all indicated & urgent CDs, Feb to Dec 2012. These 2 classes were combined owing to their combined designation during prospective data collection in Feb-Jul, and difficulty distinguishing between them in the database.2 D-O was calculated for each case. Descriptive statistics were calculated, as was the percentage of cases with D-O >60 min (the "indicated" target goal). Monthly D-O means were compared with one-way ANOVA, followed by multiple comparisons posttest for linear trend. $P<0.05$ was considered significant.

Results: Mean & SD of D-O intervals steadily decreased over time [figure]. The proportion of D-O intervals exceeding 60 min steadily decreased: Jun 36.5%, Jul 38.5%, Aug 28.8%, Sep 29.1%, Oct 20.5%, Nov 21.4%, Dec 19.4%.

Discussion: Measurement & analysis of D-O intervals, plus collaborative interventions to enhance timeliness & safety, reduced D-O intervals within months. Dramatic improvement followed introduction of direct OB-to-anesthesiologist notification and its documentation. The study is limited by inability to separate indicated from urgent in the period Feb-Jul. However, this is not unexpected (2), it allowed data to be treated uniformly, and was consistent with the goal to improve start timeliness of both categories. Further detailed study will examine intra-operative intervals (in OR, anesthesia ready, incision, delivery, out of OR) to further enhance efficiency.

Ref: 1) Lucas D. J Roy Soc Med 2000;93:346-50. 2) vanDillen J. Int J Gynecol Obstet 2009;107:16-8

Postpartum Hemorrhage and Blood Product Utilization: Comparison by Mode of Delivery for Childbirth

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Introduction: Current literature is divided on differences in the incidence of transfusion and postpartum hemorrhage (PPH) between different modes of delivery (1-3). We conducted a retrospective review at a large academic teaching hospital to compare the impact of route of delivery on blood utilization. Our study is novel in that we examined the differences in utilization for all three blood components; red blood cells (RBCs), fresh frozen plasma (FFP) and platelets (PLTs), as well as the incidence of severe PPH.

Methods: Blood utilization data were obtained for 7,330 labor and delivery patients over a 44-month period using a web-based blood management intelligence portal (Impact Online®, Haemonetics, Inc., Braintree, MA). Data were combined with our institutional database to include mode of delivery: Vaginal (n=5,038), Primary caesarean section (C/S) (n=1,428), or Repeat C/S (n=864). Modes of delivery were compared with respect to the percentage of patients given RBCs, FFP, and PLTs. Blood utilization (average number of units/ patient) for all three components, and the incidence of severe PPH, (> 5 units RBC requirement) were also compared. ANOVA and Chi-squared tests were used to determine significance, defined as $P < 0.05$.

Results: The incidence of transfusion for all components was no different between repeat C/S and primary C/S, but was greater for both C/S groups than for vaginal delivery (Fig 1). All differences between means for units/patient were significant, except for FFP compared between repeat and primary C/S, and between primary C/S and vaginal (Fig 2). Severe PPH was more common with repeat C/S (1.8%), than with primary C/S (0.85%), or with vaginal delivery (0.22%) ($P< 0.0001$).

Conclusion: Differences in transfusion requirements between modes of delivery become more evident when the outcome measured is true blood utilization than when assessing only percentage of patients transfused. Not only were C/S associated with increased RBC, but also increased FFP and PLT requirements. Furthermore, repeat C/S was associated with greater utilization for RBCs and PLTs. By more clearly defining transfusion requirements and risk for PPH, these findings have implications for improving care and patient safety in the peripartum period.

References:
1. Holm C, et al: BJOG 2012, 119:596-604.
2. Alfirevic Z, et al: Cochrane Database Syst Rev 2012, 6:1-58.
3. Larrson C, et al: J Obstet Gynaecol Can 2011, 33:796-802.

Figure 1

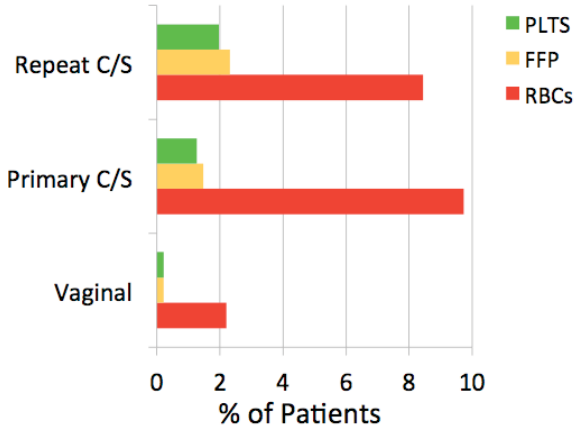
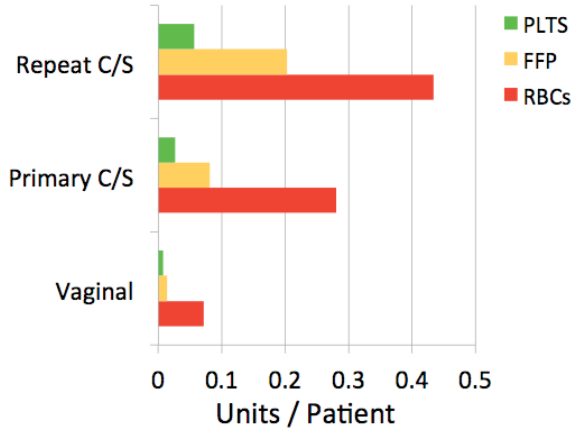


Figure 2



Risk Factors for Severe Infection Following Cesarean Delivery

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Introduction: Surgical site infections are a common cause of postoperative morbidity. A review of nearly 6000 patients in the United Kingdom found a post-cesarean delivery (CD) infection rate of 13.8%, of which 84% developed after hospital discharge. A small subset of patients with the most severe infections cannot be treated with outpatient antibiotics. Instead they require hospital readmission and/or follow-up with infectious disease (ID) specialists. In this retrospective review, we identify patient, provider and system factors that may contribute to these severe infections.

Methods: Our ID service provided a pre-existing database of patients with post-CD infections requiring consultation. Each database patient was matched to 4 control patients by BMI, approximate surgical date, and skin preparation solution (chlorhexadine or povidone iodine). Medical records were reviewed for patient demographics, medical history, perinatal course and perioperative factors using a data collection sheet developed in collaboration with the ID service. Recursive partitioning was performed to identify predictive factors for severe post-CD infection. Scheduled and unscheduled patients were separated and characteristics of infected v. non-infected patients within those groups compared using Fisher's exact or student t-test where appropriate.

Results: 134 patients (27 infection and 108 control) were reviewed. Recursive partitioning identified unscheduled CD as the only significant risk factor for severe post-CD infection of the 34 parameters investigated. These factors include history of steroid use or diabetes, supplemental intraoperative O2 administration, anesthetic technique, duration of surgical procedure, skin closure method, PACU-admission temperature and use of post-operative tranversus abdominis plane block. When characteristics within scheduled and unscheduled groups were analyzed the only difference in infected v. non-infected patients was lowest hemoglobin for unscheduled CD (Table 1).

Discussion: Established risk factors for all post-CD infection include BMI, age, blood loss, method of skin closure, emergency procedure, duration of procedure, number of prenatal consultations, and hypertension. Our study suggests the most severe post-CD infections occur in unscheduled CD, suggesting that unscheduled CD may contribute to overall risk for post-CD infections. This finding suggests a need for systems improvement aimed at decreasing infection risk following unscheduled CD.

Effect of Estradiol on Pain After Egg Retrievals for IVF

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Background: Gonadal steroid hormones are implicated in pain modulation and estradiol has been the focus of recent research (1). In women undergoing hormonal stimulation for in vitro fertilization (IVF), one study found no effect of estrogens on experimental pain (2), another showed that supra-physiological estradiol levels enhanced pain responses (3); neither studies evaluated post-IVF pain. Mechanical temporal summation (mTS), an experimental test evaluating excitatory ascending pathways, has been shown to predict acute post-surgical pain (4). We hypothesized that pre-procedural hormonal levels and mTS, as a simple bedside tool, may be useful predictors for post-egg retrieval pain and analgesic requirements.

Methods: With levels of estrogen under 75pg/ml, ovarian stimulation is induced with 5-10d days of sc gonadotrophins agonists/antagonists, followed by serial estradiol levels. Eligible participants are nulliparous women scheduled for US-guided egg-retrieval under deep sedation. Pre-op data included: plasma estradiol the day, mTS and psychosocial questionnaires (SF-MPQ, STAI and Pain Catastrophizing Score). Standardized anesthesia with iv midazolam, propofol, fentanyl 50-100mcg iv prn, ondansetron & dexamethasone was given. Post-op data were: pain scores (VPRS; 0-10) in the PACU, max VPRS after egg-retrieval & analgesic use during the first 24h (phone interview). All women received acetaminophen 625po in the PACU, and vicodin prn. Statistical analysis included a pearson product moment correlation & linear regression (SigmaPlot 12.3, SyStat Software INC, Chicago, Il, USA).

Results: In this ongoing study, 12 women are so far enrolled. Max VPRS post-egg retrieval is 5.25 (SD 1.8). Pre-op plasma estradiol levels are associated with max VPRS post-egg retrieval (Fig). Pre-op mTS is not associated with post-op pain or estradiol levels.

Discussion: Peak pain scores following egg retrieval are higher than anticipated and urge us to identify effective analgesic regimens that do not interfere with the IVF process. Our results suggest that high estradiol levels are associated with increased post-egg retrieval pain scores. Since these assays are routinely performed during IVF procedures, they could serve to guide intra- and post-operative analgesia.

1. Pain 2007;132 Suppl 1:S3-12
2. J Pain 2012;13:459-66
3. Eur J Pain 2010;14:840-6
4. J Pain 2009; 10:628-36

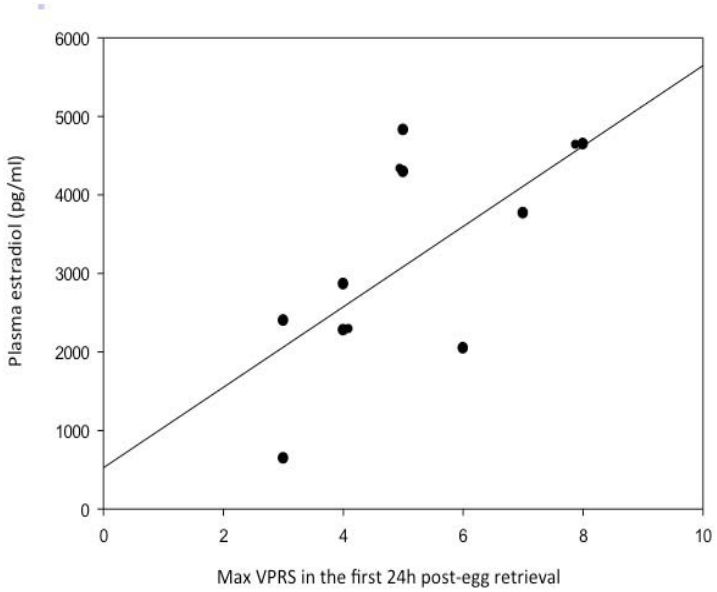

Figure. Post-procedural pain and estradiol levels.
Pearson correlation (0.635; p=0.066) shows a trend between maximum post-egg retrieval pain and pre-procedural plasma estradiol levels

Abstract S 33

Retrospective Assessment of the Effect of Anesthetic Type for Cesarean Delivery on Neonatal Acid-Base Status

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Background: While the benefits of spinal anesthesia (SA) for cesarean delivery (CD) are well documented for the mother, its impact on neonatal outcomes is less clear. A previous meta-analysis reported that cord pH was significantly lower with SA compared to general (GA) or epidural (EP) anesthesia.1 Ephedrine, which is associated with lower cord pH compared to phenylephrine, was however used to treat hypotension in the majority of included studies. As such, the aim of this study was to re-evaluate the effects of anesthesic technique for CD on cord pH now that phenylephrine has replaced ephedrine in our practice.

Methods: We searched our databases to identify patients who underwent CD and had cord blood gases available. We collected information about type of anesthesia, indication for CD, umbilical artery pH, gestational age, birth weight, maternal comorbidities, pregnancy complications, fetal issues (anomalies, non-reassuring fetal heart tones (NRFHT), growth restriction), and perioperative factors (phenylephrine use, skin incision to delivery time, uterine incision to delivery time). We decided a priori to test separately cases where CD was performed emergently for fetal or maternal indications (NRFHT, abruption, suspected uterine rupture, severe pre-eclampsia and cord prolapse) and those with no such indications. Preoperative characteristics and comorbidities were tested for association with cord blood pH; characteristics with an association of $p < 0.10$ were included in a multivariable model, and non-significant terms were removed one at a time until only those simultaneously significant at $p<0.05$ remained. The effect of type of anesthesia was then tested in models with this set of covariables.

Results: A total of 1119 cases were included in the analysis [659 with emergent indication (233 EP, 135 GA, 291 SA) and 460 with no emergent indication (100 EP, 47 GA, 313 SA). In cases without an emergent indication, anesthesia type was not a significant predictor of arterial cord pH, whereas maternal weight, presence of fetal anomalies and receipt of phenylephrine were significant predictors of low arterial cord pH. With emergent CD, anesthesia type, abruption, NRFHT, PPROM, maternal BMI, and diabetes were significant predictors of lower arterial cord pH. Specifically, the mean±SD cord pH was significantly lower with GA (7.16±0.16) compared to SA (7.23±0.11, $P<0.0001$) or EP (7.23±0.11, $P<0.0001$), with no significant differences between SA and EP.

Conclusion: Arterial cord pH was significantly lower with GA compared with SA and EP for emergent CD, but there was no difference between the anesthesia types for non-emergent cases. The lower pH with GA in emergent cases might reflect a selection bias. In contract to previous data,1 SA was not associated with lower cord pH compared to other anesthesia types. This might be due to the use of phenylephrine as a vasopressor in our practice.

References:
1) Anaesthesia 2005;60:636-653.

Abstract S 34

Ultrasound Measurement of the Subglottic Diameter in Pregnant Women

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Background: It is well established that physiological changes of pregnancy can lead to upper airway edema in parturients (1). It has been demonstrated that the Mallampati score changes throughout pregnancy and labor (2). However, in adults, the narrowest portion of the upper airway is at the level of the cricoid cartilage which guides the selection of endotracheal tube size. It has been shown that ultrasound is a feasible technology to reliably measure the subglottic diameter when compared to the gold standard of MRI (3). This study examines the dynamic changes of the subglottic diameter throughout pregnancy using ultrasonography.

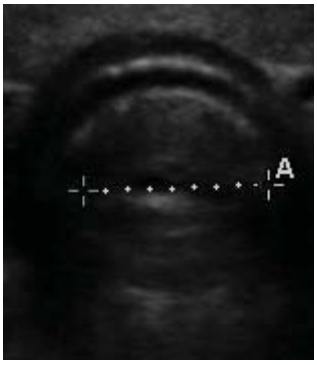
Methods: We enrolled 53 gravid volunteers to have a tracheal ultrasound done at the following stages of pregnancy: second trimester, during labor, and after delivery of the placenta. The transverse width of the air column was measured at the level of the cricoid cartilage by a single operator.

Results: The average tracheal diameter measured during the second trimester was 1.17 cm (±0.11). With 40 subjects, the power is 80% to detect a clinically significant difference of 0.05 cm using a two-sided Wilcoxon test.

Conclusion: As of February 1, 2013 one-third of the subjects have delivered. This study is still in progress and it is premature to make any statistically significant conclusions.

References:
1. Braveman FR et al. Anesthetics in Obstetrics in Clinical Anesthesia, 6th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2009. p 1138-39.
2. Pilkington S et al. Increase in Mallampati score during pregnancy. Br J Anaesth 1995; 74(6): 638-42.
3. Lakhal K et al. The feasibility of Ultrasound to Assess Subglottic Diameter. Anesthesia and Analgesia 2007; 104(3): 611-14.

Additional Files:



The Implementation of a Multimodal Analgesia Protocol for Parturients Treated with Buprenorphine: Impact on Patient Outcomes and Analgesia

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Introduction: Opioid addiction in parturients is becoming an increasing burden, with a two-fold increase in prevalence of prescription opioid abuse from 1992 to 2008 (1) and an estimated 4.5% of pregnant women abusing illicit substances in 2010 (2). A growing body of evidence is accumulating in support of the use of the opioid agonist-antagonist buprenorphine for opioid maintenance therapy during pregnancy. Multidisciplinary consensus regarding the treatment of postpartum pain in these patients is helpful, and the optimal regimen for the peripartum period is unclear. A tailored management protocol for parturients treated with buprenorphine was initiated at our institution in August of 2012. Its impact on patient outcomes and analgesia was evaluated.

Methods: After IRB approval, a retrospective review was performed of patients admitted to our institution for delivery who were treated with buprenorphine during their pregnancy. Periods of analysis were from January 2006 - July 2012 (pre-protocol) and from August 2012 - December 2012 (post-protocol). Delivery outcomes including buprenorphine dosing interval, usage of multimodal therapy, additional opioid requirements, and Visual Analog Scale (VAS) scores were compared between the two groups. Demographic data was also recorded.

Results: Twenty-five records were reviewed, including 18 patients in the pre-protocol group and 7 patients in the post-protocol group. Results are shown in Table. Notably, there were no statistically significant differences between pre- and post-protocol groups for VAS score or dose of any analgesic. However, patients managed with the protocol had shorter dosing intervals for buprenorphine, trends toward higher buprenorphine, acetaminophen, and ibuprofen use, and lower oxycodone use (p = ns).

Conclusion: A protocol for management of parturients on buprenorphine maintenance therapy was initiated at our institution to streamline the care of these patients. Clinical changes associated with protocol use included a shorter buprenorphine dosing interval and greater use of multimodal therapy, although these changes did not affect patient VAS scores. Our protocol has encouraged multidisciplinary communication among the anesthesia, obstetric, and psychiatric specialties to optimize management of these challenging patients.

References:

1. Jones HE et al. Drugs 2012;72(6):747-757
2. Goodman DJ Midw Wom Health 2011;56:240-247
3. ACOG Op No 524. 2012;119(5):1070-1076

	Pre-Protocol	Post-Protocol	*P* value
Total Patients, N	18	7	
Ethnicity - Caucasian (%)	17 (94)	6 (86)	
Hispanic (%)	1 (6)	1 (14)	
Age, y (SD)	28 (4)	30 ± 5	0.38
BMI, kg/m2 (SD)	31 (5)	30 + 7	0.54
Mode of Delivery			
Vaginal (%)	11 (61)	1 (14)	
Cesarean (%)	7 (39)	6 (86)	
Vaginal Delivery	(n = 11)	(n = 1)	
-Buprenorphine use, mg (SD)	12 (7)	16 (0)	
-Ibuprofen use, g (SD)	3.6 (1.6)	4.2 (0)	
-Acetaminophen use, g (SD)	1.7 (2.4)	2.0 (0)	
-Oxycodone use, mg (SD)	10 (33)	0.0 (0)	
-VAS score, 1-10 (SD)			
POD 0	4.1 (1.2)	4.0 (0)	
POD 1	3.3 (1.2)	3.1 (0)	
POD 2	3.2 (1.1)	3.7 (0)	
Cesarean Delivery (n=7)	(n=6)		
Indication			
FTP	3	1	
Fetal lie	1	2	
Abnormal placentation	1	0	
NRFHT	1	1	
Repeat	1	2	
-Buprenorphine use, mg (SD)	9.7 (8.2)	13.0 (9.8)	0.52
-Ibuprofen use, g (SD)	3.8 (2.5)	6.7 (2.2)	0.055
-Acetaminophen use, g (SD)	4.7 (3.3)	9.7 (7.1)	0.12
-Oxycodone use, mg (SD)	118 (166)	54 (86)	0.42
- VAS score, 1-10 (SD)			
POD 0	4.5 (1.2)	5.4 (2.1)	0.33
POD 1	4.2 (0.9)	4.4 (2.4)	0.86
POD 2	4.2 (1.5)	4.0 (2.2)	0.84
POD 3	4.5 (1.6)	4.2 (1.9)	0.77
POD 4	4.0 (1.2)	4.0 (1.7)	1.0

Table.
Patient characteristics, mode of delivery, analgesic use, and pain scores.
Y = year; SD = standard deviation; kg = kilogram; m = meter; mg = milligram; g = gram; VAS = visual analog scale;
FTP = failure to progress, NRFHT = non-reassuring fetal heart tracing

Incidence of Hypotension Between Epidural Administered Lidocaine and Chloroprocaine for Cesarean Section

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Background: Hypotension is a known side effect in neuraxial administration of local anesthetics. The resultant hypotension is a result of various hemodynamic effects including decreased venous return and decreased systemic vascular resistance. Systemic hypotension is important as it is directly related to uterine blood flow and a cause of maternal nausea and emesis. While numerous studies have compared local anesthetic effects and complications during epidural administration for cesarean section, there are few studies comparing the hemodynamic effects of chloroprocaine to lidocaine.

Methods: 151 parturients who underwent epidural anesthesia for cesarean section with lidocaine or chloroprocaine were identified during retrospective data collection. The number of episodes of hypotension were recorded with a hypotensive episode defined as a systolic blood pressure <90 mmHg or a ≥20% decrease from pre-operative baseline. Variables collected included age, pre-operative blood pressure, prior hypertensive disease (gestational or systemic), estimated blood loss, ephedrine use (mg), phenylephrine use (mg), and total intravenous fluid administration (mL).

Results: Patients receiving chloroprocaine were 4.32 times (OR 4.32, 95% Confidence Interval [CI] 1.22-15.29) more likely to experience an episode of hypotension compared to those receiving lidocaine. The mean number of hypotensive episodes in chloroprocaine patients versus lidocaine patients was 10.38 to 6.44. Only 3 of 31 (9.7%) chloroprocaine patients did not experience an episode of hypotension compared to 31 of 98 (31.6%) lidocaine patients. No significant differences existed between age, estimated blood loss, ephedrine use, phenylephrine use, pre-operative blood pressure, or total intravenous fluids.

Conclusions: The results show that patients receiving chloroprocaine during a cesarean section under epidural anesthesia were more likely to have a hypotensive episode. Despite increased episodes of hypotension chloroprocaine patients did not receive significantly more vasopressors, receive less intravenous fluids, or experience greater blood loss. The effects on fetal outcome and maternal nausea/emesis were not fully determined in this study but remain of interest in future analysis. The major limitation to this study is the small chloroprocaine patient population and additional patient recruitment is currently ongoing.

1.) Balki M, et al. Intraoperative nausea and vomiting during cesarean section under regional anesthesia. International Journal of Obstetrical Anesthesia. 2005 July; 14(3): 230-41.

2.) Kampe S et al. Epidural block with ropivacaine and bupivacaine for elective caesarean section: maternal cardiovascular parameters, comfort and neonatal well-being. Curr Med Res Opin. 2004 Jan; 20(1) 7-12.

3.) Abboud Therese K, et al. Epidural Bupivicaine, Chloroprocaine, or Lidocaine for Caesarean Section- Maternal and Neonatal Effects. Anesth Analg. 1983;62:914-9.

Abstract S 37

Achievability of the 30-Minute Standard for Urgent and Emergent Cesarean Delivery: A Systematic Review

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Background: The American Congress of Obstetricians and Gynecologists and the Royal College of Obstetricians and Gynaecologists both support emergent cesarean delivery within 30 minutes. However, the ideal decision-to-delivery interval remains controversial as many institutions report difficulty in achieving this standard. The objective of this systematic review was to evaluate the feasibility and safety of emergency cesarean deliveries conducted within 30 minutes compared to deliveries conducted after 30 minutes.

Methods: Electronic databases from inception to January 2013 were searched. Eligible studies reported decision-to-delivery or decision-to-incision intervals for non-elective cesarean deliveries. Both emergent and urgent deliveries (also known as category 1—maternal or fetal compromise with immediate threat to life, and category 2—maternal or fetal compromise with no immediate threat to life but requires expeditious delivery) were included. Two reviewers independently reviewed the identified studies for inclusion. The outcomes of interest included the feasibility and neonatal outcomes.

Results: Out of 740 abstracts identified in the primary search, 32 studies (22,489 patients) met eligibility criteria. Data on the proportion of emergent and urgent deliveries accomplished within 30 minutes from decision-to-delivery was available in 23 studies (16,073 patients). Combined, only 30% of emergent and urgent deliveries were achieved within 30 minutes. However, when one large study of 9,122 patients was removed in a sensitivity analysis, the achievement rate was 50%. In 7 US studies (3,783 patients) where decision-to-incision was reported, 64% were achieved within 30 minutes. When analysis was limited to 2,310 “true” emergency (category 1) cases, 47% were achieved within 30 minutes. Included studies accomplished target intervals from 16-100% of the time, with median decision-to-delivery intervals from 10 to 48 minutes and median decision-to-incision intervals from 16 to 23 minutes. Neonatal outcomes were reported in 12 studies. The majority of studies reported improved neonatal outcomes when the delivery interval exceeded 30 minutes.

Conclusions: Delivery within 30-minutes was not achieved in a substantial proportion of cases. However, the significance of failing to accomplish this standard remains inconclusive as outcomes varied among the included studies. Future studies should investigate terminology and universal classifications of levels of urgency in obstetrics and should include full standardized reporting of neonatal outcomes which may generate higher quality evidence needed to guide clinical decisions.

Abstract S 38

Group B Streptococcal Meningitis following Epidural Blood Patch

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A 20-year-old woman, G1P0, presented at 38 weeks in active labor. Chemoprophylaxis during labor for positive Group B Streptococcal (GBS) screen consisted of 2 grams of ampicillin on admission, followed by 1 gram four hours later. Two hours after admission, the patient requested labor analgesia, and an epidural catheter was placed, which was complicated by dural puncture. Four hours later a healthy baby boy was born with Apgar scores of 9 and 9.

Shortly after delivery the patient complained of a postural headache. An epidural blood patch (EBP) with 20 mL autologous blood was performed on postpartum day (PPD) 1 resulting in full resolution of symptoms. The patient was discharged to home on PPD 2. Her headache recurred, and the patient returned on PPD 4 for repeat EBP. The procedure was uncomplicated and the patient reported symptomatic improvement, and was discharged to home later that day.

On PPD 5 the patient returned with severe headache, not postural in nature, and a temperature of 38.6°C. Thirty minutes after arrival, the patient developed an expressive and receptive aphasia, and she was disoriented. Emergent head CT was negative for infarct or bleed. Physical exam revealed nuchal rigidity with reflexive flexion of the legs. CBC revealed white blood cell (WBC) count of 18,900 cells/mcL. Blood culture and spinal tap were performed and the patient was empirically started on vancomycin, cefepime, ampicillin, acyclovir, and dexamethasone. The results of the spinal tap revealed WBC count of 7,790 cells/mcL, protein 525mg%, and glucose < 20mg% consistent with bacterial meningitis. The patient was markedly improved the following morning and made a complete recovery within 7 days. Blood cultures were positive for GBS, but the CSF cultures were negative.

Discussion: We report a case of Group B Streptococcal meningitis after labor epidural analgesia complicated by dural puncture requiring two EBP. There are only two other reported cases of meningitis following EBP (1,2). In the first case streptococcus sanguis, an oral pathogen, was cultured from the CSF; in the latter staphylococcus epidermidis, a skin pathogen, was cultured. There are also 12 reported cases of postpartum GBS meningitis, none of whom had an EBP, and only one had neuraxial anesthesia (3).

The prevalence of cervicovaginal GBS colonization at 23-36 weeks gestation is approximately 18% (4). The number of women who are GBS positive and have received neuraxial anesthesia is unknown, but given that positive GBS screen is not a contraindication to neuraxial anesthesia, it is certainly common. Positive blood cultures indicate that our patient had GBS bacteremia, and that the EBP with the unknown contaminated blood led to meningitis. Rapid diagnosis and treatment led to a successful outcome.

1. Obstet Gynecol. 1989 Sep;74(3 Pt 2):437-9.
2. Br J Anaesth. 1994 Oct;73(4):545-7.
3. Ann Fr Anesth Reanim. 1998;17(2):195-6.
4. Obstet Gynecol. 1991 Apr;77(4):604-10

Abstract S 39

Anesthetic Implications of a Parturient with Congenital Hemoglobin M

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Case: A 31-year-old G1PO with uncomplicated, singleton pregnancy at 36 weeks presented to the anesthesia department for planning of upcoming labor and delivery due to her history of autosomal hereditary hemoglobin M disease. Physical exam was remarkable only for central cyanosis. Airway evaluation was normal. Pre-op labs showed a 35% hematocrit, 12 g/dL hemoglobin, 11% methemoglobin level and PaO2 of 80. She reported unreliability of pulse oximetry and co-oximetry.

Two weeks later, she presented in labor. Initially, labor curve was normal and a lumbar epidural was placed with PCEA (0.0625% bupivacaine + 2 mcg/ml fentanyl). Hours later, the fetus developed non-reassuring heart tones. Operative delivery was recommended. In the OR, ASA monitors were applied and pulse oximeter read 30%. Due to inadequate epidural, spinal anesthesia was administered. Three attempts were made with epidural remaining in place. CSF return was noted and 1.5 mL of 0.75% bupivacaine and 10 mg meperidine was injected. Surgical block did not occur and extension of epidural block was attempted (20 mL of 2% chloroprocaine). Again, surgical block was not achieved and general anesthesia was administered. Induction, intubation, operative course and recovery were uneventful. Normal CO2 trace and stable hemodynamics indicated adequate gas exchange.

Discussion: Methemoglobin (metHb) results from oxidation of iron in heme changing it from ferrous to ferric resulting in inability to bind O2. Mechanisms exist to keep hemoglobin in its reduced state and ensure O2 carrying capacity. These include an elaborate molecular design to protect iron from oxidation and enzymatic reduction systems. Abnormal levels of metHb occur by oxidation from toxins and drugs or from congenital defects in hemoglobin chain and enzymatic reduction systems.

Oximetry, co-oximetry and ABG are inaccurate methods of assessing oxygenation in patients with hemoglobin M. Oximetry uses 660 and 940 nm wavelengths of light to determine O2 saturation, but there is interference of dyshemoglobins. MetHb absorbs light equally at 660 and 940 nm which underestimates SaO2 when it is >70% and overestimates when <70%. Co-oximetry uses multiple wavelengths to determine the fraction of other Hb species from which total Hb and saturations are calculated. It is useful in CO poisoning and acquired metHb, but inaccurate with hemoglobin M due to structural changes causing the absorbance spectrum to differ from typical metHb. ABG analysis is a non-photometric method using pH and PCO2 to calculate O2. It assumes normal O2 affinity and absence of dyshemoglobins.

Acquired metHb due to drugs used in anesthesia are reported in the literature and most cases occur with benzocaine, prilocaine and more rarely, lidocaine. These local anesthetics should be avoided in patients with congenital methemoglobinemia or taking other oxidizing medications such as acetaminophen, metoclopramide, nitroglycerin, nitroprusside and sulfas.

Abstract S 40

Anesthetic Management of Pregnant Patients Undergoing Neurosurgical Procedures

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Introduction: Neurosurgery is rarely undertaken electively during pregnancy, and cases are typically performed in an urgent or emergent setting. Given the limited literature, the anesthetic management for such procedures is largely based on theoretical principles rather than evidence. Furthermore, the use of osmotic diuretics and hyperventilation to control intracranial pressure (ICP) in pregnant patients is controversial due to the theoretical harm to the fetus. Our study objective was to retrospectively review the intraoperative anesthetic management of all pregnant patients undergoing neurosurgical procedures at our institution and specifically to assess adverse outcomes associated with the use of measures to control ICP in this population.

Methods: We retrospectively reviewed the charts of all pregnant patients who underwent neurosurgical procedures at our institution. We used the Discharge Abstract Database (DAD) to identify patients assigned both neurological and obstetrical International Classification of Disease (ICD) 10-A codes between 2001 and 2012.

Results: Thirty-three patients met inclusion criteria and underwent chart screening for possible inclusion in the study. Twenty-four patients were excluded, because either they did not undergo neurosurgery or were not pregnant at the time of neurosurgery. Thus, 9 patients were included in the study and underwent full chart review. The median age at presentation was 28 (range 17-35) years, and the median gestational age was 23 (range 7-30) weeks. The primary neurosurgical diagnoses were intracranial vascular lesions (4 cases), intracranial neoplasms (3 cases), and traumatic brain injury (2 cases). All patients underwent a craniotomy. The lowest median intraoperative EtCO2 and PaCO2 recorded were 28mmHg (range 25-31mmHg) and 33mmHg (range 28-39mmHg), respectively. Intraoperative mannitol and furosemide were used in 4 and 3 patients, respectively and one patient received both. There were no immediate perioperative maternal or fetal complications noted from hyperventilation or the use of osmotic agents. Maternal outcomes were satisfactory in 5 patients (GCOS 4 or 5) and poor in 3 patients (GCOS 3) and one patient died. Fetal outcomes were good in 5 patients and poor in 4 patients (one therapeutic abortion and 3 cases of intrauterine fetal demise). All cases of intrauterine fetal distress or demise occurred remote from the neurosurgical procedure.

Conclusion: To our knowledge, this is the first case series describing the anesthetic management of pregnant patients undergoing neurosurgery. Overall, there were no adverse outcomes directly associated with the anesthetic management and, specifically, the use of osmotic diuretics and mild hyperventilation in pregnant patients. Although our review supports the use of these techniques in pregnant patients, further research is required to determine the optimal management of pregnant patients presenting for neurosurgical procedures.

Pulmonary Hypertension and the Parturient: A Case Report

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Case: A 32 year-old G5 P3 at 36 weeks gestation was admitted one day prior to elective repeat Cesarean section. The patient had a history of severe pulmonary hypertension secondary to chronic thromboembolic disease. Despite treatment with an IVC filter and anticoagulation, she developed lower extremity deep venous thromboses on two separate occasions. At the time of initial evaluation she was on therapeutic enoxaparin and a continuous treprostinil infusion. Prior to these events, she had 3 completed pregnancies and one miscarriage. An echocardiogram series showed worsening pulmonary artery pressure (75mmHg) and impaired RV function. On the day of admission, her pulmonologist placed a pulmonary artery catheter for perioperative hemodynamic monitoring.
The anesthesia team was made aware of the patient the day of surgery and evaluated her in the intensive care unit. A thrombelastogram obtained showed normal clotting kinetics. Of note, her care was complicated by a history of multiple lumbar back surgeries including debridement for osteomyelitis.

The patient was taken to the OR where an epidural was placed, and an arterial line was placed prior to dosing it. Approximately 15 minutes after administration of 5mL of a 2% lidocaine and 8.4% sodium bicarbonate solution, a T4 level was achieved and she experienced anxiety and shortness of breath along with a drop in systolic blood pressure from 140mmHg to 88mmHg. Administration of 1 unit of vasopressin elicited a good response, and was given throughout the case in place of phenylephrine for blood pressure support to avoid constriction of pulmonary vasculature and worsening of pulmonary hypertension. Her symptoms resolved and the baby was delivered 12 minutes after acquiring adequate surgical level with Apgars 8 and 9. Oxytocin was infused to ensure uterine tone without complication. ABG and pulmonary artery values were followed intraoperatively and the treprostinil infusion was never discontinued for any reason. The patient was transferred to the ICU for postoperative observation. She was discharged 5 days later after restarting anticoagulation and a post-operative echo was performed.

Discussion: Pregnancy combined with severe pulmonary hypertension carries a maternal mortality of 30-50%.[1,2] The physiologic changes of pregnancy create increasing demands on a cardiopulmonary system already compromised by pathologic changes and a multi-specialty approach is likely to greatly improve outcomes.[3] Epidural anesthesia with incremental dosing has been recently shown to provide good outcomes and provide better hemodynamic stability while avoiding the adverse effects of general anesthesia and positive pressure ventilation.[1] We present our successful approach to this complicated patient in order to contribute to the existing literature on this difficult subject.

References:

1. Anesthesiology. 2005 Jun;102(6):1133-7
2. Medicina (Kaunas). 2012;48(3):159-62
3. BJOG. 2010 Apr;117(5):565-74

Management of a Presumed Pheochromocytoma in the Parturient

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Pheochromocytomas are rare during pregnancy, with an estimated incidence of 0.002-0.007% (1,2), but carry significant risk to both the mother and fetus, including maternal hypertensive crisis and uteroplacental insufficiency.

A 38-year-old G6P3 in the first trimester presented with episodes of palpitations and shortness of breath. Physical exam and vitals were unremarkable. A CT scan of the chest ruled out pulmonary embolus, but incidentally discovered a left adrenal mass. Further workup noted mildly elevated plasma metanephrines. The clinical picture was suggestive of pheochromocytoma.

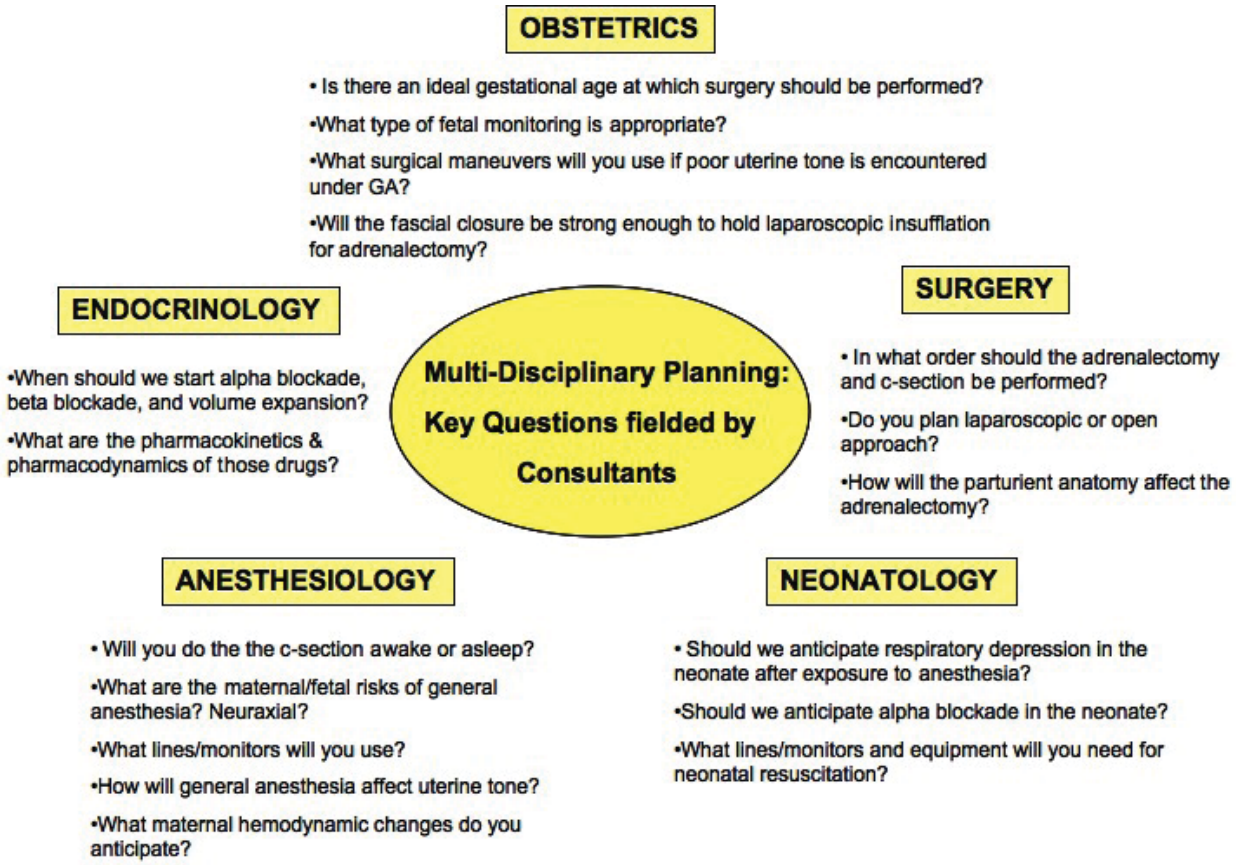
Extensive multi-disciplinary pre-operative planning involving the obstetrician, anesthesiologist, endocrinologist, surgeon, and neonatologist led to the decision to proceed under the presumption of pheochromocytoma (see figure). The patient was admitted one week prior to surgery for volume expansion and alpha-blockade, followed by beta-blockade.

At 37 weeks gestation, she underwent c-section followed by laparoscopic adrenalectomy. Pre-operatively, a large bore IV, arterial line, and central line were placed. After her abdomen was prepped and draped, rapid-sequence induction and intubation was performed. The c-section and adrenalectomy were surgically uneventful, and a healthy baby was delivered. Intra-operatively, hypertension was never a problem, but multiple high-dose vasopressors were needed for hemodynamic support. However, by the end of the case, the patient was normotensive without pressor requirement and was extubated uneventfully. Pathology of the adrenal specimen was notable for a lymphangioma cyst with no evidence of pheochromocytoma.

Ultimately, this patient did not have a pheochromocytoma. However, this case stresses the importance of multi-disciplinary planning for the uncertain adrenal mass. When pheochromocytoma is suspected, we suggest that the parturient be treated as such, given the potential catastrophic complications associated with an unrecognized pheochromocytoma. More broadly, when uncertainty exists about a diagnosis in the parturient with such potential impact, a multi-disciplinary approach to care of the patient is recommended.

References:
1. Wissler RN. Endocrine disorders. In: Chestnut DH (Ed.). Obstetric Anesthesia. Principles and Practice, 2nd ed, New York: Mosby Year Book Inc.;1999:828-32
2. Mannelli, M. Bemporad D. Diagnosis and management of phaeochromocytoma during pregnancy. J Endocrinol Invest 2002;25;567

Additional Files:



Postpartum Spontaneous Rupture of Ovarian Artery - a Case Report

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Introduction: Spontaneous retroperitoneal hemorrhage from a ruptured ovarian artery (OA) is an extremely rare event, with unknown incidence and high mortality rate. We describe a case where patient presented with unspecific symptoms and signs of severe hypovolemic shock due to postpartum rupture of OA.

Case report: A healthy 36 y/o G4P4 woman presented to postpartum clinic on 6th day after her cesarean section and tubal ligation for removal of staples. In clinic, patient had a syncopal episode and was rushed to L&D where she arrived semiconscious, pale, cold, clammy, with HR 50/min and BP 70/30mmHg. Resuscitation with crystalloids was started immediately, labs were sent, EKG showed sinus bradycardia and an abdominal ultrasound (US) was normal. An initial diagnosis of vasovagal syncopal episode was made. Patient recovered consciousness and BP returned to 90/40mmHg but she remained bradycardic. She reported constipation since her operation and fever with severe back and lower abdominal pain that started 12h before. Hb returned as 5 mg/dL, and while PRBCs were being transfused she experienced a second syncopal episode. A repeat abdominal US showed retroperitoneal fluid collection and the patient's BP dropped to 60/30mmHg despite aggressive fluid resuscitation, prompting emergent laparotomy. An extensive expanding retroperitoneal hematoma was found, aorta was clamped and the bleeding OA, distant from previous surgical site, was identified and ligated. EBL was 5L. Massive transfusion protocol was activated, she developed DIC and remained hypothermic. She was transferred to SICU, had an uneventful recovery and was discharged from the hospital without sequelae.

Discussion: Spontaneous rupture of an OA aneurysm is an extremely rare event, with only few cases described in the literature. It is believed that pregnancy predisposes to aneurysm formation due to the hormonal, hemodynamic and mechanical changes of pregnancy. Additional risk factors are: multiparty, advanced maternal age, hypertensive disease and presence of fibroids. Presentation is usually vague with acute abdominal, flank or lower back pain, vomiting and ileus associated with hemodynamic compromise. Paradoxical bradycardia instead of tachycardia is ominous, represents severe hemorrhage, and requires immediate volume resuscitation. High mortality rate seen in this clinical picture is due to delayed diagnosis, because bleeding usually occurs in a previously healthy patient with normal course of pregnancy and delivery. Awareness of this entity and a high index of suspicion may lead to an earlier diagnosis and treatment. Bedside US and exploration rather than CT, angiography, and embolization may be the only option in hemodynamically compromised patient.

References: [1]Gynecol Obstet Invest. 2009;68(2):104-7. [2]Ann Vasc Surg. 1999 Jul;13(4):445-8. [3]J Obstet Gynaecol. 2011 Aug;31(6):548-9. [4]Am J Obstet Gynecol. 2009 Mar;200(3):e7-9

Cutaneous Cerebrospinal Fluid Leak After a Continuous Spinal Anesthesia for Labour

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Cutaneous cerebrospinal fluid (CSF) leakage after different procedures is rarely reported in the literature. It has been detected after spinal trauma[1], neurosurgery or special circumstances where an intrathecal catheter was left in place for several months before its removal[2], but not much is said about the occurrence of this complication after dural puncture for neuraxial anesthesia. To our knowledge, no case had been reported in an obstetric patient in the past twenty years.

Complications of continuous CSF leakage may be serious if infection develops, and conservative measures including bed rest are not without concern in the obstetric patient at increased risk of thrombosis. For the patient herself, limited access and possibility to take care of her newborn is a major concern as well.

We present a case of a woman in labour for whom epidural anesthesia was not satisfactory in spite of multiple techniques, leading to the decision of voluntarily placing a spinal catheter for continuous anesthesia. The patient refused systemics narcotics. Two days later, we had to face a continuous cerebrospinal fluid leakage through the skin hole. Although some authors have advocated the benefit of liquid skin sealant[3] or biological glue[2] when usual management proves ineffective, we were able to stop the CSF leak with a single tight Nylon skin stitch and sterile compressive dressing for 24 hours. However, 48 hours later, the patient experienced a post-dural puncture headache that necessitated a blood patch, which was done with success.

In the case of this patient, we hypothesize that a previous intrathecal chemotherapy, received 10 years ago, could have been in part responsible for a scarred dural sheath leading to a cutaneous fistula[4] which prohibited natural healing of the tissues. Of course, the many neuraxial procedures the patient had experienced may have contributed to this complication. Fortunately, the patient never developed fever, abnormal white blood cell count or neurologic deficits. The stitch was removed five days later by the neurosurgeon. The patient had no complaint.

1. Rahamimov, N., H. Mulla, and S. Freiman, Cerebrospinal fluid leakage and pneumocephalus secondary to spine stab wounds. J Orthop Traumatol, 2010. 11(1): p. 57-9.
2. Hidou, M., J.P. Caramella, and E. Claude, [Persistent leakage of cerebrospinal fluid after removal of a device implanted for subarachnoid analgesia]. Ann Fr Anesth Reanim, 1992. 11(4): p. 467-9.
3. Rotenberg, B.W., A. Marchie, and M.D. Cusimano, Skin sealants: an effective option for closing cerebrospinal fluid leakage. Can J Surg, 2004. 47(6): p. 466-8.
4. Jawalekar, S.R. and G.F. Marx, Cutaneous cerebrospinal fluid leakage following attempted extradural block. Anesthesiology, 1981. 54(4): p. 348-9.

Management of a Parturient with Vascular Type Ehlers-Danlos

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Introduction: Ehlers-Danlos Syndrome-Vascular Type (EDS-VT) has one of the highest mortality rates of any condition when associated with pregnancy (1). Patients with EDS-VT have a defect in type III collagen that causes tissue fragility and predisposes towards vascular and uterine rupture (1). We describe the management of a parturient with EDS-VT.

Case Description: A 32-year-old (P 0-0-1-0) parturient with EDS-VT presented for induction of labor at 40 2/7 weeks. She was diagnosed (along with her mother who had uneventfully vaginally delivered two full term infants) with EDS-VT by genetic testing showing the COL3A1 mutation. She exhibited scoliosis, thin skin, visible veins, upper extremity hyperextensibility and reported easy bruising. Full body CTA revealed no evidence of aneurysm or dissection in any major vessels. Neuraxial anesthesia was not offered due to concern for epidural hematoma formation.

A healthy infant was delivered in the OR resulting in significant tears to the vagina and cervix. Blood loss was slow, albeit unremitting. After 1.2 liters of blood loss with a HR in the 150s the patient cried “an elephant is on my chest…I can’t breath!” Esmolol was given with resolution of symptoms. Bilateral arterial lines were placed to rule out dissection and GETA pursued. After a short stint in the ICU the patient was taken back to the OR for continued bleeding and stabilized after an estimated 5 liters of blood loss treated with 14 packed red blood cells.

Six days post-discharge the patient presented neurologically intact with a headache. CTA showed a new right vertebral artery dissection. Due in part to concerns over anticoagulation a plan for watchful waiting was made. The patient’s headache resolved. Follow-up pan-body CT was planned, but never completed.

Discussion: Literature supports cesarean delivery of patients with EDS-VT at 32 weeks. Scheduled delivery is favored because it avoids the hemodynamic changes associated with labor, creates more easily approximated tissue planes, and allows for better mobilization of resources (2). A 32-week delivery is recommended to optimize fetal lung maturity while ensuring that cesarean section occur before most EDS patients go into spontaneous labor (32-35 weeks) (2). In this case, vaginal delivery was allowed because of the mother’s history of successful vaginal deliveries. A family history of uncomplicated delivery should probably not be seen as reassuring when determining a delivery plan.

References:

1. Hammond R, Oligbo N. Ehlers Danlos Syndrome Type IV and pregnancy. Arch Gynecol Obstet. 2012; 285: 51-4.
2. Lurie S, Manor M, Hagay ZJ. The threat of type IV Ehlers-Danlos syndrome on maternal well-being during pregnancy: early delivery may make the difference. J Obstet Gynaecol. 1998; 18:245-8.

Abstract S 46

Cesarean Delivery and Splenectomy for Severe Idiopathic Thrombocytopenic Purpura: A Case Report

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Introduction: Idiopathic thrombocytopenic purpura (ITP) accounts for 3% of maternal thrombocytopenia. [1] We report a case with severe ITP in the third trimester who underwent cesarean delivery (CD) with intrapartum splenectomy.

Case: A 29 year-old G1P0 presented with lower extremity petechia (platelet count (PLT)=5x109/L). Bone marrow biopsy showed hypocellularity with hyperplasia of megakaryocytes. She received dexamethasone, azathioprine, repeat platelet transfusions and plasmapharesis with no sustained increase in her PLT. A thromboelastogram performed at 37 weeks gestation showed low maximum amplitude (MA) and clot stability (G) causing inability to measure clot formation time (K) (Table). After hematology and obstetric consultation, CD with concomitant splenectomy was recommended. She received a general anesthetic for elective CD with propofol and succinylcholine for induction and a remifentanil infusion at 0.5 mcg/kg/min. Prior to incision, she received methylprednisolone 40 mg to stimulate platelet function and a prophylactic dose of recombinant FVIIa 4.5 mg. The neonate had Apgar scores of 2 and 8 at 1 and 5 min. After a splenectomy was performed, she received a 4 unit platelet infusion. The total estimated blood loss (EBL) was 1L; IV fluids = 1L crystalloid. The patient was extubated and taken to the ICU in a stable fashion where she was given 6 more units of platelets, Romiplostim 250 mcg, a fusion protein analog of thrombopoietin, and methylprednisolone 60 mg. On POD1, her PLT transiently increased to 107x109/L. She required multiple rounds of steroids, azathioprine, and Romiplostim before hospital discharge. On POD6, her PLT=14x109/L, and she was discharged home. One month after CD, her PLT normalized to 271x109/L.

Discussion: The extremely low MA and G values of the preoperative TEG indicate reduced strength of clot formation which was consistent with a clinical picture of severe thrombocytopenia. A general anesthetic technique was used because neuraxial anesthesia was contraindicated with the decreased PLT. During the perioperative period, the PLT transfusion and recombinant FVIIa may have promoted clot formation and the favorable EBL. Intrapartum removal of the spleen during CD [2] and the use of Romiplostim post-CD can be considered for obstetric patients with severe ITP refractory to other treatment measures (corticosteroids, IVIG, splenectomy).

References: (1) Semin Hematol 2000;37: 275-89. (2) Blood 1996;88: 3-40.

Abstract S 47

Successful Management of Cardiac Arrest From Amniotic Fluid Embolism With Ondansetron, Metoclopramide, Atropine, and Ketorolac: A Case Report

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Introduction: Amniotic fluid embolism (AFE), a rare obstetric event with high maternal and fetal mortality, consists of cardiac and pulmonary symptoms with consumptive coagulopathy. In animal models of pulmonary embolism, serotonin receptor blockers, cyclooxygenase inhibitors, and vagotomy improve cardiac function and decrease mortality.(1,2) Here we report a successful resuscitation of cardiac arrest from AFE using adult cardiac life support (ACLS) plus ondansetron, metoclopramide, atropine, and ketorolac.

Case: 41 yo G8P3043 woman presented at 39 weeks for labor induction. At complete cervical dilation, the patient complained of shortness of breath. Oxygen saturation decreased to 80% and within 1 minute she developed cardiac arrest. ACLS was initiated and the baby was quickly delivered via forceps. The patient was still pulseless after 40 minutes of ACLS. Atropine 1mg, ondansetron 8mg, metoclopramide 10mg, and ketorolac 30mg were then administered and the patient regained a pulse and stabilized within 2 minutes. A bedside echocardiogram one hour later showed a hyperdynamic left ventricle, a flat intraventricular septum, right ventricle pressure and volume overload, and preserved right ventricular function. Right heart failure improved quickly. The patient then developed consumptive coagulopathy. Profuse uterine bleeding requiring 13u PRBC, 6u FFP, 2u platelets, 30u cryoprecipitate, 2 doses of recombinant Factor VIIa, and an intrauterine Bakri balloon. She required hemodialysis for 5 days due to acute tubular necrosis. The patient developed speech and memory function difficulties which still persist. She was discharged to home on day 13.

Discussion: AFE treatment requires prompt resuscitative measures plus fetal delivery, yet maternal mortality is still high. Pulmonary hypertension and right-sided heart failure are seen with echocardiography in AFE cases.(3) Animal models suggest that significant embolism of any material is followed by platelet degranulation, pulmonary hypertension due to serotonin and thromboxane, and systemic hypotension due to vagal stimulation.(1,2) It was not until ondansetron (5-HT3 antagonist), metoclopramide (5-HT3 antagonist), atropine (vagolytic), and ketorolac (cyclooxygenase inhibitor) were given that the patient regained a pulse. It is likely that anti-serotonin, anti-thromboxane, and vagolytic therapy helped restore this patient's circulation and ultimately helped her survive AFE.

References:
1. Armstrong DJ, Miller SA. The role of platelets in the reflex tachypnoeic response to miliary pulmonary embolism in anaesthetized rabbits. Exp Physiol 1990;75:791-800.
2. Leanos OL, et al. Reflex circulatory collapse following intrapulmonary entrapment of activated platelets: Mediation via 5-HT3 receptor stimulation. Br J Pharmacol 1995;116:2048-52.
3. James CF, et al. Massive amniotic fluid embolism: Diagnosis aided by emergency transesophageal echocardiography. Int J Obstet Anesth 2004;13:279-83.

Abstract S 48

Management of a Parturient with Diastrophic Dysplasia

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A 27 year old primagravida with Diastrophic Dysplasia (DD) presented to our obstetrics clinic at 8 weeks gestational age. DD is an autosomal recessive disease characterized by limb shortening, spinal deformities, and large joint contractures, with a normal-sized skull and normal intelligence. Little is known about pregnancy in individuals with DD, with only two case reports known in the literature. This patient had a history of airway difficulty at age 13 when intubation had been impossible and surgery was aborted. She also had a history of spinal fusion with a posterior Harrington rod extending from level T1 to S1, and known difficulty with venous access. She was referred to anesthesiology clinic for evaluation early in her pregnancy. Pulmonary function testing and otolaryngology evaluation were obtained. A mediport was placed to enable venous access. She was followed closely and remained stable with the exception of the onset of mild orthopnea at 30 weeks. Elective cesarean section was planned for 35 weeks gestation. She did not tolerate awake fiberoptic nasal intubation, and with an otolaryngologist present a modified rapid sequence induction was performed and the airway was secured with videolaryngoscopy. Cesarean section was uncomplicated and both mother and infant had an unremarkable postoperative course. The parturient with DD presents multiple challenges to perinatal anesthetic management. Airway management may be complicated by cervical kyphosis, micrognathia, or laryngomalacia. Restrictive lung disease should be suspected due to often severe scoliosis, and with uterine growth may progress to respiratory failure. This patient had undergone spinal fusion with a Harrington rod, and even in the absence of such instrumentation spinal deformities may be severe, with curvature up to 180° reported. Access to the neuraxial space may be difficult, and appropriate dosing for such patients is not well defined.

Abstract S 49

A Case Report: Rectus Sheath Hematoma or an Obstetrical Emergency?

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Introduction: Rectus sheath hematomas(RSHs) are uncommon and may be misdiagnosed during pregnancy. Presenting signs and symptoms are vague and can mimic obstetrical, as well as, surgical emergencies. With a reported mortality rate of 13% for paturients and 50% for the fetus, it is an important but often unrecognized obstetrical diagnosis.

Case Report: A 36-year-old G10P6035 patient at 29 2/7 weeks gestation with di/di twins and morbid obesity (BMI 47) presented to the labor and delivery suite with severe right upper quadrant(RUQ) pain. Past medical history included asthma, smoking, and current upper respiratory infection(URI) being treated with antibiotics and steroids. On admission, she had an elevated blood pressure of 150/80 and proteinuria noted at a recent office visit. Physical exam included wheezing in all lung fields and extreme abdominal tenderness with a mass palpated in the RUQ. Ultrasound was technically difficult due to patient's body habitus. Fetal heart tones were only detected for one fetus.

The patient was taken to the OR for an emergency cesarean section. A differential diagnosis of abruption, uterine rupture and liver capsular rupture were all considered. The patient was prepped for surgery while ASA standard monitors were applied and the patient was preoxygenated. The patient was intubated by direct laryngoscopy following a rapid sequence induction. Baby A and B were both delivered and taken to the NICU. A 20% abruption was noted on both placental surfaces with no evidence of uterine rupture. During laparotomy a large, bulging upper RSH of 750 ml was evacuated. There was no evidence of intraperitoneal bleeding and the liver capsule appeared intact. The patient was transferred to the surgical ICU at the end of surgery and was extubated within 24 hours. Post-op course was unremarkable.

Discussion: Rectus sheath hematomas are uncommon and often misdiagnosed. Sudden rupture of deep epigastric vessels within the rectus muscle can form a hematoma. This can be spontaneous or traumatic and can mimic surgical and obstetrical emergencies. The differential diagnosis includes cholecystitis, appendicitis, dissecting aneurysms, torsion or rupture of ovarian cysts, uterine rupture and abruption. Presenting symptoms are typically vague and include acute abdominal pain, fever, nausea and vomiting. Risk factors consist of anticoagulation, degenerative muscle disease, pregnancy, acute asthmatic attacks, URI and repeated valsalva maneuvers. Our patient had multiple risk factors secondary to her recent URI and asthma exacerbation. Ultrasound is first line in diagnosing RSH, followed by MRI and CT. Given the acuity of the situation, MRI or CT was not appropriate. Although uncommon, RSHs are an important but often unrecognized obstetrical diagnosis.

Reference: Tolcher MC,Nitsche JF,Arendt KW,Rose CH.2010.Spontaneous rectus sheath hematoma in pregnancy:case report and review of the literature. Obstet Gynecol Surv:65(8):517-522.

Abstract S 50

Needle Phobia in an Obstetric Patient

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Introduction: Needle phobia (NP) is a specific terror with diagnostic criteria. NP patients typically have a vasovagal response to needles or the mention of needles resulting in hypotension and/or syncope. Other symptoms include diaphoresis, pallor, nausea, respiratory disturbances, bradycardia, arrhythmias, seizure, and cardiac arrest and have resulted in 23 documented deaths.

Case Report: A 30 year-old primigravida female at 40+2 weeks estimated gestational age presented for scheduled induction of labor. Her NP began at 12 years of age when she recalls being held down for a blood draw. She had treatment for NP multiple times as a teenager, and as an adult was previously on an anxiolytic and a beta-blocker without improvement in symptoms. She had also tried hypnotherapy without benefit.

The obstetric team planned for an induction of labor without IV access. The anesthesiologist on the labor deck at the time made multiple visits to discuss her NP and establish a therapeutic alliance with her, although she continued to decline an IV. After thirty hours of unsuccessful labor, a cesarean section recommendation was made for arrest of dilation/failed induction.
An IV was placed on the third attempt in the operating room with her consent, though she continued to refuse a regional technique. The patient developed tachycardia during IV placement which rapidly converted to bradycardia suggestive of a vasovagal reaction.

Discussion: The obstetric patient with NP presents multiple challenges including difficulty in medication delivery, inability to use a regional technique, and the possibility of syncope or asystole if IV access is emergently needed. Management reports include the use of an inhalational induction using sevoflurane for cesarean section, forceful placement of an IV, or oral/nasal sedative agents.

NP can become a barrier to medical care for the obstetric patient and should be addressed early in the pregnancy so that the patient may be evaluated by mental health for possible treatment with cognitive behavior therapy and by anesthesiology for discussion of the risks of avoiding needles during the peripartum period.

The therapeutic alliance established prior to induction likely contributed to the patient's willingness to allow IV placement prior to administration of a sedative or inhalation agent in the operating room.

1. First MB, Pincus HA. DSM-IV-TR: Diagnostic and Statistical Manual of Mental Disorders. 2000.
2. Hamilton, JG. Needle phobia: A neglected diagnosis. J Fam Prac. 1995; 41:169-175.
3. Hart PS, Yanny W. Needle phobia and malignant vasovagal syndrome. Anaesthesia. 1998; 53:1002-1004.

Abstract S 51

Femoral Artery Cannulation for Maintenance of Uteroplacental Perfusion During Deep Hypothermic Circulatory Arrest

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Introduction: We present a novel technique to maintain uterine perfusion in the management of a pregnant patient with Takayasu's arteritis requiring circulatory arrest for aortic valve repair and arch reconstruction. In this case, femoral artery cannulation was performed to allow for distal perfusion of the uterus after clamping the descending thoracic aorta and initiating circulatory arrest.
Case: A 30 year old G1P0 female with Takayasu's arteritis presented at 15 weeks gestational age with worsening shortness of breath. Workup revealed severe aortic regurgitation and an ascending aortic aneurysm of 5.1 cm extending into the transverse aortic arch. After consultation with maternal fetal medicine and cardiothoracic surgery regarding maternal and fetal risks, including the possibility of an elective termination, the patient decided to continue her pregnancy and proceed with surgical repair. On the day of her surgery, after receiving standard GI prophylaxis, the patient was transported to the OR. A pre-induction right radial arterial catheter was placed. After rapid sequence induction and intubation, a left radial arterial catheter and a left internal jugular 9 French MAC introducer were placed. Next, a right axillary arterial cannula was placed, followed by sternotomy and venous cannulation for cardiopulmonary bypass (CPB). Then right femoral artery cannulation was performed, which would allow for distal uteroplacental perfusion during DHCA (Deep Hypothermic Circulatory Arrest). CPB was initiated and the patient was cooled to 24 degrees Celsius. The mean bypass flow rate was 4.4 L/min/m and the mean perfusion pressure was 60 mm Hg. DHCA was initiated after the descending thoracic aorta was clamped. Blood flow to the uterine vessels was maintained via the cannulated right femoral artery. The mean perfusion pressure of the distal thoracic aorta was maintained at 39 mm Hg during circulatory arrest. Transverse arch replacement was performed during a total DHCA time of 26 minutes. Total CPB time was 261 minutes. After transfer to the ICU, post-surgical fetal ultrasound showed no evidence of fetal heart tones and an intraoperative intra-uterine fetal demise was diagnosed. The remainder of the patient's postoperative course was uneventful.

Discussion: Although case reports suggest fetal mortality to be as high as 20-30% during maternal surgery requiring CPB, data is limited on fetal survival after DHCA. Although the fetus did not survive the surgery, this case introduces a novel approach which maintains uteroplacental perfusion during circulatory arrest and demonstrates a potential strategy to help promote fetal survival during this critical surgery.

1.) John AS, et al. Ann Thorac Surg. 2011 Apr;91(4):1191-6
2.) Sepehripour AH, et al. Interact Cardiovasc Thorac Surg. 2012 Dec;15(6):1063-70
3.) Buffolo E, et al. Ann Thorac Surg. 1994 Nov;58(5):1532-4

Anesthesia for Cesarean Delivery in a Patient with Marfan Syndrome and Lumbar Tarlov Cyst

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A 41-year-old patient, G2P1, at 38 weeks gestation presented for elective Cesarean delivery (C/D); she had a past medical history of Marfan syndrome with aortic root dilation, rheumatoid arthritis with atlanto-axial instability, and a large lumbar dural (Tarlov) cyst. During her pregnancy, she experienced new onset numbness and paresthesias in her right lateral thigh.

Preoperative MRI (attached) showed 4mm alanto-odontoid subluxation, a dural cyst (4.3cm x 6.5cm x 8.6cm) with sacral extension from its origin at L5-S1, and multiple nerve root cysts at L2 and L3. Notwithstanding her neurologic symptoms, a neuraxial anesthetic was chosen as the mode of anesthesia for overall patient safety.

For C/D, a thoracic epidural was placed at the T10/11 intervertebral space. A T4 surgical anesthesia level was attained via 3 mL boluses of 1.5% lidocaine for a total dose of 20mL. The patient remained stable throughout the procedure. She was discharged on postpartum day 3 without complication.

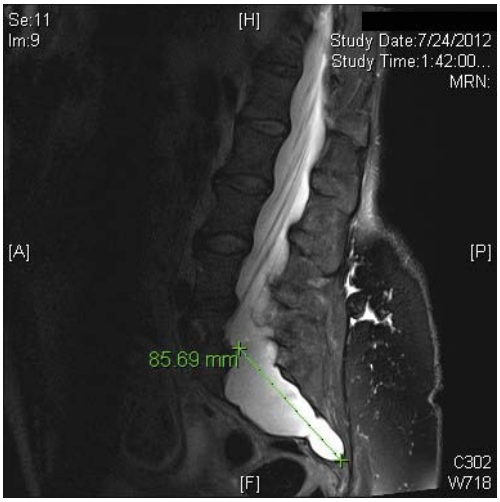
Dural ectasia, a major diagnostic criterion for Marfan Syndrome, occurs in 63-92% of Marfan patients. Tarlov cysts, a subset of dural ectasias, are perineural cysts occurring along the nerve roots, most commonly in the sacral region. They occur in 4.6-9% of the adult population. At least part of the lining contains nerve fibers; they vary widely in size and number, and can compress or even invade the nerve roots leading to paresthesias or other neurologic symptoms.

Neuraxial anesthesia was the safest course for delivery. General anesthesia would be suboptimal in this patient with an aortic root diameter of 4.3cm and concern for rupture. In addition, atlanto-axial instability would make airway management more dangerous.

Spinal anesthesia was also discounted as an option. Since Tarlov cysts contain an unknown and sometimes significant volume of CSF, appropriate dosing of a spinal block can be unpredictable and often inadequate for C/D. Her dural cyst contained a significant amount of CSF based on imaging, and was located such that a typical approach for neuraxial anesthesia could not be safely attempted. A low thoracic epidural provided adequate surgical anesthesia while avoiding the Tarlov cyst.

LaCassie HJ, et. al. Dural ectasia: a likely cause of inadequate spinal anaesthesia in two parturients with Marfan's syndrome. Br. J. Anaesth 2005; 94: 500–4

Acosta FL, et. al. Diagnosis and Management of Sacral Tarlov Cysts. Neurosurg Focus 2003;15(2)



Fentanyl Intravenous Patient Controlled Analgesia During Pregnancy

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Introduction: A complication of uterine adenomyosis during pregnancy is relatively unknown, because uterine adenomyosis causes infertility. The chief symptom of uterine adenomyosis is severe menstrual pain, and the pain has seemed to reduce under hormonal influence during pregnancy. However, this time, we will present a case report of the patient with severe pain caused by uterine adenomyosis treated by long-lasting intravenous patient controlled analgesia (PCA) by fentanyl.

Case report: A 36-year-old woman with uterine adenomyosis was impregnated through in vitro fertilization and embryo transfer. She was admitted with a severe abdominal and sacral pain at 24 weeks gestation. Although she took 60 mg of pentazocine and 400 mg of etodolac per day, they were not effective in the management of her pain. Then obstetrician consulted anesthesiologists. Intravenous PCA by fentanyl was started. Without basal infusion, PCA dose of fentanyl was 25 mcg and lockout interval was 10 minutes. Initially her daily consumption of fentanyl was 500 mcg/day. Daily consumption of fentanyl was decreased to 300 mcg/day by the addition of oral acetaminophen at her 30 weeks gestation.

At 36 weeks gestation, she was performed cesarean section under general anesthesia because the fetal bradycardia was prolonged and uterine rupture was suspected. 300 mg of thiopental, 100 mg of suxamethonium, and 100 mcg of fentanyl were administered for induction. And general anesthesia was maintained by 50 % of oxygen, 50 % of and nitrous oxide, and 1 % of sevoflurane until delivery. Induction-to-delivery time was 2 minutes. A rupture of uterine cervix was detected and cesarean hysterectomy was performed.

APGAR score 1 and 5 minutes after delivery were 8 and 9, and UApH was 7.312. Four days after delivery, her baby was admitted to NICU because of hyperbilirubinemia. However, withdrawal action and neurobehavioral abnormality were not observed. Maternal plasma concentration of fentanyl after induction of general anesthesia was 4.19 ng/mL, and umbilical arterial plasma concentration of fentanyl was 0.307 ng/mL.

Discussion: Long-lasting pain treatment during pregnancy can be a difficult problem. Care must be taken to ensure adequate pain relief during pregnancy with minimizing the risks to the fetus of teratogenicity, intrauterine withdrawal, or neurobehavioral disorder. The choice of opioid is a critical decision. Actually fentanyl is highly lipid-soluble and it transfers easily from mother to fetus through placenta. However, according to the American Academy of Pediatrics, fentanyl use during pregnancy is compatible. In addition, fentanyl is metabolized to inactive substance unlike morphine, and fentanyl has less adverse effect, especially constipation, than morphine. Moreover, there was a case report of woman who had taken transdermally fentanyl 100 mcg/hour during pregnancy. In our presentation, UA:MA ratio of fentanyl is 0.07, and it seems to have little effect on neonate.

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Aortic Fungal Infective Endocarditis During Pregnancy

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Introduction: Infective endocarditis (IE) is a rare complication during pregnancy with an incidence of 0.006% and a mortality rate as high as 33% (maternal) and 29% (fetal) (1,2). The leading causes of mortality are destruction of the valves leading to heart failure and embolism from the vegetations (2).

Case: A 23 year old G1P0 at 30 5/7 weeks gestation with a history of intravenous drug abuse on methadone, hepatitis C, and bipolar disorder presented at an outside hospital with severe right groin pain. She also had night sweats for a month and was taking ampicillin for a dental abscess. An ultrasound showed a right profunda artery thrombus, and enoxaparin was started. IE was diagnosed by echocardiogram, with 0.8cm x 1.0cm mobile aortic valve vegetation and mild to moderate aortic insufficiency (AI). The patient was transferred to our CTICU for aortic valve replacement (AVR). She received betamethasone for fetal lung maturation and magnesium for neuroprotection. Two blood cultures were positive for Candida; she was started on amphotericin B. Brain MRI revealed a 2mm anterior communicating artery aneurysm that was either idiopathic or mycotic. She was hemodynamically stable.

During a multidisciplinary meeting between MFM, cardiothoracic surgery and obstetric anesthesiology (OA), the decision was made that the maternal risk of embolism outweighed the fetal benefit of prolonging the pregnancy. The plan was to stop anticoagulation 12 hours prior to a CS and then perform the AVR ~24 hours after the CS. Heated discussions ensued between MFM, OA, and nursing about where the CS should be done, and it was agreed that the CS would be done in our main operating room. Due to her fungemia, the decision was made to utilize general anesthesia. An arterial line was placed, and a rapid sequence induction was performed using 150mg propofol, 120mg succinylcholine, and 100mcg remifentanil. Anesthesia was maintained with sevoflurane, nitrous oxide and opioids. The cardiac anesthesia team and cardiothoracic surgeons remained on standby, but the patient had no intraoperative complications and was extubated immediately postoperatively. She had a successful and uneventful AVR 24 hrs later.

Conclusion: There is no consensus on the best management of pregnant patients with IE in need of CS and AVR. Depending on the gestational age, AVR could precede CS, CS could precede AVR, or they can be done simultaneously. This patient had IE, moderate AI, fungemia, and a possible mycotic aneurysm. Her CS was done in our main OR, which is closer to adult ICUs but farther from the NICU. When a labor floor is geographically far from main ORs and ICUs, there are logistical difficulties in caring for complex parturients and neonates, especially involving staffing.

References:
1. Kaoutzanis, C. Gen Thorac Card Surg, 2012
2. Vincelj, J. Int J Card, 2008

Abstract S 55

Protamine Use in a Parturient with Massive Hemorrhage From Placental Abruption While Receiving Intravenous Heparin

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Introduction: Antepartum thromboembolic disease occurs in approximately 0.1% of pregnancies and is commonly treated with intravenous heparin administration. Therapeutic heparinization can contribute to uncontrolled hemorrhage. We describe a case of a woman who was fully anticoagulated from heparin and started to hemorrhage from a placental abruption.

Case report: A 32 year old gravid 1 para 0 woman, at 28 weeks gestation was admitted to the labor and delivery suite with left lower extremity swelling and diagnosed with a left deep venous thrombosis (DVT). She was started on a continuous infusion of heparin in an effort to reach a therapeutic level of aPTT > 2x normal. The patient also had a history of chronic hypertension and had extensive fibroid disease despite prior myomectomy in 2004. The planned mode of delivery was a cesarean delivery with hysterectomy at term. On hospital day 3, with the aPTT at > 1.5 x normal, the patient developed extensive vaginal bleeding. Heparin was immediately stopped and the patient was taken to the operating room (OR). After placement of two large bore IV's and an arterial line, rapid sequence induction of anesthesia was achieved with etomidate 12mg and succinylcholine 100mg. Protamine sulfate 20mg was started and a massive transfusion protocol (MTP) was initiated. Prior to arrival to the OR, estimated blood loss (EBL) was 2000 mL. A vertical incision was made and the baby was delivered with Apgar scores of 9 and 9 at 1 and 5 minutes. Resuscitation was ongoing and totaled 3 liters of crystalloid, most given prior to entry into the OR, 10 units packed red blood, 8 units FFP, 2 units pooled platelets and 1 unit cryoprecipitate. Total EBL was 4 liters. The patient remained hemodynamically stable and was transferred tracheally intubated to the medical intensive care unit (MICU). Her trachea was extubated approximately 6 hours after arrival to the MICU and she was discharged to home on postoperative day 7. She did not require any blood products postoperatively.

Discussion: Pregnancy is a known hypercoagulable state with an approximate 0.05% incidence of DVT. There are few reports in the literature regarding protamine use in pregnant women. To our knowledge, this is the first case reported of protamine use to reverse intravenous heparin in a pregnant woman for emergent cesarean section for massive hemorrhage. Protamine is a highly cationic peptide. It binds to heparin to form a stable ion pair which has no anticoagulant activity. The heparin-protamine complex is then broken down by the reticuloendothelial system. Our patient was also at risk for placental abruption due to her preexisting hypertension. The combination of abruption in the fully anticoagulated patient was a challenge. The use of protamine along with MTP and immediate delivery all contributed to the successful outcome.

A Sellar Mass Revealed After a Post-Dural Puncture Headache and an Epidural Blood Patch

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Introduction: Post dural puncture headaches (PDPH) are not uncommon in obstetric anesthetic practice. However, PDPH has also been misdiagnosed with other causes of postpartum headaches ranging from benign conditions to more severe neurologic pathology. We report a rare case in which the resolution of a PDPH with an Epidural Blood Patch (EBP) revealed an underlying dissimilar headache, which when investigated, disclosed a previously undiagnosed sellar mass.

Description: A 22 year old, healthy patient at 39+6 weeks gestation Gravida 3 para 0 was admitted for labor. After an initial accidental dural puncture with a 17 gauge Tuohy needle, successful epidural analgesia was achieved and the patient subsequently had an uneventful labor and vaginal delivery. In the postpartum period, she complained of a severe, postural, occipital headache. Despite conservative management, her severe headache persisted along with photophobia necessitating an EBP. The patient had a resolution of headache with no other symptoms. The next day she developed a non-postural, frontal headache which was less intense with persistent vomiting, and developed intermittent somnolence. An urgent CT of the brain and neurology consult were obtained. The CT – and follow up MRI – revealed a 1.4 cm complex mass within the sella extending into the suprasellar region. The patient's symptoms resolved completely with conservative management. The patient was discharged home and scheduled for appropriate follow up visits.

Discussion: PDPH treatment is a common part of obstetric anesthesia practice. It is well recognized that this treatment of a complication engenders its own set of risks. Though the risks of EBP are mostly minor [1], the temporal relationship between the PDPH and EBP in this presentation might suggest a causal significance. Sellar masses may present with a headache but the fleeting presentation in this patient limits the possible reasons [2]. Both sub-acute apoplexy and a vascular headache might fit with this presentation. The intracranial pressure effects from changes in cerebral spinal fluid (CSF) dynamics resulting from both an initial loss of CSF and subsequent increased pressure from the EBP could be postulated as influencing the evolution of this pathology.

Conclusion: This case describes the occurrence of a PDPH following an accidental dural puncture which was treated with an EBP. However, persistent symptoms which could have been attributed to ongoing PDPH, instead, led to the diagnosis of a large sellar mass.

References:
1. Turnbull DK, Shepherd DB. Post-dural puncture headache: pathogenesis, prevention and treatment. Br J Anaesth 91 (5), 718, 2003
2. Peter N Riskind. Pituitary Tumors and Headaches, Neuroendocrine Newsletter; Volume 19, Issue 1, Spring 2012

Simultaneous presentation of Post Dural Puncture Headache and Post Partum Eclampsia with Posterior Reversible Encephalopathy Syndrome: A Rare and Unique Case

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Introduction: Postdural puncture headache (PDPH) has a high differential index of suspicion of a headache following regional anesthesia. Other differentials include, Post Partum Eclampsia (PPE) and Posterior Reversible Encephalopathy Syndrome (PRES). We present a rare case of simultaneous development of PDPH and PPE in a parturient, which then proceeded to PRES.

Case Description & Management: A 26 year old G2 P2 parturient delivered vaginally following an uncomplicated combined spinal epidural but then developed positional headache (no neurological symptoms) on post-partum day 2. Conservative management for PDPH includes IV caffeine/analgesia (Fioricet) with slight improvement. She was discharged home on the post partum day 3 with mild headache. Two days later, the patient was readmitted to neuro ICU with severe headache having had two episodes of tonic and clonic seizures at home. CT-brain showed global cerebral edema. Patient had slightly elevated blood pressure with normal PIH labs with moderately elevated uric acid levels. The patient was diagnosed with post partum eclampsia and treated with IV magnesium and dexamethasone. On the following day, an MRI was suggestive of PRES with mild intracranial hypotension. On the third post readmission day, patient's condition improved but the positional headache persisted, which necessitated an epidural blood patch. Her headache resolved and she was discharged home in stable condition without any neurological sequelae.

Discussion: PRES is a rare disorder associated with acute hypertension, immune-suppressive therapy and eclampsia and manifests with headache, seizures, and altered sensorium. Late post partum eclampsia is diagnosed as convulsions occurring greater than 48 hours but less than 4 weeks postpartum, with 40% of the cases without the clinical signs and symptoms of preeclampsia [1]. The case presented here is a unique and rare episode of Post partum eclampsia with PRES, which commenced with subtle signs of a headache, masked with PDPH symptoms, proceeding to seizures. In the same patient, post-partum eclamptic seizure, masked her coincident PDPH later successively treated with epidural blood patch. Simultaneous onset of the two different complications, PDPH and PPE masked each other due to the common symptom of headache.

Conclusion: Headache in post-partum women may not always be simple PDPH on its own. PPE and PRES must always be considered in the differential diagnosis.

Reference:
1. Hirshfeld-Cytron J, Lam C, Karumanchi SA, Lindheimer M. Late postpartum eclampsia: examples and
review. Obstet Gynecol Surv. 2006 Jul; 61(7):471-80.

Ultrasound Guided Caudal Labor Analgesia in a Patient with Harrington Rods

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A caudal epidural catheter can provide effective labor analgesia in a parturient desiring neuraxial analgesia when a lumbar epidural catheter is not feasible. In patients whose anatomical landmarks for blind caudal epidural placement cannot be clearly identified, the use of an ultrasound may facilitate accurate, less traumatic, and faster placement of the catheter. We report the first successful ultrasound guided caudal catheter placement for labor analgesia.

A 27-year-old woman with a history of thoracic and lumbar Harrington rod placement presented to the labor and delivery unit at 38 weeks gestation. She described a previous delivery without analgesia due to unsuccessful epidural placement. She requested neuraxial labor analgesia, and we agreed to attempt caudal catheter placement.

The patient was positioned in the left modified Sims position. Using a curvilinear ultrasound probe, the sacral cornu, sacral hiatus, and sacrococcygeal ligament were identified in the transverse plane (Fig 1). Under ultrasound guidance, using the out of plane technique, a 17G Tuohy needle was advanced at a 45-degree angle through the sacrococcygeal ligament at the sacral hiatus and into the caudal epidural space. The catheter was advanced through the Touhy. The tip was identified at the L4-5 space with visualization assisted by color flow during bolus of normal saline. Following a negative test dose and analgesic dose, the patient was pain free with a bilateral sensory level of L3 to S2. She had excellent pain control throughout her labor with maintenance patient-controlled caudal epidural analgesia.

Utilization of caudal epidural labor analgesia is often limited by technical difficulties. Weight gain during pregnancy can make it difficult to palpate landmarks. There is anatomic variability in the sacral hiatus size, with some patients' sacral hiatus being too small or closed, precluding caudal epidural injection [1]. Ultrasound is being used more frequently to assist with neuraxial techniques to increase success rates and reduce complications [2]. The use of this technique can make caudal epidural analgesia a reasonable alternative when lumbar epidural catheter placement is not possible.

References:

1. Chen CP et al: Ultrasound as a screening tool for proceeding with caudal epidural injections. Arch Phys Med Rehabil. 2010 Mar;91(3):358-63.
2. Shankar H, Zainer CM: Ultrasound guidance for epidural steroid injections. Tech Reg Anesth Pain Manag. 2009 Oct;13(4): 229-35.

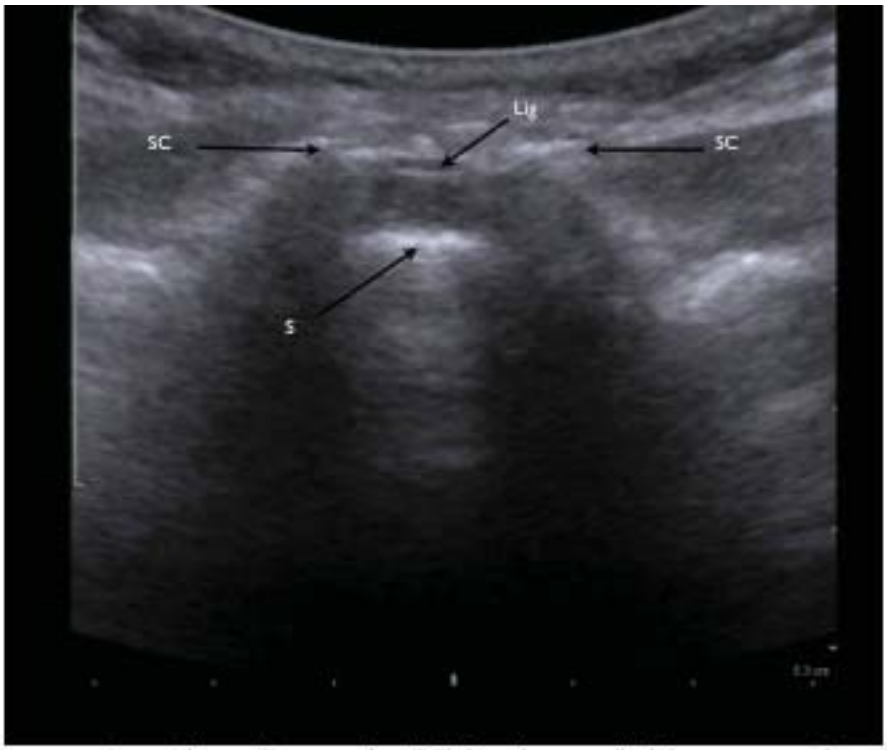

Fig 1. Transverse view with curvilinear probe. (SC) Sacral cornu; (Lig) Sacrococcygeal ligament; (S) Base of sacrum.

Abstract S 59

Accidental Administration of Epidural Oxytocin in Laboring Patient: Case Report and Root Cause Analysis

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Introduction: Epidural analgesia during vaginal delivery is widespread practice in current obstetric anesthesia. Epidural administration of unintended substance is well known and potentially devastating complication. Pubmed search reveals epidural administration of chlorhexidine, oxytocin, insulin, vecuronium, rocuronium, atracurium, succinylcholine, tramadol, acetaminophen , potassium chloride, magnesium sulfate, metaraminol, cefazolin, gentamicin, glucose, fat emulsion and dextran. (1-6)

Report: We present a case of healthy G4P3 parturient, scheduled for standard labor analgesia procedure. After uneventful placement and epidural administration of two test doses of what was believed to be 0.1% Bupivacaine with 2mcg/ml of fentanyl. No immediate motor block was detected after first test dose ruling out intrathecal placement. After 5 minutes second test dose was given to establish analgesia level and confirm epidural placement. This is routine way of ruling out intrathecal and intravascular position of epidural catheter adopted by our service. We draw test doses from premade epidural solution bag before procedure start. Soon after test doses it was noticed that by mistake Oxytocin solution of 30 units in 500 ml of NS was attached to epidural tubing though which test doses were drawn. Patient made aware of the error and epidural infusion was never started with regular neurological checks performed every hour. Patient delivered vaginally and no neurologic deficits were assessed. Follow up did not reveal any neurological deficit after 10 days.

We present root cause analysis of this incident with recommendations to reduce the risk of such event happening again.

References:
1. Responsiveness to the chlorhexidine epidural tragedy: a mental block? O'Connor M. J Law Med. 2012 Mar;19(3):436-43.
2. Accidental epidural administration of Syntocinon. Ross MJ, Wise A. Int J Obstet Anesth. 2012 Apr;21(2):203-4.
3. Accidental epidural injection of rocuronium.
4. Shin SW, Yoon JU, Baik SW, Lee HJ, Ri HS. J Anesth. 2011 Oct;25(5):753-5.
5. [Paraplegia after inadvertent epidural administration of potassium chloride]. Belyamani L, Elmoqadem A, Elbaite A, Mounir K, Drissi Kamili N. Ann Fr Anesth Reanim. 2008 Jan;27(1):111-3.
6. Inadvertent epidural administration of insulin. Kal JE, Vlassak EE, Bulder ER, Franssen EJ. Anaesthesia. 2007 Jun;62(6):621-3.

Abstract S 60

Cesarean Section in Parturient with Prosthetic Mitral Valve: Challenges of Safe Neuraxial Block Management

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Introduction: Incredible progress in the field of cardiac surgery has guaranteed survival and prolonged normal life of many children and young adults, with cardiac defects both congenital and acquired. Prosthetic valve replacement is a common option for surgical repair in young patients. The benefit of durability of prosthetic valves comes at the price of lifelong anticoagulation treatment. During pregnancy patients must switch from warfarin to Low Molecular Weight heparin (LMWH), due to teratogenicity of warfarin. They present an extra challenge for peripartum obstetric and anesthetic management. Usual approach is limited to general anesthesia for cesarean section, due to substantial risk of catastrophic epidural hematoma after neuraxial block [1][2]. We present a case of cesarean section realized under spinal anesthesia guided by Thromboelastogram (TEG) as a tool for safe management of neuraxial block.

Report: A 29 year old G2P1 parturient at 39 weeks was scheduled for induction of labor, but found to be in breech presentation. Cardiology service was consulted and recommended that she be switch from LMWH to heparin infusion, to be discontinued 4-6 hours prior to vaginal delivery. Cesarean section was indicated after fetal distress during induction of labor. During consent, the patient expressed preference for regional anesthesia. In addition to routine platelet count (169K) PT(12.6), INR(1.0) and PTT(38), TEG was also drawn before surgery (Without heparinase: R-2.2 min, K-0.8 min, Angle-78.4 deg, MA-75.9mm. With heparinase: R-2.2 min, K-0.8 min, Angle-77.9 deg, MA-5.1 mm). Blood was noticed at initial attempt during spinal placement. Considering normal TEG, the decision to proceed with spinal anesthesia was made and was successfully performed with clear CSF. Cesarean section was uneventful with delivery of a healthy baby. Two hourly follow up for 24hours showed no neurological deficit and patient met all post-partum recovery goals. Heparin infusion was restarted in the postpartum period. She was switched to LMWH and later to warfarin as per cardiology service recommendations.

Conclusion: Performing TEG with and without heparinase is an indispensable tool when considering neuraxial block for peripartum anesthetic management in high risk obstetric patients receiving heparin anticoagulation.

References:
1. Regional anaesthesia in the patient receiving antithrombotic and antiplatelet therapy. Horlocker TT. Br J Anaesth. 2011 Dec;107
2. Regional anesthesia in the patient receiving antithrombotic or thrombolytic therapy: American Society of Regional Anesthesia and Pain Medicine Evidence-Based Guidelines (Third Edition). Horlocker TT, Wedel DJ, Rowlingson JC, Enneking FK, Kopp SL, Benzon HT, Brown DL, Heit JA, Mulroy MF, Rosenquist RW, Tryba M, Yuan CS. Reg Anesth Pain Med. 2010 Jan-Feb;35(1):64-101.

Abstract S 61

Anesthetic Management of a Parturient with Severe Pulmonary Hypertension

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Introduction: This is a case report of the successful anesthetic management of a laboring patient with severe pulmonary HTN. The mortality rates for pregnant women with pulmonary hypertension are 30-56%; a majority of these deaths occur during labor or within one-month postpartum.

Case Report: A 35 years female G5P2 , with PMH of childhood rheumatic heart disease, s/p mitral valvuloplasty for mitral stenosis in 1998 and chronic pulmonary HTN was admitted to the OB unit at 35 weeks for symptomatic and progressing pulmonary HTN. Patient complained of SOB on minimal exertion, orthnopnea requiring two pillows to sleep, and 3 episodes of syncope in the last 3 weeks. She was placed on bed rest, fluid restriction, no medications and scheduled for labor induction at 37 weeks when stable. A Doppler echocardiogram showed severe pulmonary HTN, severe tricuspid regurgitation (right ventricular systolic pressure of 63 mm Hg), moderate mitral stenosis (area of 1.2cm2 with an estimated mean gradient of 21 mm hg), severe dilated left atrium, moderate dilated right atrium, mild left ventricular systolic dysfunction with an EF= 45-50%. Patient was stable at rest although unable to tolerate physical activity. At 37 weeks and 3 days, she was brought to L&D for induction. She was placed in PACU with standard monitoring and given supplemental O2 2l via NC. Preinduction A-line and CSE was inserted by anesthesia team. Duramorph 0.3 mg, fentanyl citrate 25 mcg, and 1mg bupivicaine were injected intrathecally. No test dose performed. 0.1% bupivacaine with 2mcg fentanyl epidural infusion at 6cc/h started three hours later to ensure patient comfort while induction continued with oxytocin. The patient was not given any IV fluids except 10ml/h as a carrier for Oxitocin. She was allowed to have clear liquids up until delivery. Six hours after the patient had NSVD without complications. She was observed postpartum in the telemetry unit with no issues and discharged home 2 days later. 2 months later, patient underwent TVR/ MVR/ AVR cardiac surgery.

Discussion: Physiologic hypervolemia of pregnancy predisposes women to pulmonary congestion, which is poorly tolerated by patients with preexisting pulmonary HTN. Labor and the early postpartum state puts these patients at the highest risk of hemodynamic catastrophe due to a significant increase of cardiac output secondary to autotransfusion from uterus contractions. Anxiety, pain, hypoxia, and hypercapnea are known to increase pulmonary pressure and should be avoided. We advocate for a pain free, stress free delivery; early CSE with intratechal morphine dose for prolonged analgesia and hemodynamic stability; strict titration of epidural infusion rate of local anesthetics; tight hemodynamic monitoring; continuous oxygen supplementation; avoidance of routine IV fluid use; and 24 h postpartum ICU monitoring. For achievement of these goals, discussion with all medial care teams must take place.

Abstract S 62

Managing Post-Cesarean Analgesia in Opioid-Dependant Parturients: A Case Report of a Woman on Chronic Buprenorphine Therapy

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Pre-existing opioid dependence in pregnant women increases the complexity involved with management of peripartum analgesia. Buprenorphine, a mixed partial μ-opioid receptor agonist and κ-opioid receptor antagonist, is increasingly being prescribed over methadone in opioid dependent parturients (3,4,5). Use of this drug, which may produce a “ceiling effect” in achievable pain relief via additional μ-opioid receptor agonists, is of concern (2,4). We report our experience with managing a buprenorphine-dependent parturient presenting for urgent Cesarean section.

Case: A 36 y.o. G1P0 female at term gestation with a history of opioid dependence presented for urgent Cesarean section due to low biophysical profile score and breech presentation. She was taking buprenorphine 2mg sl twice daily, and had her most recent dose the morning of her arrival.

Combined spinal-epidural anesthesia with 1.5 cc of 0.75% hyperbaric bupivicaine and 10 mcg fentanyl was administered intrathecally. Immediately post-surgery, ultrasound-guided transversus abdominis plane (TAP) block was performed bilaterally with 20 mL of 0.5% ropivicaine, in addition to commencing patient-controlled epidural analgesia (PCEA: infusion of 0.08% bupivicaine with 2 mcg/ml fentanyl, rate 10 cc/hr, bolus 6cc, lockout 10 mins). Diclofenac sodium, 100 mg pr, was given once, followed by regular doses of acetaminophen (1 g po q6h) and diclofenac (50 mg po q8h). Buprenorphine was continued on her regular schedule. Oxycodone (10 mg po q4h prn) for breakthrough was seldom used as she found her pain to be generally well managed, with verbal pain score 2/10. She required one epidural bolus on post-operative day (POD) 1 with 6cc 0.25% bupivicaine, 4cc 2% lidocaine and 50 mcg fentanyl. PCEA was discontinued POD 2 and the patient was discharged home POD 4 on her usual dose of buprenorphine, diclofenac and acetaminophen. There was no evidence of opioid withdrawal during her admission. The patient provided consent for publication of this case.

Discussion: Our choice of PCEA as primary modality of analgesia allowed unaltered maternal buprenorphine therapy. It obviated the risk of therapeutic failure of administered opioid agonists, due to functional antagonism by buprenorphine. Omitting epidural morphine, the TAP block was utilized as part of multimodal therapy and provided 8 hours of analgesia. Our multimodal approach, with regional and neuraxial anesthesia techniques and oral adjuncts, appeared to reduce opioid requirements, as our patient required less oxycodone than amounts published in literature. We expect the prevalence of patients maintained on buprenorphine to increase, given that buprenorphine has shown promising results compared to methadone in terms of neonatal outcomes (1).

References

1. Am J Obstet Gynecol. 2011;205(4):302-8.
2. Am Surg. 2010;76(4):397-9.
3. Drug Alcohol Depend. 2003;70(2 Suppl):S59-77
4. Drug Alcohol Depend. 2003;70(2 Suppl):S87-101.
5. N Engl J Med. 2010;363(24).

Dextrocardia Presenting as Sustained Atrial Tachycardia Refractory to Medical Management During Term Labor in a Nulliparous Parturient

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A 21y/o G1P0 previously healthy female admitted in active labor at 38wks developed narrow complex tachycardia after administration of terbutaline for tocolysis secondary to sustained fetal HR deceleration. Multiple interventions proved unsuccessful, except for transient normalization with adenosine. The patient delivered with vacuum-assistance and immediately postpartum a full work up was performed. A cardiac echo was negative and a chest x-ray at that time demonstrated dextrocardia and a gastric bubble under the right hemi-diaphragm suggestive of situs inversus. The patient was started on a diltiazem infusion, loaded with flecainide and transitioned to oral diltiazem. During pregnancy women experience a variety of physiological changes, and to the parturient with pre-existing cardiac disease, whether known or not, none is as significant as the hemodynamic and cardiovascular changes that occur. These physiological changes may also precipitate new onset cardiac disease. The most common cardiac complication that occurs in pregnancy is arrhythmias, with or without underlying structural heart disease, and may be secondary to the combination of a hyperdynamic state, electrolyte disturbances and an altered hormonal environment. Iatrogenic causes include administration of medications such as tocolytics (terbutaline) or oxytocin. The use of terbutaline in this patient already in labor, with an unknown congenital cardiac condition may have induced the arrhythmia. Our patient was found to have dextrocardia on CXR. Dextrocardia, a congenital cardiac position anomaly in which the heart is located in the right hemi-thorax and the axis of the heart is rotated so that the apex is pointed right instead of the left. There are two major types--patients with the “mirror image” type, such as our patient, the conduction system of the heart is also abnormal. As a result, the development of arrhythmias in dextrocardia is more likely secondary to the abnormal conduction system. Again, it is interesting to note that this patient did not have ECG findings consistent with dextrocardia, but CXR was positive for the cardiac silhouette in the right hemi-thorax and gastric bubble in right upper quadrant consistent with dextrocardia situs inversus. In regards to the recalcitrant nature of the arrhythmia, this likely may have been a consequence of her dextrocardia. RH Anderson. The conduction tissues in congenitally corrected transposition. Ann Thor Surg. 2004;77:1881-1882.

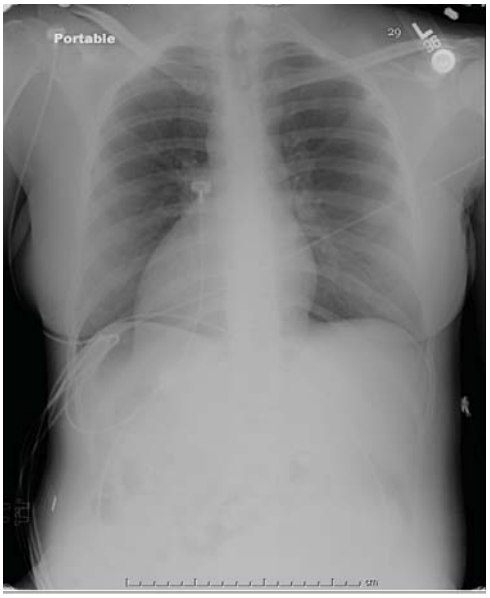

Figure 3: CXR demonstrating dextrocardia

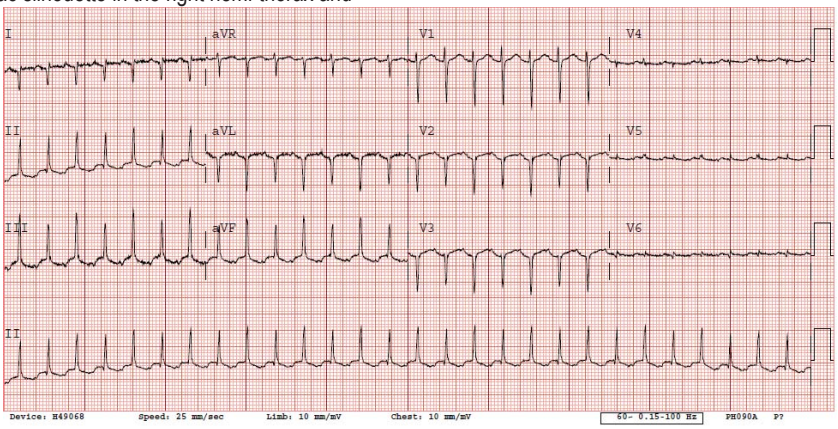

Figure 2: 12 lead EKG

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Successful Resuscitation of a Parturient with Amniotic Fluid Embolism

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A 27 year old (G3P2, 37 weeks gestation) white lady, with history of pre-eclampsia and precipitous labor during her previous pregnancies was admitted for elective induction of labor. In this pregnancy she had polyhydramnios. She had a rapid progress of fist stage of labor. When cervix was fully dilated there was fetal bradycardia (Fetal heart rate 60 bpm). Instrumental delivery was performed and the baby had normal Apgar scores. As soon as baby was delivered mother was found to be unresponsive.

Anesthetist was in the room within one minute. At this stage, patient was unresponsive but there was carotid pulse and respiratory effort. Within a minute, patient lost cardiac output. Advanced Life Support was commenced with left lateral tilt and Defibrillator was attached. ECG trace on the monitor was Pulseless Electrical Activity. Trachea was intubated and IV fluid was started. Per-vaginal bleeding was noted and the obstetrician manually removed the placenta.Ergometrine 0.5mg + oxytocin 5IU was given IM. Continued massive vaginal bleed was noted. Although initially contracted, the uterus was found to be becoming intermittently atonic and IM Carboprost 250IU was administered followed by oxytocin analogue infusion (10IU/Hr)and 1gm of IV Tranexamic acid. Two units of O negative blood was given stat. Arterial line was inserted.

Patient briefly regained cardiac output and was transferred to OR. She was ventilated with oxygen/ nitrous oxide (50:50) and minimal sevoflurane. Decision was made to do laprotomy. Patient was still intermittently losing her cardiac output in OR and had to be given CPR and further boluses of Epinephrine. The patient was in Disseminated Intravascular Coagulopathy (DIC) and obstetrician decided to do a hysterectomy. Her hemoglobin was found to be 6.2 gm/dl and the INR, fibrinogen and PTT ratio were not recordable. She received 2 units of O negative blood and 4 units of packed red blood cell (pRBC), 3 units of Fresh frozen plasma (FFP), 2 units of platelets and 2 units of cryoprecipitate. Central line was inserted and Nor Adrenaline infusion was commenced. By the end of the laprotomy, patient was relatively haemodynamically stable. Total estimated blood loss was 4 liters.

Patient was transferred to ICU, where she developed further bleeding from DIC and had be transfused 2 pRBC, 5 units of FFP and 3 units of Cryoprecipitate. After discussion with hematologist it was decided to give patient Recombinant Activated Factor VIIa and further tranexamic acid. Patient made a full recovery after 15 hours and was extubated. No neurological or thrombotic complication was noted at follow-up.

Discussion: Amniotic Fluid Embolism although rare is a significant cause of direct maternal death. High Index of suspicion, quick clinical decision making, aggressive management of coagulopathy and high quality supportive care are essential for favorable outcome.

Abstract S 65

Obstetric and Anesthetic Management of a Parturient with Extensive Lower Extremity DVT

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This case report describes the obstetric and anesthetic management in the peripartum period of a 31 year-old G1P0 parturient on anticoagulation therapy for an extensive deep venous thrombus (DVT) in the left lower extremity. Her past medical history was significant for Factor V Leiden deficiency and asthma. At 33 weeks gestation, she developed extensive venous thrombus involving the left proximal superficial femoral, the great saphenous, the common femoral and the external iliac veins. Therapeutic anticoagulation was started with enoxaparin and switched to heparin infusion after she was admitted to the labor and delivery suite for induction of labor at 39 weeks gestation. When she progressed into active labor, the heparin infusion was discontinued in anticipation of labor epidural placement. A labor epidural catheter was placed uneventfully with one attempt four hours after stopping the heparin infusion and upon obtaining a normal PTT. Approximately twelve hours after the epidural was placed, she developed a non-reassuring fetal heart tracing and underwent an uneventful stat cesarean section with delivery of a healthy infant. She was administered heparin subcutaneously two hours after surgery and epidural catheter removal and restarted on therapeutic enoxaparin twelve hours after surgery. The patient was discharged home on postoperative day four and underwent successful percutaneous thromboplasty four months after delivery due to persistent extensive lower extremity thrombus and edema despite therapeutic anticoagulation.

The estimated incidence of deep venous thrombosis is 5-12 per 10,000 pregnancies in antepartum and 3-7 per 10,000 pregnancies during postpartum period (1). When compared with non-pregnant controls, the daily risk for parturient to develop DVT is increased 10 to 30 fold (2). Combined with pulmonary embolism, it is a leading cause of maternal death in the developed world (3). However, current management guidelines are largely extrapolated from data obtained in non-pregnant patients due to limited data available from the pregnant patient population. Our case report describes the peripartum management of extensive lower extremity DVT and reviews the etiology, risk factors, current management guidelines and considerations for surgical (IVC filter placement) versus medical (anti-coagulation only) approaches.

References:

1. Simpson, EL, Lawrence RA, Nightingale, AL, Farmer RD. Venous thromboembolism in pregnancy and the puerperium: incidence and additional risk factors from a London perinatal database. BJOG. 2001;108:56-60
2. Heit JA, Kobbervig CE, James AH, et al. Trends in the incidence of venous thromboembolism during pregnancy or postpartum: a 30-year population-based study. Ann Intern Med. 2005;143:697-706
3. Marc Rodger. Evidence base for the management of venous thromboembolism in pregnancy. Hematology.2010;1:173-180.

Abstract S 66

Spinal Anaesthesia After Spinal Instrumentation...Made Easy by Ultrasound!

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We present a case series of three patients in whom use of the ultrasound facilitated successful Neuraxial anaesthesia. Each of the patients had prior spinal surgery ranging in extent from multi-level lumbar spinal fusions to thoraco-lumbar spinal fusions.

Case 1: This 30-year-old patient previously had two Caesarean deliveries under general anaesthesia after having been refused a regional anaesthetic in a different institution. This was because of a perceived contraindication to the technique on the basis that she had Spinal rods in situ for correction of scoliosis.

Case 2: The second patient in this series described a psychologically traumatic previous experience where attempts at spinal anaesthesia had taken more than one hour. She had previous spinal instrumentation with spinal rods, which were subsequently removed and underwent spinal fusion and bone grafting.

Case 3: The third patient in this series had initially been reluctant to undergo spinal anaesthesia, as it was her perception that it was contraindicated due to her spinal surgery. Following consultation with our team she agreed to an ultrasound guided regional technique.

All three had uncomplicated single shot spinal anaesthesia administered at a lumbar space with reasonably preserved anatomy, as pre-determined by ultrasound. Satisfactory anaesthesia was achieved in each case and post-operatively there were no adverse sequelae.

Anaesthetists confronted with a patient with prior spinal instrumentation often avoid Neuraxial anaesthesia. There are a multitude of different reasons for taking this approach including perceived difficulty and lack of success. Fears over medico legal consequences of adverse sequelae exist. Furthermore, there is a misconception amongst both physicians and patients that Regional Anaesthesia is contraindicated where there has been prior spinal surgery.
In one study only two of nineteen patients who had had anterior spinal surgery received regional anaesthesia for delivery.1

In our institution, we are very familiar with the use of ultrasound guided regional anaesthetic techniques. We feel that this case series highlights the benefit of using ultrasound in performing regional anaesthesia in technically difficult cases.

References:
1. Lavelle WF, Demers E, Fuchs A, Carl AL. Pregnancy after anterior spinal surgery: fertility, caesarean section rate, and the use of Neuraxial anaesthesia. Spine J 2009; 9:271-4

Abstract S 67

Pelvic Haematoma as a Cause of Unilateral Lower Limb Weakness After Spontaneous Vaginal Delivery

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We describe the case of a 34-year old multiparous woman (gravida 3, para 2) who presented to our institution in spontaneous labour at 40 weeks gestation. First stage of labour lasted 90 minutes, during which time epidural analgesia was administered. The second stage of labour lasted 30 minutes during which time the McRoberts manoeuvre (hyperflexion of hips) was employed to aid delivery. No instrumentation was necessary and a healthy male infant weighing 3.6kg was born by spontaneous vaginal delivery.
Twenty-four hours post-delivery, the patient complained of right hip pain and unilateral lower limb weakness. She was reviewed by our anaesthetic team and was found to have neuropathy in the distribution of the femoral and obturator nerves. She underwent MRI of her lumbosacral spine to outrule direct nerve injury from neuraxial blockade. Images demonstrated extensive muscle abnormality within the sartorius, adductor and gluteal muscle groups consistent with haematoma. Conservative management with analgesia and physiotherapy was unsuccessful and she required haematoma drainage under radiological guidance to relieve nerve compression.

This case of pelvic haematoma causing neurological abnormality has not been described in the literature to date. Maternal neurological complications after labour and delivery are well documented1 and most injuries are the result of maternal obstetric palsies rather than anaesthetic intervention.2 However, given the close correlation between neuraxial blockade and neurological deficit, the anaesthesia team is usually the first port of call when a woman has neurological signs post-delivery.3 This case highlights how patients with epidural analgesia can be placed in extreme delivery positions, which they may not have assumed in the absence of sensory blockade. This extreme maternal positioning may result in mechanical trauma or stretch injury to nerves and vascular structures.

1Holdcroft A, Gibberd FB, Hargrove RL, Hawkins DF, Dellaportas CI. Neurological complications associated with pregnancy. Br J Anaesth 1995;75:522-6
2Loo CC, Dahlgren G, Irestedt L. Neurological complications in obstetric regional anaesthesia. Int J Obstet Anesth 2000;9:99-124
3Wong CA. Neurologic deficits and labor analgesia. Reg Anesth Pain Med 2004;29:341-51

Extensive Lymphadenopathy Complicating Airway Management in a Parturient

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Introduction: This case report of a parturient presenting with neck swelling concerning for difficult airway emphasizes the need for a multidisciplinary approach to care.

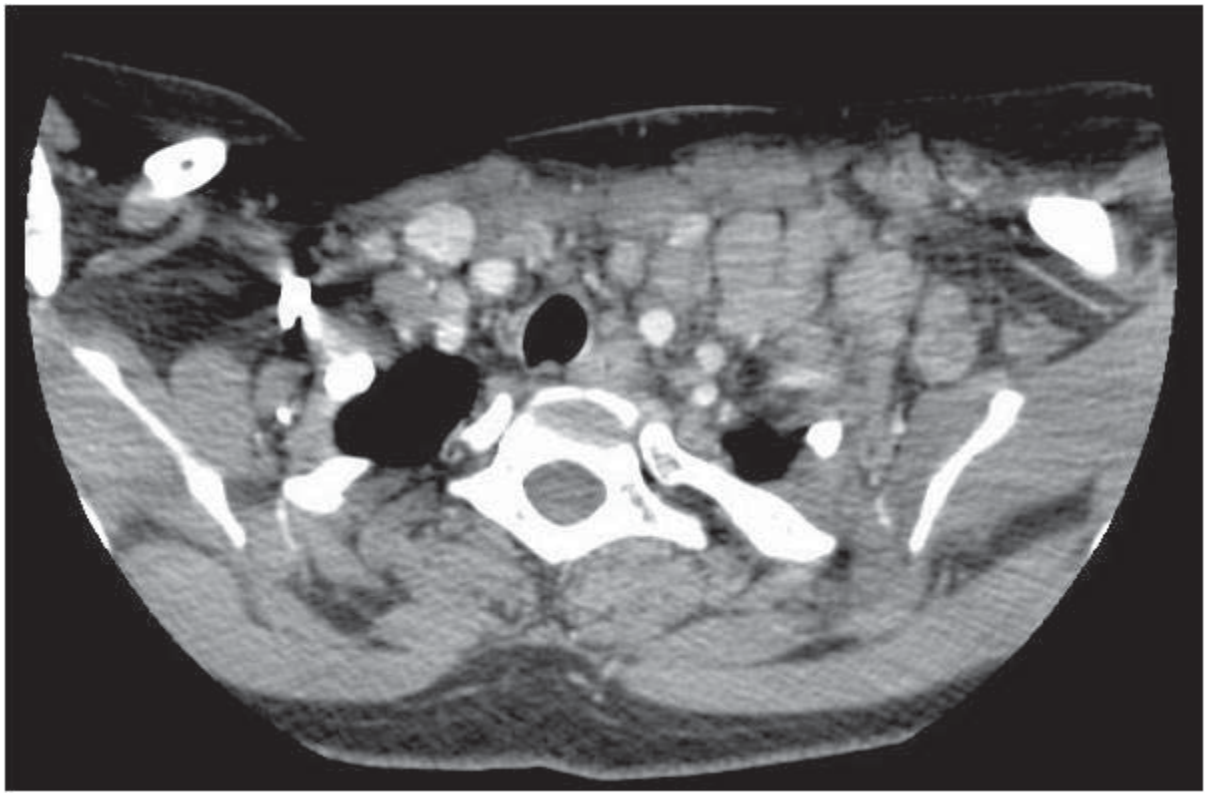
Case: A 25-year-old G3P2 patient at 35+6 weeks gestational age (GA) presented to our institution with “tennis ball sized” neck swelling and voice change. The patient denied dysphagia or dyspnea in the supine position with uterine displacement. Body mass index was 37. Interincisor distance was 2cm, limiting Mallampati determination. Neck extension was limited by pain, and no tracheal deviation was present. Computed tomography [Fig1] showed extensive submandibular, supraclavicular, and mediastinal lymphadenopathy without airway compression. The ENT service performed fine needle aspiration, consistent with carcinoma, and bedside fiberoptic nasopharyngoscopy, showing no airway abnormality. Inflammatory breast cancer was suspected based on breast ultrasound, with punch biopsy results pending.

At 37+1 GA, the patient was taken for primary Cesarean delivery for breech presentation under neuraxial anesthesia after discussion with surgical oncology, ENT, radiology, anesthesia, and obstetric services, with plans for additional surgery and treatment of carcinoma after the immediate postpartum period.

The patient received low-dose combined spinal (0.4 ml of 0.75% hyperbaric bupivacaine with 100mcg morphine and 15mcg fentanyl) epidural with fiberoptic bronchoscope and airway cart present for the entirety of case. After titration of epidural with 2% lidocaine with epinephrine, the patient had adequate sensory level for surgery and uneventful delivery.

Discussion: Initial plans for this patient were for awake fiberoptic intubation and general anesthesia for Cesarean delivery. Regional anesthesia does not represent a solution to the parturient with a difficult airway, and strategy for intubation must be determined(1). After further imaging and ENT evaluation, however, it was clear that she had no airway compromise and that her voice change was due nerve involvement, not direct compression. There was multidisciplinary coordination of care prior to delivery and continuous adjustment of anesthetic plan based on evolving information. Neuraxial anesthesia was ultimately selected due to reassuring airway elements and the ability to convert to general anesthesia intraoperatively if necessary.

Reference: 1.ASA Task Force of Management of the Difficult Airway.Anesthesiol 2003:1269-77



Abstract S 69

Utilizing Skin Temperature Measurements to Assess Efficacy of Epidural Analgesia in a T6 Paraplegic Parturient

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We present a patient with autonomic hyperreflexia (AH) in which a novel method of measuring the level of epidural blockade was employed. AH is a life-threatening condition that occurs commonly in patients with spinal cord injury at or above the T7 level (1). AH is characterized by facial flushing, bradycardia, and malignant hypertension (4). It is precipitated by stimulus below the level of injury or distention of hollow viscera, i.e. bladder distention, uterine contraction, or cervical dilation (2). Prophylactic epidural analgesia is the treatment of choice for AH, however assessment of the level of analgesia is difficult in these patients due to their injury.

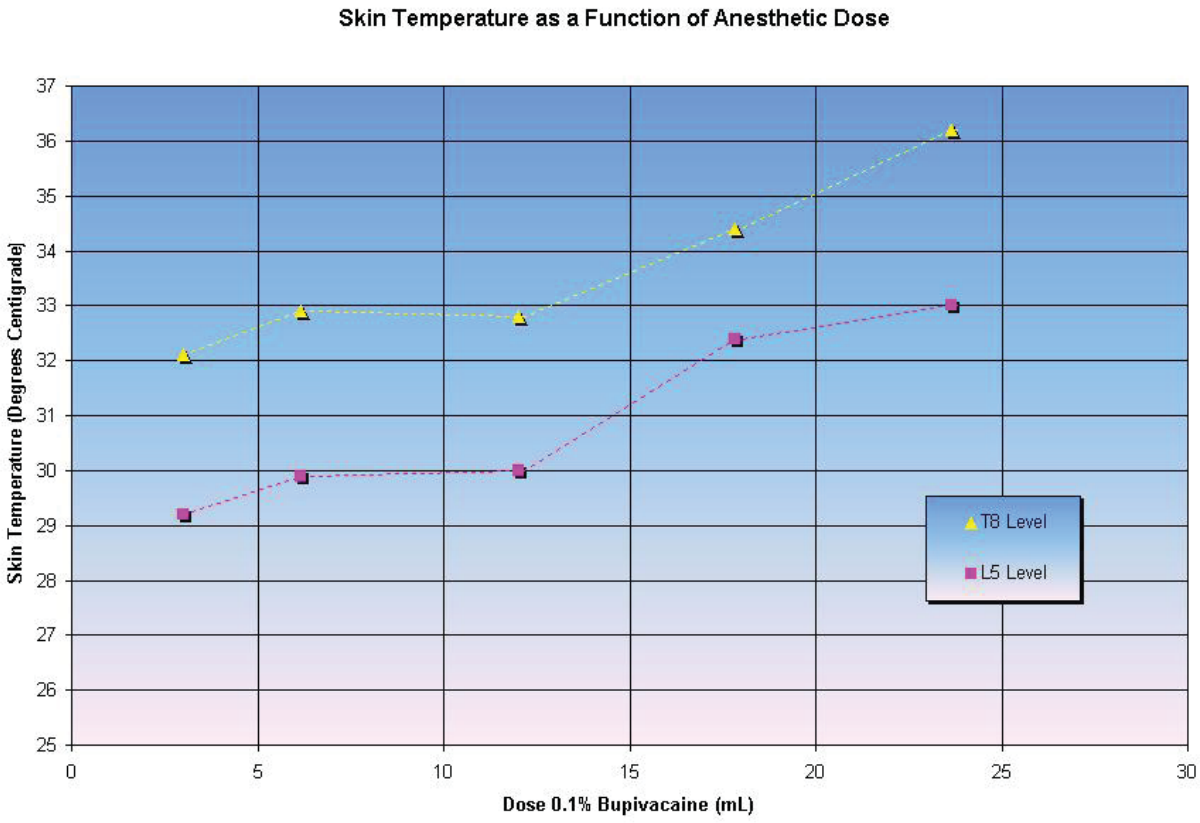
A 23-year-old P1G0 with T4 parapalegia and AH presented at 37 weeks EGA for management of delivery by induction of labor. The plan included epidural prior to labor induction as prophylaxis against AH triggered by uterine contraction. An epidural catheter was placed at the L3/L4 interspace with 6cm of catheter in the epidural space. Analgesia was induced with bupivacaine 0.25%. An infusion of 0.1% bupivacaine with 1.5 mcg/mL fentanyl was initiated at 10 mL/hr. Skin temperature probes were placed at the T8 and L5 levels to asses temperature change due to vasodilation caused by the epidural block. Readings were taken at 5 minute intervals during the dosing of the epidural medication. During this time, an increase in skin temperature was noted that the T8 and L5 Levels.

Following completion of dosing, a control temperature was taken at the C4 level which was lower from the T8 level temperature. Labor proceeded without incident and the catheter was removed following delivery.

Prophylaxis against the trigger of AH is an important aspect of the management of at-risk patients who present for childbirth. Placement of an epidural is the current standard for treating these patients (3). Difficulty arises in the dosing of the epidural block in patients who are unable to communicate the signs of loss of cold or sharp touch sensation for the assessment of block level,(3) as in pediatrics or otherwise non-communicative patients. We propose that increase in skin temperature at the desired level of block can be studied as a potential simple and safe measure of blockade in patients who are otherwise unable to communicate block level.

1. Miller, R. Miller's Anesthesia 7th ed. 2009.
2. Anes. Analg. 89(1):148-9, 1999 Jul.
3. Regional Anesthesia. 19(6):415-7, 1994 Nov-Dec.
4. Anesthesiology. 51(6):560-2, 1979 Dec.

Additional Files:



First Nurse Anesthesia Bachelor's Degree Program in Africa: A First in the Continent

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Thomas Anabah, M.D. - University for Development Studies School of Medicine and Health Sciences - Tamale, Northern Region
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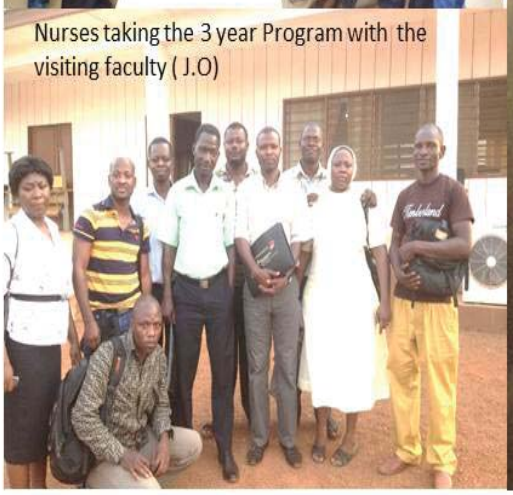
Introduction: Majority of anesthesia in Africa is delivered by non-physicians. There is acute shortage of trained anesthesia personnel in Ghana. About 500 nurse anesthetists provide over 88% of anesthesia. Only diploma degrees are offered. The lack of career progression within the nurse anesthesia specialty compels many nurse anesthetists to leave the specialty to attain higher degrees in other subjects. The government however only recognizes higher qualifications within the same primary specialty. This lack of career progress contributes to the lack of new recruits. It is imperative that higher degrees are available to nurses delivering anesthesia care to develop the specialty and improve quality.

Methods: A curriculum was approved by the University for Development Studies School of Medicine and Health Sciences in Tamale, Ghana, and supported by the Ghana Anaesthetist Society, Ministry of Health, Ghana Health Service and Tamale Teaching Hospital. Diploma curriculums were upgraded by introduction of advanced anesthesia principles, leadership training, research methodology studies, statistics, and managerial principles. Admission qualifications included diploma in nursing with a minimum of 3 years post-registration working experience; bachelor of nursing degree with 2 years' post-registration working experience or advance diploma in nurses anaesthesia with 2 years working experience. The degree program is 3 years for registered general nurses and 2 years for already qualified nurse anaesthetists.

Results: 12 nurse anesthetists with diplomas and 11 registered nurses were admitted for the two and three year program respectively. With one local consultant anesthesiologist, external faculty are obtained to deliver various lectures. Duke University anesthesia / nurse anesthesia faculty (working through Kybele®) have received formal recognized faculty positions within the local university to compliment the teaching faculty base. Other international faculty have also provided lectures on volunteer basis.
Conclusions: Local and International educational interest groups have recognized the need for higher degrees in nurse anesthesia in Ghana. The prestige of a career path is a positive step in ensuring the best educated practitioners remain in the profession. International educational partners should see the potential benefit in supporting these educational ventures to support the few teaching faculty base in low resource countries.



Management of an Urgent Cesarean Delivery in a Woman with Methamphetamine-Induced Cardiomyopathy and Pulmonary Hypertension

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Methamphetamine (meth) intoxication accounts for 5% of all cases of heart failure presenting in emergency rooms across the US, 40% of admissions for cardiomyopathy in patients under age 45 are due to meth use^1. Meth injection triggers neurotransmitter release that may cause placental abruption, IUGR, preterm birth, and fetal cardiac abnormalities, as well as MI, respiratory failure, stroke, pulmonary HTN (pHTN), aortic dissection, and sudden cardiac death^2. Chronic meth use is likely to increase in the obstetric population, therefore meth-induced cardiomyopathy should be considered in women presenting with heart failure^3. We present the delivery management of a primigravida using meth for over 20 years.

A 33 yo G1P0 was admitted @25 wks with chest pain, dyspnea, tachycardia, and hypertension (180/100). Transthoracic echo (TTE) showed EF 20%, severe global hypokinesis, PAP 35mmHg.The diagnosis of meth-induced cardiomyopathy with pHTN was established. Treatment included digoxin, atenolol, hydralazine, lasix and fluid restriction for an expectant management until delivery (vaginal delivery with neuraxial analgesia, arterial & central venous lines). At 29 wks concern for placental abruption with NRFHR prompted the call team to perform a semi-urgent cesarean delivery. The obstetrician argued strongly to transfer the case to the main OR and for insertion of a PA catheter. Pre-op TTE showed EF 40%. After an arterial line was inserted, an epidural catheter was placed. Despite negative CSF aspiration, epidural test dose revealed it was intrathecal (hypotension & T5 block). Upon PA catheter placement, the patient became so uncomfortable and uncooperative that a GA was performed. A RSI resulted in uneventful OT intubation. Initial PA catheter values were 41/25mmHg and stable throughout the case. Anesthesia was maintained with sevoflurane; a total of 25mg ephedrine, 600mcg of phenylephrine boluses & 0.2mcg/kg/min were also given. Time from GA to delivery was 45min, and total anesthesia time was 120min. Birth weight was 1222g, Apgar scores were 3,6 and 7; baby was admitted to the NICU. At the end of the case, spinal bupivacaine 1.25mg & duramorph 0.1mg was given and the catheter removed. The patient was transferred awake to the ICU where fluid restriction, carvedilol, furosemide, lisinapril were started. The PA catheter was kept for 48h and recovery was overall uneventful with no ensuing headache.

In sum, an unintended intrathecal catheter was placed in this patient with cardiomyopathy and pHTN. However, GA was induced for the patient to tolerate a PA catheter. A LidCO monitor may have been a useful tool in this case. This case is to our knowledge the 1st case report on meth-induced cardiomyopathy in pregnancy. It is unknown whether potentially neurotoxic effects of GA are worse in already compromised neonates exposed in utero to methamphetamine.

1. Am Fam Physian 2007, 76(8):1169-74
2. J Cardiovasc Magn Res 2009,11:46
3. Am J Med 2007,120(2):165-71

Abstract S 72

Peripartum Management of a Patient Status-Post Four Liver Transplants

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Introduction: A recent meta-analysis of 450 pregnancies in liver transplant (LT) recipients concluded that "successful pregnancies are viable" in this population. The vast majority of the 14,000 post-LT women of child bearing age in the United States had a single LT, and, while considered high-risk, pregnancy outcomes have been well documented. To our knowledge there are no reported cases of pregnancy after multiple LTs.

Case: 33 yo G1P0 with history of four orthotopic LTs presented at 35.0 wks EGA in labor. Her first transplant was at age 3 for biliary atresia; she was retransplanted at age 22 for hepC cirrhosis (likely contracted during first LT); at 23 she twice developed hepatic artery thrombosis, requiring third LT and subsequently fourth and final LT. Her medical history was also significant for tracheostomy as a child (subsequently decannulated), prolonged intubation between LT #3 and 4, as well as other surgeries including colostomy and takedown. Complications during pregnancy included perihepatic and intraabdominal abscesses requiring IV antibiotics. Her immunosuppressant regimen (azathioprine and cyclosporine) was continued through pregnancy. On presentation she was diagnosed with preeclampsia with BP elevated to 170s/110s, urinalysis with 3+ proteinuria, and creatinine of 2.1 mg/dl (baseline 1.1). An early combined spinal-epidural was placed, and analgesia was maintained per usual protocol. 3% chloroprocaine was at the bedside in case of emergency cesarean delivery (CD). A magnesium infusion was maintained throughout labor, and blood pressure was controlled with IV labetalol. Her labor was complicated by intermittent variable decelerations, but she vaginally delivered an 1859g male infant. Creatinine peaked at 2.4 on postpartum day 1 but downtrended thereafter, and the patient was discharged home on PPD 2.

Discussion: While outcomes have been studied in post-LT women, we believe our patient is the first report of pregnancy following four LTs. LT recipients are at increased risk of CD, preeclampsia, and preterm birth, and the latter two complications occurred in our patient. Cases of graft rejection, renal failure, and birth defects have also been reported. Our patient's renal function was of particular concern, as one case series observed eventual need for long-term dialysis in patients whose creatinine rose above 1.5 mg/dl. An emergency CD could have been problematic due to altered anatomy and presumed severe adhesive disease. Previous abdominal surgery is associated with longer CD duration, and the increased time to delivery in patients with previous CD is more pronounced when adhesive disease is present. Her possibly difficult airway added to the potential perils of emergent CD and reinforced the importance of having a functioning epidural. Collaboration between maternal fetal medicine, anesthesiology, nephrology, and transplant surgery led to a favorable outcome in this complex patient.

Abstract S 73

A Case of Complete Small Bowel Obstruction Complicated by Preterm Labor and Sepsis

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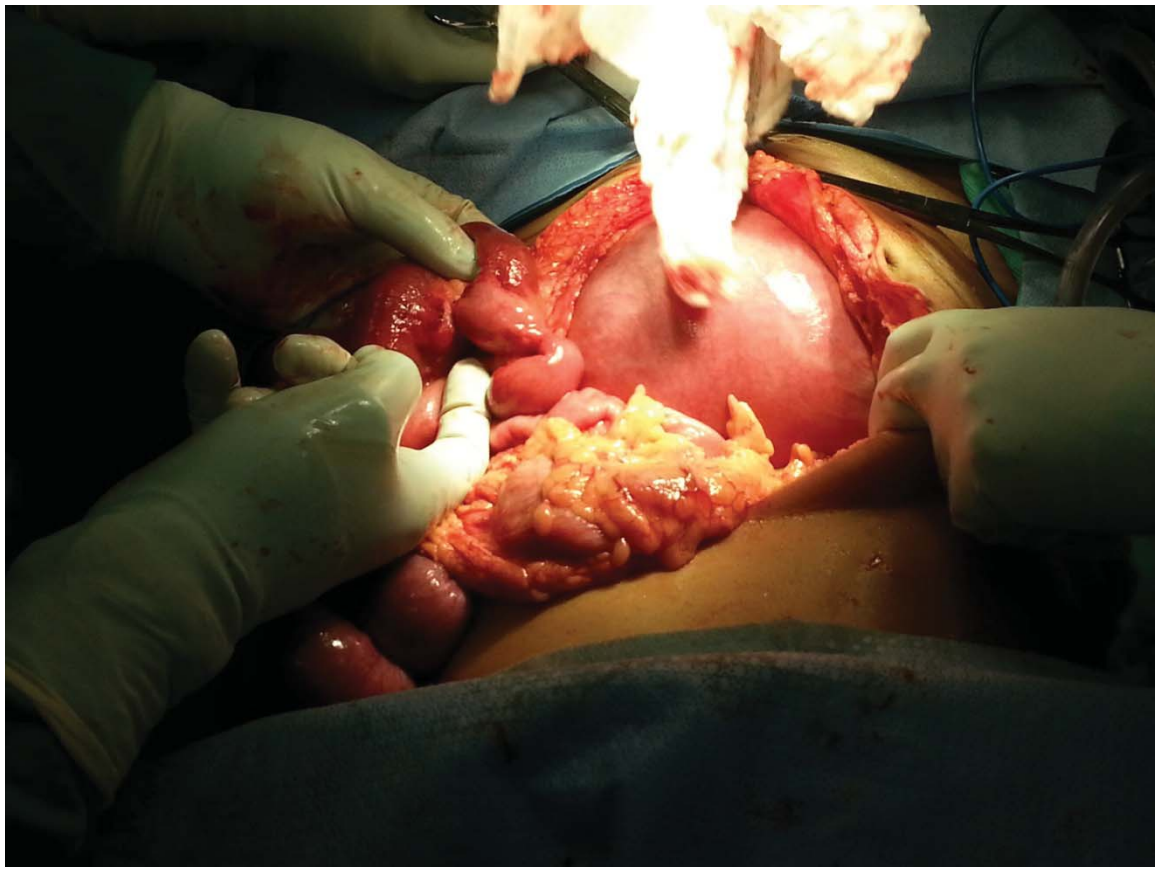
Nicholas Nedeff, M.D. - University of Miami Miller School of Medicine - Miami, FL

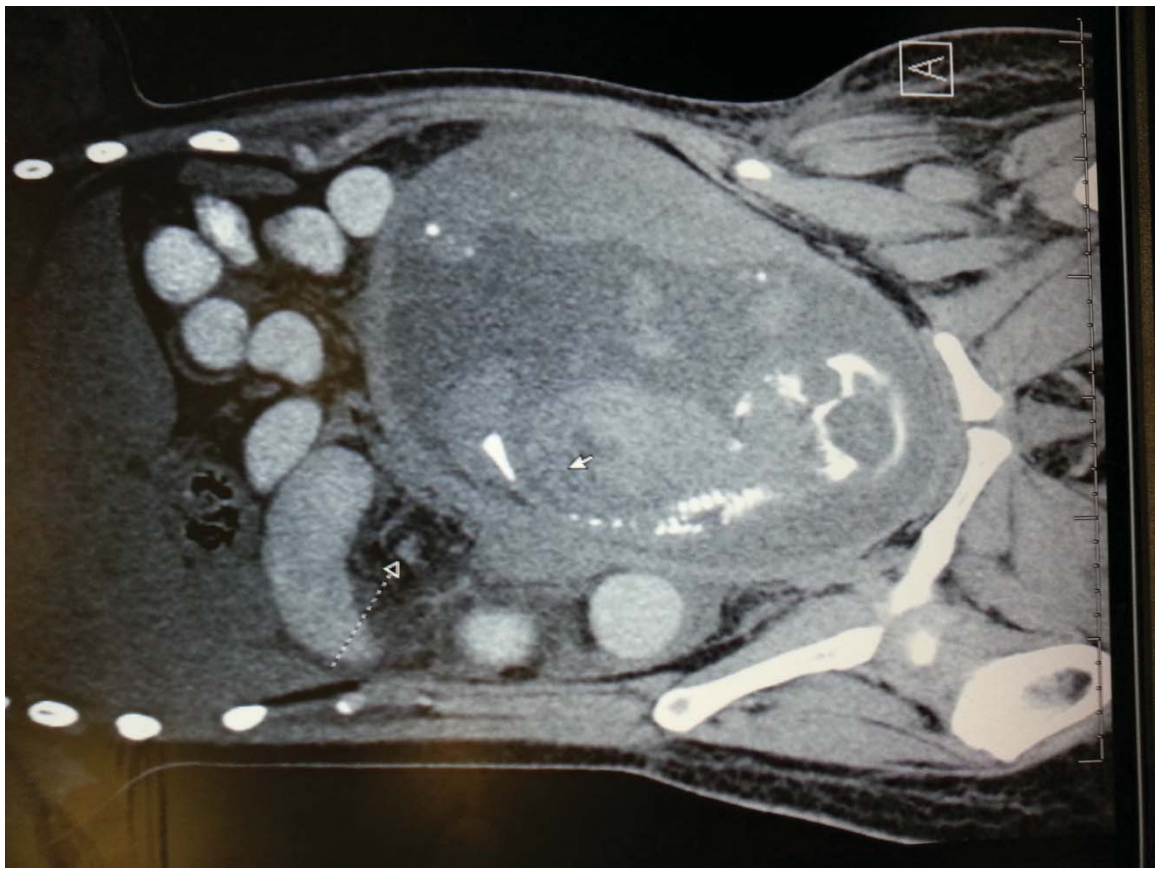
Small bowel obstruction (SBO) in pregnancy is a rare event with a reported 6% maternal and 26% fetal mortality rate. Acute recognition of this surgical emergency is paramount as delays in treatment increase maternal and fetal morbidity and mortality. Complications include preterm delivery, post-operative sepsis and prolonged paralytic ileus. Thoracic epidurals are well known to be the gold standard for postoperative pain management as well as lumbar epidurals for labor analgesia. In addition thoracic epidurals have been shown to significantly reduce the duration of postoperative ileus. Here we present a case of SBO with perforation during pregnancy complicated by preterm labor, sepsis and ileus that was successfully managed with a thoracic epidural for postoperative pain and labor analgesia.

A 21 year old female in the 27th week of her first pregnancy presented to the emergency room with an acute abdomen and obstipation for two days. The patient has had two prior surgeries including an open appendectomy and an ovarian cystectomy. MRI confirmed the clinical suspicion of complete small bowel obstruction and she was immediately taken to the operating room (OR) for an emergency exploratory laparotomy (ELAP). A preoperative thoracic epidural was placed followed by general endotracheal anesthesia via a rapid sequence induction with cricoid pressure. Surgeons found that a small bowel internal hernia, resulted in perforation and necrosis of a large portion of the bowel and resected 20cm of bowel accordingly. Fetal heart rate monitoring was done immediately prior to incision and after completion of the procedure and they were both reassuring.

Approximately 12 hrs post-op she went into preterm labor which resulted in a vaginal delivery. She also developed a fever and additional empiric antibiotics were started when she progressed into sepsis shortly after delivery. She did not require vasopressors and was resuscitated adequately with fluids and later admitted to the medical intensive care unit for monitoring.

For approximately 72 hours in midst a complicated post-op course the thoracic patient-controlled epidural analgesia safely provided excellent postoperative pain and labor analgesia with bupivicaine 0.125% and hydromorphone 20mcg per ml set at 3ml/hr with four 2 ml boluses an hour. She did not develop any CNS infections or prolonged ileus.

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Abstract #:S 74

Third Degree Heart Block During Spinal Anesthesia for Cesarean Delivery: A Case in a Healthy Parturient

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Rebecca D. Minehart, M.D. - Massachusetts General Hospital - Boston, MA

Adverse cardiovascular effects of spinal anesthesia include hypotension, dysrythmias/bradycardia, and cardiac arrest, likely due to intracardiac reflexes and imbalanced autonomic tone[1]. In healthy parturients undergoing elective Cesarean delivery (CD), risks of an arrhythmia may be minimal; however, it can be more dangerous in those with cardiac risk factors. We describe a case of third degree AV block and hypotension during spinal anesthesia for CD in a healthy 34 yo woman with a background phenylephrine (PE) infusion.

Case Report: A healthy 34 yo woman G2P1 with uncomplicated pregnancy at term (83 kg, 1.57m tall) was scheduled for elective repeat CD. Prior CD was due to arrest of dilatation in the setting of preeclampsia. Plan was made for spinal anesthesia with 1.6 ml hyperbaric 0.75% bupivacaine and fentanyl 10mcg.

Baseline blood pressure (BP) was 122/86 mmHg, SpO2 100% on RA, and ECG normal sinus rhythm (NSR) at 69 bpm. She was co-loaded with 750 ml of LR through an 18G IV and a spinal was placed in the sitting position at L4-L5. She was placed in left uterine displacement (LUD), an infusion of PE started at 25 mcg/min, and O2 given via face mask. Immediately after spinal, BP was 150/120, HR 98. One minute later, BP was 83/41, HR 64. PE infusion was increased to 50 mcg/min and 160 mcg of PE was given IV. She had dizziness and nausea, and ECG showed worsening bradycardia, progressing over one minute to Mobitz type I, and then to third degree AV block at 29bpm with no detectable NIBP. She was conscious throughout. Her legs were elevated to improve venous return, LUD was confirmed, and ephedrine 10 mg and atropine 0.4 mg were given IV. Over the next 2 minutes, HR increased to 129 bpm, BP to 196/84, NSR was restored, and she noted a headache. Her BP and HR over the next 3 minutes returned to 144/77 and 115. Her dizziness and nausea improved. She had a bilateral T4 level to pinprick. CD was uneventful without recurrence of dysrythmia and a healthy baby (Apgar scores 8/9) was delivered. The patient was monitored with single lead ECG for 24 hrs postop and cardiology was consulted. A postop 12-lead ECG and TTE were normal, and no further workup was recommended.

Discussion: Third-degree AV block, while rare, has been described in the setting of spinal anesthesia. Our patient had a prior history of preeclampsia, and under usual care including co-loading and PE infusion developed complete AV block. It is unclear if her prior preeclampsia increased her susceptibility. Recent literature suggests parturients may have more cardiovascular risk factors[2]; in them, significant dysrhythmias may be riskier. Perhaps in these patients, a heightened awareness of dysrhythmia associated with spinal anesthesia is needed. Future considerations should include whether ECG markers such as calculated PR interval could be linked to earlier detection and treatment.

References

1. Reg Anesth 1995;20:41-44.
2. Anesthesiology 2011;115:963-972.

Psoas Abscess and Sacroiliac Osteomyelitis Following Dilatation and Evacuation: Unusual Causes of Lumbar Radiculopathy After Spinal Anesthesia

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A 37 year old female, G5P2112 at 17 weeks 3 days gestation presented to the hospital for premature spontaneous rupture of membranes and was diagnosed with intrauterine fetal death. She underwent dilatation and evacuation(D&E) with an atraumatic L4/L5 level subarachnoid block. Surgery was uneventful and she was discharged home on the same day. On postoperative day (POD) 1, she complained of intermittent fever, and severe back pain which radiated to the right buttock, medial thigh and foot. On examination, lower back tenderness with paresthesia at right-sided L2 and L3 dermatomes and reduced strength of right lower extremity was elicited. Total white count was 11.6 mmol/L and body temperature was 102.3°F. MRI showed asymmetric thickening and enhancement along the course of iliacus and piriformis muscles with a small amount of fluid in the sacroiliac joint. At this point, the patient was treated empirically with antibiotics and physical therapy. She was transferred to inpatient rehabilitation center for further physical therapy and pain control on POD 12.

Two weeks later, she was readmitted for persistent back pain radiating to the right lower extremity. MRI revealed an organized fluid collection on the right iliacus muscle which was drained percutaneously with aspiration of purulent material. Microbiological culture yielded Methicillin Sensitive Staphylococcus aureus. Since she continued to have severe back pain and marked limitation of ambulation, She was discharged to inpatient rehabilitation center for physical therapy and continued antibiotics.

Follow-up MRI preformed in 8 weeks revealed evolution of the initial iliopsoas abscess into sacroiliac osteomyelitis. The patient underwent percutaneous bone biopsy and completed 6 weeks of IV antibiotic treatment for osteomyelitis.

Discussion: Pyogenic infection following dilatation and evacuation is rare and may pose a diagnostic dilemma. In our patient, improper positioning and possible nerve root injury was considered as causes of back and lower extremity pain before imaging demonstrated an infective etiology. Clinically unapparent uterine perforation during D&E and transient bacteremia has been proposed as a likely initiator of pathogenesis. There is insufficient data to recommend routine prophylactic antibiotic preoperative to prevent this serious complication. We recommend serial imaging studies of the pelvis to accurately diagnose the condition early in the clinical course.

Reference

1) Bacterial sacroiliitis and gluteal abscess after dilation and curettage for incomplete abortion. Yansouni CP,
Ponette V, Rouleau D. Obstet Gynecol. 2009 Aug; 114:440-3.
2) Psoas abscess related to spontaneous abortion, intra-uterine contraceptive device and curettage. Scheepers
NJ, van Bommel PF, Bleker OP. Acta Obstet Gynecol Scand. 1993 Apr; 72(3):223-4.
3) Incidence of bacteremia at dilation and curettage. Sacks PC, Tchabo JG. J Reprod Med 1992;37:331–4

Abstract S 76

Superior Sagittal Sinus Thrombosis and Posterior Parietal Intracerebral Hemorrhage following an Accidental Dural Puncture

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Latoya Mason, M.D. - Baylor College of Medicine - Houston, Texas

Introduction: Accidental dural puncture (ADP) occurs in ~0.19-3.6% of parturients during attempts at epidural analgesia. Intrathecal catheterization following ADP is one measure that may be performed to reduce the incidence of post-dural puncture headaches. According to some studies, this technique may represent an effective and safe method to manage this complication. With this case report, we review the management of a 29-year-old healthy parturient who sustained an ADP with intrathecal catheterization and subsequently developed a superior sagittal sinus thrombus and right posterior parietal intracerebral hemorrhage.

Case: A 29-year-old G3P1011 active labor requested epidural analgesia for labor. The procedure was complicated by ADP. An intrathecal catheter was threaded and remained in place for the duration of her labor course (< 12hrs). She underwent an otherwise unremarkable labor, delivery, and postpartum hospital course. Three days following hospital discharge, the patient presented to the emergency department (ED) with symptoms of altered mentation, headaches, and left-sided gait dysfunction. She was subsequently discharged with supportive care and caffeine. Two days later, she presented again to the ED with symptoms of seizures and worsening altered mental status; intubation was required for airway protection and appropriate anti-epileptic medications were administered. CT/CTA/MRA of the head were obtained revealing a superior sagittal sinus thrombus and right posterior parietal intracerebral hemorrhage. The patient was extubated and discharged 5 days later. Due to the intracerebral hemorrhage, anticoagulation was not started. To date, the patient has remained asymptomatic and free of further seizure activity.

Discussion: Superior sagittal sinus thrombosis is an uncommon complication of ADP; it is even rarer to have a coinciding intracerebral hemorrhage. The incidence of these complications is unknown. Diagnosis may be challenging and treatment requires a multidisciplinary approach. This case reviews the current literature on this topic with similar complications and the role of anesthesia providers in the management of this rare complication. In particular, this case highlights the difficulty in the diagnosis and workup of this patient who did not have classic PDPH or symptoms.

References:

1. Ellen M. Lockhart, M.D., Curtis L. Baysinger, M.D., Intracranial Venous Thrombosis in the Parturient, Anesthesiology, 2007; 107:652–8 2007
2. S. Ghatge, S. Uppugonduri, Z. Kamarzaman, Cerebral venous sinus thrombosis following accidental dural puncture and epidural blood patch, International Journal of Obstetric Anesthesia, 2008; 17, 267–270
3. Benzon HT, Iqbal M, Tallman MA, Boehlke L, Russell EJ, Superior sagittal sinus thrombosis in a patient with postdural puncture headache, Regional Analgesia and Pain Medicine, 2003 Jan-Feb;28(1):64-7

Abstract S 77

Verrucous Psoriasis of the Thoracolumbar Area

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Hamilton Shay, M.D. - Montefiore Medical Center - Bronx, NY
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Psoriasis is a common skin disorder worldwide with a prevalence of 0.6 to 4.8%. The typical lesions of plaque psoriasis consist of erythematous papules and plaques with sharply defined raised margins with a silver scale. They are symmetrically distributed in the scalp, extensor elbows, knees, and back. These comprise 75 to 80% of psoriasis lesions. There are other forms of psoriasis, of which verrucous psoriasis (VP) is one of the rarest.

28yo G9P4044 at 39 weeks was admitted for elective repeat C/S and BTL. Prenatal care began at 23 weeks. PE during initial OB visit described her skin and extremities as WNL with no scar, tattoo, or anomaly noted. She gave a history of psoriasis since 12 yrs ago with no mention of the location of lesions. She had two prior vaginal deliveries, 2 C/S via epidural anesthesia, and 4 D&Cs under general anesthesia. On admission: Ht 4'11" 217lbs. VSS. Heart and lungs exam WNL. Airway – Mallampati class 2, bucked teeth, good TM.D..

In the OR, she was placed in a sitting position and examination of her back revealed an irregular island of elevated flat-topped tan-colored cauliflower lesions scattered over the thoracic and lumbar areas. The patient insisted that she had the same lesions for many years and had 3 prior epidurals for her C/S and vaginal delivery. I asked her permission to photograph her back so I could show her that we do not have any safe area to place the needle in. After a discussion with the patient and her significant other, she agreed to undergo general anesthesia. She tolerated the procedure well and was discharged three days later.

A dermatologist reviewed pictures of the lesions and believed they were most likely VP, a rare variant of psoriasis. Thus the patient was referred to an outpatient dermatology clinic for a complete evaluation. Though little is known about the pathogenesis and treatment of VP, the use of phototherapy, topical steroids and Vitamin D analogs can be tried. Since psoriasis may be associated with co-morbidities, it is important to exclude metabolic syndrome, cardiovascular disease, inflammatory bowel disease and malignancy. Smoking, obesity and alcohol consumption have also been associated with psoriasis.

The use of digital photography significantly facilitated our discussion with the patient. It can also serve as a useful tool for following the progression and /or regression of the disease as well as the response to treatment.

1. Holly R et al. Dermatology Online Journal. 17(5):10

Additional Files: