



Society for Obstetric Anesthesia and Perinatology



Abstracts of Scientific Papers
presented at the
36th Annual Meeting
May 12-16, 2004
Sanibel Harbour Resort and Spa
Ft. Myers, Florida

Abstract Supplement

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Society for Obstetric Anesthesia and Perinatology

37th Annual Meeting
Palm Desert, California
May 5-8, 2005

Abstract submission site available
November, 2004 - www.soap.org.



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Scientific Program

WEDNESDAY, MAY 12, 2004

12:00 n - 6:00 pm	Registration
12:00 n - 5:00 pm	Poster Mounting
2:00 - 6:00 pm	Workshop on High Risk OB Care (By Ticket Only - Limited Registration) <i>Barry A. Harrison, MBBS; Gurinder M.S. Vasdev, MD</i>
6:00 - 8:00 pm	SOAP Opening Reception

THURSDAY, MAY 13, 2004

6:30 am	Registration
7:00 - 7:45 am	Breakfast with Exhibitors; Posters
7:45 - 8:00 am	Opening Remarks and Welcome - <i>M. Joanne Douglas, MD, FRCP;</i> <i>Richard N. Wissler, MD, PhD</i>
8:00 - 9:30 am	Gertie Marx Symposium (6) - Moderator: <i>Geraldine O'Sullivan, MD, FRCA</i> Judges: <i>Yaakov Beilin, MD; Stephen H. Halpern, MD; McCallum R. Hoyt, MD, MBA;</i> <i>Joy L. Hawkins, MD; G.M. Bassell, MD</i>
9:30 - 9:45 am	Distinguished Service Award - Awarded to <i>Sheila E. Cohen, MB, ChB;</i> Presenter: <i>Richard N. Wissler, MD, PhD</i>
9:45 - 10:15 am	Coffee with Exhibitors; Posters
10:15 - 11:30 am	Oral Presentations #1 (5) - Moderator: <i>Kenneth E. Nelson, MD</i>
11:30 am - 12:30 pm	Pro/Con Debate: MLAC Studies: More Ups than Downs? Moderator: <i>Ruth Landau Cahana, MD</i> Pro: <i>Malachy O. Columb, FRCA</i> Con: <i>Robert D'Angelo, MD</i>
12:30 - 1:30 pm	Lunch with Exhibitors
1:30 - 2:30 pm	What's New in Obstetrics? Neonatal Encephalopathy and Fetal Monitoring Introduction: <i>Rakesh B. Vadhera, MD, FRCA, FFARC</i> <i>Gary Hankins, MD</i>
2:30 - 3:30 pm	Zuspan Award Symposium (4) - Moderator: <i>Barbara L. Leighton, MD</i> Judges: <i>Elizabeth A. Peter, MD; Holly A. Muir, MD, FRCPC; Steven S. Schwalbe, MD;</i> <i>Divina J. Santos, MD</i>
3:30 - 4:00 pm	Coffee with Exhibitors; Posters
4:00 - 6:00 pm	SOAP Business Meeting - Awards Presentation - <i>Richard N. Wissler, MD, PhD</i>



Sheila E. Cohen, MB, ChB
2004 DSA Recipient

Scientific Program

FRIDAY, MAY 14, 2004

6:00 - 7:00 am	Fun Run/Walk
6:30 am	Registration
7:00 - 8:00 am	Breakfast with Exhibitors
8:00 - 9:00 am	Oral Presentations #2 (4) - Moderator: <i>Felicity Plaat, MD</i>
9:00 - 10:00 am	What's New in Neonatology? Laser Umbilical Cord Surgery for Twin-Twin Transfusion Introduction: <i>Sunil Eappen, MD</i> <i>Ruben Quintero, MD</i>
10:00 - 10:30 am	Coffee with Exhibitors
10:30 - 11:30 am	Poster Review #1 - <i>Brenda A. Bucklin, MD</i>
11:30 - 12:30 pm	IV and Spinal Drugs for Labor Pain: Fact and Fiction? Moderator: <i>Felicity Reynolds, MD, FRCA, FRCOG</i> <i>James C. Eisenach, MD; Sheila E. Cohen, MB, ChB</i>
12:30 - 12:45 pm	Questions and Discussion
Afternoon	SOAP Golf and Tennis; Water Sports, etc. (Golf Tournament begins at 1:00 pm)

SATURDAY, MAY 15, 2004

6:30 am	Registration
7:00 - 8:00 am	Breakfast with the Experts - Moderator: <i>B. Scott Segal, MD</i> <i>Jodie L. Buxbaum, MD; Brendan Carvalho, MB, BCh, FRCA; Chantal Crochetiere, MD;</i> <i>Roshan Fernando, FRCA; David L. Hepner, MD; Caroline Grange, MD; Klaus Kjaer, MD;</i> <i>Craig M. Palmer, MD; Linda S. Polley, MD; Alex F. Pue, MD; Mike Sanchez, MD;</i> <i>Rakesh B. Vadhera, MD, FRCA, FFARC</i>
8:15 - 9:15 am	Ostheimer What's New in OB Anesthesia? - Introduction: <i>William R. Camann, MD</i> <i>Lawrence C. Tsen, MD</i>
9:15 - 9:45 am	Coffee Break
9:45 - 10:45 am	Poster Review #2 - <i>Pamela J. Angle, MD</i>
10:45 - 11:45 am	Fred Hehre Lecture - <i>Samuel C. Hughes, MD</i>
11:45 - 1:00 pm	Lunch on Your Own
1:00 - 2:25 pm	Panel Discussion: "Practical SOAP Labor Analgesia" Alternatives to Conventional Epidural and CSE Analgesia in Labor - Moderator: <i>David J. Bimbach, MD</i> <i>Valerie A. Arkoosh, MD; Tracie A. Saunders, MD; Kathryn J. Zuspan, MD;</i> <i>William R. Camann, MD</i>
2:25 - 2:35 pm	Coffee Break in the Room
2:35 - 4:00 pm	Best Paper Presentations (6) - Moderator: <i>Lee S. Perrin, MD</i> Judges: <i>Andrew P. Harris, MD, MHS; David C. Campbell, MD, Msc, FRCPC;</i> <i>Jaya Ramanathan, MD; Robert S. McKay, MD</i>
4:00 - 5:00 pm	Research Hour - <i>Richard M. Smiley, MD, PhD; Philip Hess, MD</i>
6:00 - 11:00 pm	SOAP Banquet

Scientific Program

SUNDAY, MAY 16, 2004

6:30 am	Registration
7:00 - 7:30 am	Breakfast
7:30 - 8:30 am	Pro/Con: Ephedrine, Rather Than Phenylephrine, is the Vasopressor of Choice to Prevent and Manage Spinal-Induced Hypotension - Moderator: <i>Donald H. Penning, MD, MSc, FRCPC</i> Pro: <i>Alison J. MacArthur, MD</i> Con: <i>Edward T. Riley, MD</i>
8:30 - 9:30 am	Poster Case Reports: You did what? The Best Case Reports of the Year! - <i>Peter H. Pan, MD</i>
9:30 - 10:00 am	Questions and Discussion
10:00 am	ADJOURNMENT

Please visit www.soap.org for program updates and information.

IN MEMORIAM Gertie F. Marx, MD - 1912-2004



GERTIE MARX

**SOAP A1
THROMBOCYTOPENIA, THROMBOELASTOGRAPHY
AND PREGNANCY, AN IN VITRO MODEL**

S. K. Chau, M. Columb, G. Lyons
St James University Hospital, Department of Obstetric
Anaesthesia, Leeds, United Kingdom

Introduction: Platelet count thresholds for spinal blockade vary from 50 to 100 $\times 10^9/L$. This is not based on outcome data. Thromboelastography[®] (TEG[®]) variable maximum amplitude (MA) provides a reproducible assessment of platelet function. This prospective observational study examines the effects of laboratory generated thrombocytopenia on MA in four groups of volunteers.

Methods: Healthy male (N=20) and female staff (N=20), full term pregnant (N=14) and pre-eclamptic (PET) (N=4) women were recruited. From each subject, 35mL of venous blood were aspirated into a citrated tube and manipulated in the laboratory in accordance with established protocols,¹ to generate seven individual blood samples with platelet counts between 2 and 150 $\times 10^9/L$. Full blood count and coagulation profile were performed on both native and laboratory generated samples to ensure identically in all respects except for platelet count. TEG[®] was performed on all samples at 37°C with 330 μ L of blood recalcified with 30 μ L of 0.2M CaCl₂ as described in the Hemoscope manual. After pooling the samples for analysis, log transformation, ANCOVA, and robust linear regression were used to identify gender and pregnancy effects. A further analysis at an arbitrary platelet count of 50 $\times 10^9/L$ with ANOVA was used to quantify the differences. Statistical significance was defined at $P < 0.05$ (two-sided).

Results: Differences in height, weight and coagulation profile varied with gender and pregnancy as expected. Age ranges were similar. 140 data points were obtained for men, 146 for women, 103 for pregnant women and 29 for PET women. The pooled data are shown in Fig 1. TEG[®] MA is plotted against platelet count for the 4 groups. There were significant effects ($P < 0.0001$) related to gender and pregnancy. Pregnancy was associated with significantly greater clot strength. Differences between the samples from PET and the 3 other groups were highly significant ($P < 0.01$). At an arbitrary platelet count of 50 $\times 10^9/L$, differences between men, women and pregnant women were highly significant ($P < 0.01$)

Discussion: Samples generated from normal pregnant women and those with PET are more likely to maintain clot strength at lower platelet counts than normal volunteers. Higher fibrinogen levels in pregnancy may protect against the relative effects of thrombocytopenia.

References

1) White M: Platelet protocols. 1999; Academic Press, San Diego pp39-42

**SOAP A2
NEONATAL EFFECTS OF MATERNAL ANALGESIA AND
SEDATION WITH FENTANYL AND MIDAZOLAM**

M. A. Froelich, T. Euliano, D. Caton
University of Florida, Gainesville, FL

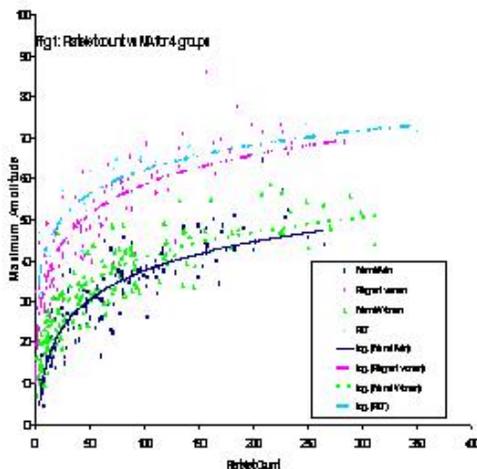
Introduction: The study of drugs used during pregnancy is one of the most neglected areas in the field of clinical pharmacology and drug research. Analgesia and sedation, routinely used as adjunct medication for regional anesthesia, is rarely used in the pregnant patient because of concerns about adverse neonatal effect. We studied neonatal and maternal effects of intravenous fentanyl and midazolam prior to spinal anesthesia for elective Cesarean section. We postulate that an intravenous bolus of midazolam and fentanyl does not affect neonatal well-being.

Methods: After institutional approval, sixty healthy women scheduled for elective Cesarean delivery were enrolled from April 2001 until December 2003. Women were randomly assigned to either receive a combination of 1 mcg/kg IV fentanyl and 0.02 mg/kg IV midazolam or an equal volume of intravenous (IV) saline at the time of their skin prep for spinal anesthesia. Both investigator and patient were blinded to the study drug. Patients underwent spinal anesthesia with 12 mg hyperbaric bupivacaine, 10 mcg fentanyl and 300 mcg preservative-free bupivacaine. We collected maternal and umbilical levels of fentanyl and midazolam and maternal catecholamine levels (epinephrine and norepinephrine). Fentanyl and midazolam levels were analyzed using high performance lipid chromatography (HPLC). The following neonatal data were recorded: Apgar scores, continuous neonatal pulse oximetry for 3 hours and Scanlon neurobehavioral scores (NACS). This study had more than 95% power (expected difference of means and standard deviation: 1 Apgar score unit).

Results: Women in both groups were of similar height, weight and age. Neonates of women who received fentanyl and midazolam did not show different Apgar or NACS scores. Umbilical arterial and venous levels of fentanyl and midazolam were below the limit of quantification (less than 50 ng/mL) and neonates in either group did not show significant oxygen desaturations during the first three hours of life. Mothers in both groups were able to recall their birth.

Conclusion: Maternal analgesia with fentanyl (1 mcg/kg) and midazolam (0.02 mg/kg) prior to spinal anesthesia for elective Cesarean section is without adverse neonatal effects.

(Note: An interim analysis of this study was presented as abstract at the 2001 SOAP meeting)



GERTIE MARX

SOAP A3

PAIN TOLERANCE IN PREGNANCY

A. J. Fuller, E. Lin, A. Mathusamy, B. Carvalho, M. Angst, B. Golianu, E. T. Riley
Stanford University, Stanford, CA

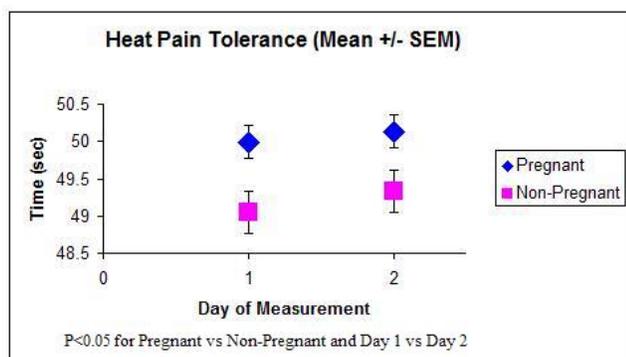
Introduction: Animal studies suggest that increased circulating sex steroids and activation of the endorphin system, particularly spinal opioid pathways, contribute to the increased pain threshold and tolerance during pregnancy^{1,2}. Human studies have been inconsistent in elucidating these changes³. The objectives of this study were to compare pain threshold and tolerance in pregnant and nonpregnant volunteers using heat and cold pain tolerance methodology.

Methods: After IRB approval and informed consent, 19 healthy nonpregnant female volunteers and 20 pregnant subjects at term were enrolled. Pain threshold and tolerance were examined using heat and cold pain models. Heat pain tolerance (HPT) was tested with a hand-held thermode administering a nociceptive heat stimulus placed on the volunteer's forearm and temperature increased one degree per second. The volunteer stopped the temperature rise by pressing a button at her maximal tolerable temperature. Cold pain threshold and tolerance were measured by placing the volunteer's hand in ice water. Cold pain threshold was when pain was first reported and tolerance was when the volunteer could no longer tolerate the ice water and removed her hand. Subjects were evaluated pre and 24 h post delivery (pregnant) or on consecutive days (nonpregnant) and average values for each test recorded.

Results: Heat pain tolerance was increased in the pregnant compared to the nonpregnant volunteers on both Day 1 and Day 2 (Figure, $P < 0.05$). HPT was higher in both groups in the second session and did not decrease post delivery (Figure). There was no significant difference in cold pain and cold tolerance between the groups.

Conclusions: The higher HPT in pregnant subjects is consistent with animal data^{1,2}. HPT did not return to non-pregnant levels on post-partum day one. This could be due the post-partum analgesics which most parturients were receiving or because it takes longer than 24 hours to return to the non-pregnant state. The HPT increase in both groups on the second day was probably due to accommodation to the pain model. The tonic cold pain model, which probably tests different pain pathways than the HPT model, did not demonstrate a difference between the groups.

References: 1. Pain 2000; 85: 273-81; 2. Pain 1986; 27: 63-8.; 3. J. Nippon Med Sch 2002; 69:342



SOAP A4

A COMPARISON OF SCOPOLAMINE PATCH AND ONDANSETRON IN THE TREATMENT OF INTRATHECAL MORPHINE INDUCED NAUSEA AND VOMITING

N. O'Rourke, M. Walsh, J. Carabuena, E. Cappiello, S. Segal, M. Harnett
Brigham and Women's Hospital, Boston, MA

Introduction: The incidence of postoperative nausea and vomiting (PONV) following the administration of intrathecal morphine is reported to be 30-35% (1). Previously, Kotelko et al reported a reduced incidence of nausea and vomiting after the *preoperative* application of scopolamine in patients undergoing cesarean section with epidural morphine for postoperative analgesia (2). However, patients and physicians often raise concerns about fetal exposure to maternally administered drugs. Therefore, we choose to compare the efficacy of scopolamine patch to that of ondansetron and placebo in the prophylactic but *post cord clamping* treatment of nausea and vomiting induced by intrathecal morphine.

Methods: To date we have recruited 103 parturients undergoing elective cesarean section under spinal anesthesia. Complete data was collected on 98 patients. All patients received standardized spinal, which included intrathecal bupivacaine 12.5mg, morphine 0.2mg and fentanyl 10µg. After clamping the umbilical cord patients received study medication according to their randomly allocated group. Group S received a scopolamine (1.5mg) patch placed behind the ear and 10ml of IV saline, group O received a placebo patch and ondansetron 4mg IV (10ml clear solution) and group P received a placebo patch and IV saline. All episodes of nausea, vomiting and retching were recorded. Patients were assessed at 2 hours, 6 hours and 24 hours postoperatively. VAS for nausea, pruritus and pain were recorded as well as episodes of nausea, vomiting and retching and use of antiemetic drugs during those time intervals. Differences between groups were analyzed by ANOVA or chi-squared, where appropriate.

Results: There were no differences in demographics, intraoperative management or neonatal outcome between groups. Mean VAS scores were 5.84 in group S, 15.94 in group P and 15.91 in group O ($P = 0.11$). 29 of 32 patients required no rescue antiemetic medication in group S, compared to 24 of 34 patients in group P and 23 of 32 patients in group O ($p = 0.96$).

Discussion: At this preliminary stage there is a definite trend towards lower mean VAS scores for nausea, less vomiting and less use of rescue antiemetic medication in the scopolamine group compared to either the placebo or ondansetron groups.

The implications of our study are 2 fold. Firstly, as with all medications, exposure to the fetus remains a concern. We have shown a definite benefit in reducing VAS scores for nausea and a lower requirement for rescue antiemetics even when the scopolamine is administered post cord clamping. Secondly, there is an added advantage of a four-fold difference in the cost of scopolamine (\$4/patch) with medication released over 72 hours, compared to ondansetron (\$16/ 4mg).

References:

1. Dahl et al. Anesthesiology 1999; 91: 1919-27.
2. Kotelko et al. Anesthesiology 1989; 71: 675-8.

GERTIE MARX

**SOAP A5
COMPARISON OF SKIN DISINFECTANTS FOR
EPIDURAL PLACEMENT IN LABORING PARTURIENTS**

K. I. Stewart, S. A. Shaw, D. C. Campbell
University of Saskatchewan, Saskatoon, SK, Canada

INTRODUCTION: Chlorhexidine as an antiseptic solution for placement of intravascular catheters decreases incidence of central line colonization and blood stream infection when compared to povidone-iodine (1,2). A previous study from a large inner city teaching hospital in the USA reported an incidence of 30% positive skin culture rate using povidone-iodine (3). The low incidence of infection following lumbar epidural analgesia/anesthesia makes its use as an endpoint impractical; however when infection occurs, the consequences can be devastating. Reducing skin contamination should logically reduce risk of infectious complications. This prospective, randomized, controlled trial was designed to evaluate the efficacy of skin asepsis using povidone-iodine or chlorhexidine for epidural placement in laboring parturients.

METHODS: A convenience sample of accessible patients meeting inclusion criteria was used. Inclusion criteria included laboring parturients over age 18, not receiving antibiotics, requesting epidural labor analgesia. Exclusion criteria were known allergy to either solution, antibiotic administration prior to epidural placement, and immunosuppression of the patient. An a priori sample size calculation was performed. Utilizing the previously documented 30% positive culture rate using povidone-iodine (3) a 50% reduction in positive culture rate (2) can be detected with 80% power at a one-tailed significance of 5%. To detect such a difference, a total of 300 parturients will be enrolled.

Following IRB approval and informed consent, parturients were randomized via computer-generated random tables to receive skin preparation with 2% chlorhexidine or 10% povidone-iodine. Following standardized skin preparation with one of the two solutions, and prior to epidural placement, a skin swab was collected from the proposed epidural needle puncture site. Data collection included parturient's age, level of operator (resident vs. attending) and compliance with protocol.

RESULTS: To date, culture analysis has been reported on 270 of a planned 300 samples. Only 3 positive cultures have been reported; the study remains blinded.

DISCUSSION: As the majority of the planned 300 samples have been analyzed to date, it is likely no difference will be found between the two solutions. The significant difference between positive skin culture rates following a standardized application of both aseptic solutions reported in the literature and those observed at our Canadian Teaching Hospital for epidural placement requires further investigation.

REFERENCES:

1. Lancet 338: 339-43,1991
2. Ann Intern Med 136: 792-801,2002
3. Anesthesiology 88: 668-72,1998

**SOAP A6
THE PLATELET FUNCTION ANALYZER (PFA-100) DOES
NOT PREDICT BLOOD LOSS DURING DELIVERY IN
WOMEN WITH SEVERE PREECLAMPSIA**

J. Warren, S. Sharma, P. Dadarkar, J. Wiley, R. Sarode
University of Texas Southwestern Medical Center, Dallas, TX

Introduction: The PFA-100™ is a new point-of-care device, which has been designed to measure in vitro platelet function¹. This simple test evaluates the capacity of a sodium citrated whole blood sample to form a platelet plug at the aperture situated on a collagen/ADP or collagen/epinephrine surface. The time required for full occlusion of the aperture by the platelet plug is termed as the closure time (CT) in seconds(s). The aim of this study was to determine whether PFA-100 is a reliable device in predicting blood loss during vaginal and cesarean delivery in women with severe preeclampsia (PE).

Methods: Following IRB approval and informed consent, 73 healthy pregnant women undergoing elective CS and 66 women with severe preeclampsia (36 in labor and 30 emergency CS) were enrolled in the study. Apart from routine obstetric screening test, blood was also collected in 3.2% buffered sodium citrate syringes for PFA-100 analysis. CT was measured after transfer of a 800 µl citrated blood sample into two PFA-100 test cartridges containing a collagen membrane and epinephrine (CEPI) or ADP (CADP) as a platelet activator. Simultaneously thromboelastography was performed with TEG® 500 using celite activated whole blood. Additional tests included fibrinogen, PT and PTT.

Results: See table. Hct and coagulation profile did not differ between the groups. CT increased and MA decreased significantly with severity of preeclampsia

Discussion: PFA -100 and TEG both revealed impairment of platelet function with increasing severity of preeclampsia. However, 16% of healthy women and 19% of preeclamptic women showed increased PFA – 100 values without developing abnormal blood loss. This suggests that PFA-100 may either give false positive values, probably a result of technical problems, or may not be clinically relevant in pregnant women. PFA-100 may not be a sensitive method of predicting clinical bleeding in women with severe preeclampsia.

1. Br J Anaesth 2001;87:890-3

Table:

	Healthy n=73	PE n=54	PE (PC<100) n=12
PC	233±65	215±49	78±22*
CT(s)			
CEPI	119±40	135±47*	183±82*
CADP	87±22	95±35*	131±70*
Prolonged CT			
CEPI	12(16)	10(19)	4(33)
CADP	7(1)	10(19)	4(33)
MA (mm)	75±6	76±5	66±11*
Low MA (<60)	0	0	1(8)
Excessive surgical Bleeding	1(1.5)	1(2)	2(17)
Abnormal Coags	0	0	1(8)
Regional Anes/Anal	73(100)	35(65)	9(75)

Values are number (%) and Mean ± SD. PC: platelet count 1,000/mm³. Prolonged CT (CEPI healthy > 150 s; PE > 190 s); (CADP healthy >120 s; PE > 117s)¹. Excessive bleeding: SVD > 500 ml; CS > 1000 mL; excessive oozing. Abnormal coagulation: Fib < 250mg%, PT > 12 s; PTT > 39 s. *P < 0.05 compared to healthy.

ORAL PRESENTATIONS #1

SOAP A7

FACTORS INFLUENCING USE OF NEURAXIAL LABOUR ANALGESIA

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Introduction: Little is known about parturient decision-making related to use of neuraxial analgesia (NA) for labour. We report preliminary research examining sources of information and concerns experienced related to NA prior to its use. Information was gathered during development of the Quality of Labour Analgesia Index.

Methods: Qualitative descriptive methods were used to explore sources of information used related to NA and concerns at the time of epidural placement. After REB approval, a purposeful sample of English speaking parturients (mixed parity, racial, socioeconomic status, delivery mode) was recruited from 1 teaching and 2 community urban hospitals with a combined delivery rate of >10,000/year. All women received NA (readily available in all hospitals). Focus groups and in-depth interviews were held during hospitalization ≤ 72 hours of delivery. A semi-structured interview guide was used to explore information sources and concerns related to NA with further iterative exploration until response saturation was achieved. Thematic content analysis was performed. Emergent themes related to factors influencing women's decisions to use NA.

Results: 27 parturients were interviewed (5 focus groups; 14 in-depth interviews). Preliminary results suggest a complex dynamic interaction between major themes influencing the decision to use NA. Themes included: pain, past experience, self-image, fear (related to pain and/or NA side-effects/complications); information provided (past and present) by women's key informants (lay and professional), and personal labour support. Key concerns included: paralysis, nerve damage, long term back pain, effects on labour progress, participation in the birth experience, sitting still for the procedure, drug side-effects; safety (neonatal and maternal) and fear of having to wait for pain relief. Primiparous women were usually concerned over the risk of paralysis, nerve injury and back-pain. Multiparous women with a history of uneventful NA were more likely to have few concerns and voiced fear of having to wait for analgesia. Dissatisfaction/frustration was voiced over the lack of accurate information (usually negative) available in communities and from some health care providers relating to NA.

Discussion: Research findings suggest a complex dynamic process involved in parturients' decision making related to use of NA for labour and post-analgesia frustration related to the lack of accurate information provided by key informants.

SOAP A8

CHRONOBIOLOGY OF INTRATHECAL FENTANYL FOR LABOR ANALGESIA

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Introduction: A temporal pattern of the dynamics of local anesthetics has been demonstrated in dental and skin anesthesia and recently in epidural ropivacaine, with a significant variation in the analgesic duration related to the hour of administration¹⁻³. However, the chronobiology (diurnal variation) of intrathecal (IT) fentanyl has not been well studied or included in the past comparative studies. The chronobiologic variation may create significant statistical bias and variability in the results or conclusions from past or future studies. The purpose of this study is to determine whether the hour of administration influences the analgesic duration of IT fentanyl administered for labor analgesia.

Method: After IRB approval and informed consent, a total of 70 patients are to be enrolled. Inclusion criteria are: ASA 1-2, nulliparous, singleton term pregnancy, vertex presentation, active labor with cervix ≤ 5 cm, no systemic analgesics X1hr, age ≥ 18 yo. Enrolled patients requesting neuraxial labor analgesia were assigned to one of two groups based on one of the two time periods when the CSE was administered - Group D for time period between 12pm to 6 pm and Group N between 8pm to 2 am. CSE was performed at L3-4 level using a 27-G Whitacre needle through an 18-G epidural needle technique. 20 mcg IT fentanyl was injected after clear free-flowing CSF return on aspiration. Epidural catheter was inserted, but not dosed until patients requested further analgesia. Analgesic duration is defined as the time from IT fentanyl injection to time patients request additional analgesia. Besides demographics, other variables (pain scores, vital signs, motor/sensory block, side effects, fetal heart rate) were recorded before CSE and at 5 mins increment for 15 mins after CSE, and then every 15 mins. A prior power analysis revealed a sample size of 35 per group is required to detect a 15-min difference in analgesic duration between groups with power of 0.9 and alpha of 0.05.

Results: A total of 43 evaluable patients had been enrolled, with 32 patients in Gp D and 11 in Gp N. Demographics were similar between groups. The analgesic duration (mean \pm SEM) for IT fentanyl labor analgesia was 91 \pm 6.4 min for group D and 75 \pm 8.7 mins for group N. There is a trend of longer analgesic duration with group D, but no statistical difference during this interim analysis.

Discussion: The 2 time periods chosen for patient enrollment were based on data previously published on labor epidural ropivacaine showing maximum difference between these two time periods. If the current trend of differences between groups continues, the completed study will show significant chronobiological difference in IT fentanyl analgesic duration; and the chronobiology may be important to be incorporated in future studies.

Reference: 1. Anesthesiology 2002;96:542-5. 2. Chronobiol Int 1989; 6:157-62. 3. J Pharm Pharmacol 1987; 39:148-9.

ORAL PRESENTATIONS #1

SOAP A9

INTRATHECAL HYDROMORPHONE AND BUPIVACAINE FOR STAGE I LABOR ANALGESIA

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Introduction: Hydromorphone (HM), a mu-opioid agonist, has an octanol water coefficient of 1.28 (morphine 0.7, fentanyl 717). Pain specialists administer HM in long-term intrathecal (IT) infusions (1). Neuraxially, HM produces less segmental effect and longer duration of action than fentanyl and less frequent negative side effects than morphine (2). This study examines the effects of IT HM and bupivacaine (BUP) given for uterine contraction pain.

Method: With IRB approval, healthy parturients in spontaneous or oxytocin-induced labor were enrolled; none received prior analgesics. CSE was performed (L3-4 or L4-5, sitting position) and IT isobaric HM (100 mcg) and BUP (1.5 mg) were injected (volume = 1.3 ml). The VAS (0-10) was assessed frequently to determine the time to good analgesia (VAS<3). VAS, sensory level (pin-prick), Bromage score (0-3), respiratory rate, SpO₂, blood pressure, and fetal heart rate were recorded at 0, 5,10,15, 30 minutes and every 30 minutes thereafter. Upon request or VAS>5, the epidural catheter was tested then bolused with 0.125% BUP (10 ml) and infused with 0.125% BUP (10 ml/hr). Apgar scores were recorded. Prior to discharge, patients rated their satisfaction with this pain control technique.

Results: Presently, 23 parturients have participated. Three were excluded: failed technique, n=1; precipitous delivery, n=1; and fetal bradycardia (FHR 80-90 b.p.m) 43 minutes after IT injection, necessitating cesarean delivery, n=1. Demographics for the remainder (n=20) were (mean ± S.D.): age 25 ± 6 years, height 63 ± 3 inches, weight 78 ± 18 kg, cervical dilation 4 ± 1 cm; 8 patients were nulliparous and 12 multiparous. All patients reported good analgesia; time to VAS<3 was 7 ± 2 min. Peak skin sensory levels ranged from T6-T12; most were T9-T11. Data for duration of analgesia was excluded in patients (n=5) who requested supplemental analgesia for perineal pain only. In the others (n=15), analgesia duration for contraction pain was 193 ± 127 min (range: 60 - 505 min). Side effects occurred with the following incidence: pruritis, mild = 9, severe (requiring therapy) = 2; hypotension (SBP<100 mmHg) = 2; nausea = 2; SpO₂< 97% = 0; Bromage score >0 = 0; prolonged urinary retention = 0. Apgar scores were 8 ± 0.5 and 9 ± 0.5 at 1 and 5 min. On follow-up assessment, 14 patients were very satisfied and 6 patients satisfied; no patient reported fair or unacceptable analgesia.

Discussion: For stage I labor, IT HM (100 mcg) and BUP (1.5 mg) rapidly provided effective analgesia, yielding a long, though variable, duration. Severe pruritis occurred in 10% of patients and hypotension in 10% of patients. Changes in respiration and motor function were not apparent.

Reference: 1. Personal communication; S. Ramamurthy 2. Seminars in anesthesia, perioperative medicine and pain. 2000, 19(2): 108-131.

SOAP A10

THE EFFECT OF A RAPID CHANGE IN THE AVAILABILITY OF PATIENT CONTROLLED EPIDURAL ANALGESIA ON MANPOWER REQUIREMENTS

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Introduction: Anesthesiologists that cover labor and delivery (L&D) units are often working in other operating areas.¹ Therefore, efficient labor analgesia management is beneficial. The goal of this study is to evaluate manpower requirements before and after the initiation of patient controlled epidural analgesia (PCEA) for labor and delivery.

Methods: After a two months period of nursing staff, and anesthesia provider education, PCEA was introduced for all patients receiving epidural analgesia for L&D at our institution. Following a standard epidural or combined spinal-epidural technique, parturients received a continuous infusion of bupivacaine 0.125% and fentanyl 2u/cc at 6cc/hr and PCEA settings of 6cc every 15 minutes with no 1 or 4-hour limit. Before this time, epidural analgesia was provided via a continuous epidural infusion (CEI) at 10cc/hr. There were no changes in any other nursing, obstetric or anesthetic variables. We compared the month before to the two-month period after the introduction of the PCEA technique. We have so far reviewed the records of 525 patients. Differences between groups were tested by ANOVA or chi-square, where appropriate.

Results: There were no changes in maternal demographics, fetal outcomes or mode of delivery during the April-June time period. There was a significant decrease in the number of interventions for labor analgesia, and in the quality of analgesia after PCEA was introduced (Table 1). CSE also reduced mean VAS (P=.02) and analgesic interventions (P=.02) but was performed less frequently in the PCEA month (P=.001). Multivariate ANOVA showed PCEA to independently reduce both VAS and analgesic interventions (P<.0001).

Discussion: Parturients receiving PCEA without background infusion require less anesthetic interventions and local anesthetic use, and have less motor block when compared to CEI.² A study at our institution has previously demonstrated the benefit of the administration of a significant but modest proportion of the maximum hourly demand dose as a continuous background infusion in regards to physician-administered supplemental local anesthetic, when compared to PCEA groups receiving no or low background infusion.³ Our results support the notion that there is a decreased need for physician administered bolus with the PCEA and, in addition, demonstrate improved analgesia when combined with a background infusion providing 25% of the maximum hourly demand dose.

References: 1. Anesthesiology 1997;87:135-43; 2. Br J Anaesth 2002;89:459-65; 3. Anesth Analg 1994;79:80-4

	CEI	PCEA	P value
Weight (lb)	181.3±35.5	180±32.9	NS
Age	31.7±17.2	31.1±6.6	NS
Multip	119	136	NS
Average VAS	1.89±2.1	1.0±1.7	<.0001
# interventions	1.46±1.7	0.67±1.2	<.0001
Apgar<7 ¹	15	21	NS
Apgar<7 ⁵	5	6	NS
CS	50	34	NS
Instrumental	18	17	NS
NSVD	207	228	NS
Cath manipulation	11	21	NS
Cath replacement	21	18	NS
Epidural	136	184	<.0001
CSE	134	92	<.0001

ORAL PRESENTATIONS

SOAP A11

DETERMINATION OF THE EFFICACY OF PCEA ALONE COMPARED TO PCEA + CIEA USING AMBULATORY EPIDURAL LABOR ANALGESICSD. C. Campbell¹, T. W. Breen², S. Halpern³, H. Muir², R. Nunn⁴¹University of Saskatchewan, Saskatoon, SK, Canada, ²Duke University, Durham, NC, ³University of Toronto, Toronto, ON, Canada, ⁴Dalhousie University, Halifax, NS, Canada

INTRODUCTION: PCEA alone reduces total epidural medication requirements (1,2) and anesthesiologist-delivered supplemental "top-up" analgesia (1,3) compared to continuous infusion epidural analgesia (CIEA). The purpose of this prospective, randomized, double-blinded study was to compare the impact of PCEA alone vs PCEA + CIEA on analgesic efficacy and requirement for Anesthesiologist-administered "top ups" using ambulatory epidural labor analgesics (4).

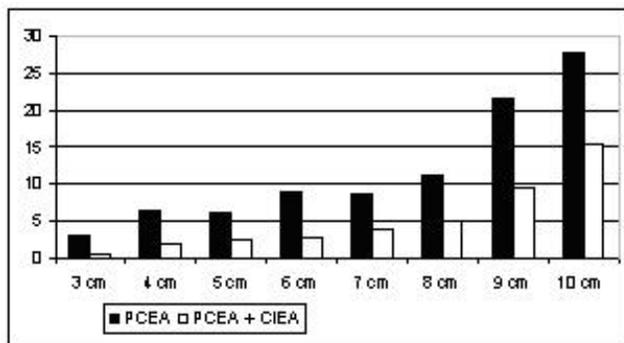
METHODS: Following IRB approval and written informed consent, 300 term nulliparous women undergoing induced labor, <6 cm dilated, were randomized. Epidural analgesia (EA) was established with 20 ml 0.8% Ropivacaine + 2 µg/ml Fentanyl (4), with all women receiving this same solution via PCEA alone (5 ml bolus; 10 min lockout, No 4 hour limit) or PCEA (5 ml bolus; 10 min lockout, No 4 hour limit) plus CIEA (10 ml/hr) in a double-blind manner. EA and obstetric management were predetermined using strict protocols. An "a priori" decision was made to analyze only vaginal delivery data to eliminate the impact of the higher analgesic requirement with "dystocia". Data analysis included 2-tailed unpaired T-test, repeated measures ANOVA and Chi square with P<0.05 considered significant.

RESULTS: 104 PCEA alone and 107 PCEA + CIEA delivered vaginally. No statistical differences in demographics, cervical dilation at EA initiation, VAS pain scores prior to and 30 min post EA and neonatal weight. 3 (2.8%) PCEA alone withdrew due to inadequate analgesia and 1 (0.9%) PCEA + CIEA withdrew. Repeated measures ANOVA analysis indicated VAS Pain scores were significantly higher (P<0.001) at each cervical dilatation in PCEA alone vs PCEA + CIEA (Figure 1). Significantly more women required Anesthesiologist-administered "top ups" with 43 (41.3%) PCEA receiving a total of 64 "top ups" and 29 (27.1%) PCEA + CIEA receiving a total of 45 "top ups" (P<0.03). Mean analgesic satisfaction at 24 hours postpartum was significantly greater (P<0.02) with PCEA + CIEA (90.6 ± 10.9) than with PCEA alone (84.7 ± 21.1).

DISCUSSION: PCEA + CIEA at 10 ml/hr, utilizing 0.08% Ropivacaine + 2 µg/ml Fentanyl, provides more effective labor analgesia with significantly fewer Anesthesiologist-administered "top ups" and greater maternal postpartum labor analgesia satisfaction compared to PCEA alone.

REFERENCES: 1. CJA 40:211-7, 1993; 2. CJA 35:249-54, 1988; 3. IJOA 2:73-7, 1993; 4. Anesth Analg 90: 1384-9, 2000

Figure 1: VASP Scores at each Cervical Dilatation

ORAL PRESENTATIONS INCLUDING
THE ZUSPAN AWARD

SOAP A12

PRE-LABOR MATERNAL SERUM INTERLEUKIN-6: A POTENTIAL SCREENING TEST FOR FEVER AFTER EPIDURAL ANALGESIA

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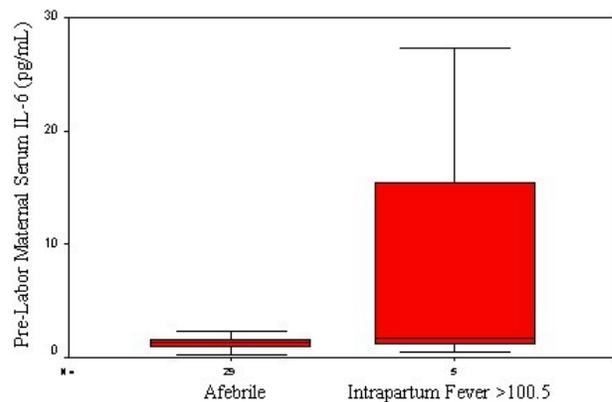
Objective: Intrapartum fever after epidural analgesia is associated with increased levels of maternal serum interleukin-6 (IL-6) at catheter placement. Our objective was to determine whether pre-labor maternal serum IL-6 predicts subsequent intrapartum fever.

Methods: Nulliparous women at full term (>37 wks) but pre-labor were recruited and consented. Maternal serum IL-6 levels were determined by standard ELISA methodology. Maternal characteristics and pregnancy outcomes were obtained by chart review. Continuous outcomes were compared using the Pearson's correlation, Mann Whitney U and Kruskal Wallis tests as appropriate. A p-value of <0.05 was considered significant.

Results: 40 subjects were recruited; at the time of analysis, 34 had delivered. Six women developed intrapartum fever >100.5°F; five were associated with epidural analgesia. The mean gestational age at screening was 38.1 ± 1.0 weeks. IL-6 levels were not correlated with gestational age at screening (r=0.11, p=0.52). Hispanic ethnicity was associated with significantly higher median serum IL-6 (1.81±1.89 vs. 1.10±0.71 pg/mL, p=0.001). Women who chose epidural analgesia had lower median IL-6 values (1.26±0.73 vs. 1.98±1.55 pg/mL, p=0.004). Women who developed intrapartum fever had higher median pre-labor serum IL-6 levels (Figure 1.) but this difference did not achieve statistical significance (p=0.296).

Conclusions: Women with higher pre-labor IL-6 levels are less likely to select epidural analgesia, however if they do, they may be more likely to develop maternal fever. Women of Hispanic ethnicity have higher baseline IL-6 levels, which may explain the higher rates of fever associated with epidural analgesia that have been reported in predominantly Hispanic populations. If these results are confirmed in larger cohorts, analysis of maternal serum IL-6 levels prior to labor may be useful as a screening test to identify women at risk for fever after epidural analgesia for targeted intervention.

Supported by the Joseph Mortola/Solvay Research Grant, Society for Gynecologic Investigation

Pre-Labor Maternal Serum IL-6 Levels
and Subsequent Intrapartum Fever

ORAL PRESENTATIONS INCLUDING THE ZUSPAN AWARD

**SOAP A13
SIMULATOR TRAINING FOR OBSTETRICAL CRISIS
MANAGEMENT: AN EFFECTIVE MEANS OF
PROMOTING TEAMWORK**

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Introduction: Labor and delivery units are unique clinical environments where most activities are unscheduled. Patient needs are dynamic, and clinicians must be prepared for unexpected events, including obstetrical emergencies. Event management on the labor and delivery floor requires coordinated teamwork and effective communication between all members of the care team, including nurses, anesthesiologists and obstetricians. To meet the need for teamwork training, a human patient simulator-based course in crisis resource management and teamwork (LDCRM) derived from the work of Gaba et al has been developed. We sought to develop a method to evaluate the effectiveness of the LDCRM teamwork course by qualitative analysis of post-hoc interviews of the participants.

Methods: After completion of the LDCRM course and a return to clinical practice for at least one month, participants were interviewed using a six-question open-ended interview instrument. The taped interviews were transcribed and a coding scheme was developed for subsequent study of the effectiveness of the CRM course.

Results: Our preliminary results suggest that simulation-based training is an effective means of improving teamwork and communication skills. Participants stated that skills critical for crisis management, such as communication and role clarity, improved in their practice. Furthermore, participants learned the value of repeated global assessments to avoid fixation during a crisis.

Discussion: Teamwork and communication are behaviors that can be taught and applied to critical environments. In addition, these behaviors are not practiced reliably, regularly, or well unless specific training or reinforcement has established them. The LDCRM course allows team members to manage simulated obstetrical crises in a safe environment free of judgment or negativity. Participants in these videotaped interactive sessions learn the principles of crisis management and take these skills back to the clinical workplace. At our hospital, the LDCRM course was taken by multidisciplinary workgroups who care for patients together on the L&D floor, allowing them to learn more about their unique group dynamics, strengths and weaknesses. The insights learned during the course are directly applicable to their work environment and impact patient care. The Risk Management Foundation (RMF) of the Harvard Medical Institutions values simulation-based training and offers a malpractice premium discount for LDCRM course participants at the Center for Medical Simulation. We have analyzed the short-term impact and effectiveness of LDCRM training on teamwork coordination and communication between the multidisciplinary obstetrical staff at our hospital with an interview instrument that focuses on behaviors and skills acquired during simulation-based training.

References: 1. *International Anesthesiology Clinics* 27(3):148-52,1989. 2. *Health Services Research* 37(6):1553-81,2002.

**SOAP A14
IDENTIFICATION AND CHARACTERIZATION OF
PROTEOMIC BIOMARKERS FOR SEVERE
PREECLAMPSIA IN CEREBROSPINAL FLUID**

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INTRODUCTION: Preeclampsia is an idiopathic multisystem disorder specific to human pregnancy, and a major cause of maternal and perinatal morbidity and mortality. This study uses proteomic analysis of cerebrospinal fluid (CSF) to identify protein biomarkers for the diagnosis and/or treatment of preeclampsia.

METHODS: CSF was collected at spinal anesthesia from women with severe preeclampsia (n=7), mild preeclampsia (n=8), and controls (n=7). Indications for severe preeclampsia included symptoms (n=1), BP (n=2), HELLP syndrome (n=1) pulmonary edema (n=1), or a combination of these features (n=2). Manual cell counts were performed in a blinded fashion on all CSF specimens. A preeclampsia proteomic biomarker (PPB) score was developed based on the presence or absence of four discriminatory peaks on pooled specimens of severe preeclampsia versus controls analyzed by SELDI time-of-flight mass spectroscopy. Two different experimental conditions were used to optimally visualize the protein peaks. Individual samples were then analyzed in a blinded fashion, and PPB scores were compared. In-gel tryptic digest, western blot analysis, on-chip immunoassays, ELISA, and spectral analysis were used to identify and quantify these proteins.

RESULTS: PPB scores were able to distinguish severe preeclampsia from both mild preeclampsia and controls with 85.7% sensitivity and 100% specificity (Fig 1). The only outlier (arrow in Fig 1) was a patient with severe preeclampsia by pulmonary edema, which was attributed primarily to iatrogenic fluid overload. PPB scores were unaffected by parity (P=0.672), magnesium seizure prophylaxis (P=0.163), CSF leukocyte counts (P=0.104), and CSF protein content (P=0.177). However, CSF erythrocyte counts were significantly higher in severe preeclampsia than mild preeclampsia and controls (122.3±39.5, 1.8±1.0, and 3.0±1.2 cells/HPF, respectively; P=0.031). These low erythrocyte counts effectively exclude a bloody tap. The outlier was the only patient in the severe preeclampsia group that had no erythrocytes in her CSF. Proteomic identification techniques matched the discriminatory protein peaks to the unglycosylated and glycosylated forms of free hemoglobin a and b chains.

DISCUSSION: Proteomic analysis of CSF can accurately distinguish severe preeclampsia from both mild preeclampsia and controls. These data demonstrate that proteomic technology can be used to identify important biomarkers for diagnosis of severe preeclampsia and candidate targets for treatment. The novel finding that patients with severe preeclampsia present nanomolar amounts of free hemoglobin in their CSF may have both pathophysiologic and therapeutic implications.

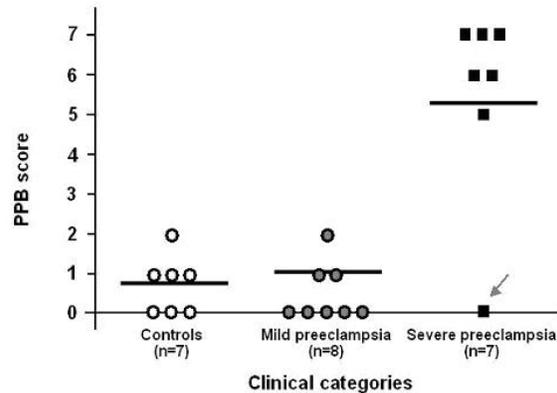


Figure 1: Distribution of study population by clinical categories and preeclampsia proteomic biomarker (PPB) scores

ORAL PRESENTATIONS INCLUDING THE ZUSPAN AWARD

SOAP A15 OBSTETRIC ANESTHESIA EDUCATION-FROM LABOR ROOMS TO THE UNITED NATIONS AND WORLD HEALTH ORGANIZATION

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Hospitals generally provide childbirth information via educational sessions, informational brochures, and prenatal interviews. In 2002, however, a comprehensive website explaining the concepts of obstetric anesthesia was designed and deployed to disseminate information to anyone looking for up-to-date information about this topic.

Visitor profile: From a humble beginning of 200 visitors a month in April 2002, the website www.painfreebirthing.com is currently visited by about 4500 visitors a month. A modified version of website was installed at the request of Brigham and Women's on their hospital's own platform in 2003. Visitors have increased steadily from 600 in July 2003 to presently about 3000 a month.

Web Links: Several organizations related to childbirth including SOAP have provided links to direct visitors seeking childbirth information to our website.

Women's Health and Education Center(WHEC)/UNO/WHO: WHEC had launched a web-learning program – WomensHealthSection.com with the assistance of the United Nations and WHO and was given an associated status with the Department of Public Information (DPI) of UN. The purpose of this organization is to propagate women's health related issues to patients and health care workers. A million visitors visit this site annually. In 2003, www.womenshealthsection.com requested a section on obstetric anesthesia to be included on their website. Through this website, obstetric anesthesia information is available via WHO and UN network to 85 countries.

Website search engines: Website search engines such as Google.com or Yahoo.com have ranked our websites highest among 67000 sites on childbirth related subjects based on popularity of content. This has assured that our sites do come up for review for the viewers when searching for information. This has fulfilled one of our main objectives that were to counter-balance the negative information on the web about labor epidurals and provide our view based on scientific studies.

Translation to other languages: The website is currently available in Spanish and French versions. An Italian version is underway. Translation into other languages recognized by the General Assembly of the UN: Arabic, Chinese, and Hindi will be done by March 2004 by WHEC.

E-mails: E-mails are being received daily from patients, physicians, and others with an interest in obstetric anesthesia. Patients invariably are grateful for the availability of easily understandable information on the website. As expected, there were critical e-mails in the beginning phase from organizations that are against medicalization of childbirth. However, some organizations such as 'Doula's of North America' (DONA) have realized that consumer demand for pharmacological pain relief is strong. Therefore they have provided a link to our site.

What is the future? Continuation of these efforts will help us to express our views as practicing clinicians. Plans are to include high-resolution graphic/video clippings and translate website to other languages depending on funding availability.

ORAL PRESENTATIONS #2

SOAP A16 EARLY LABOR NEURAXIAL ANALGESIA DOES NOT INCREASE THE INCIDENCE OF CESAREAN DELIVERY

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Introduction: Studies comparing labor outcome in parturients who received neuraxial vs. systemic opioid analgesia suggest early initiation of neuraxial analgesia may be associated with higher operative delivery rates (1,2). The purpose of this randomized study is to determine if neuraxial compared to systemic analgesia, initiated during early labor, increases the incidence of Cesarean delivery.

Methods: 844 healthy, term, nulliparous parturients with singleton, vertex presentation, in spontaneous labor or with spontaneous rupture of membranes consented to participate in this IRB-approved study. Parturients who requested analgesia with cervical dilation <4cm were randomized to receive intrathecal fentanyl (as part of a CSE technique) (IT) or systemic hydromorphone (SYS). Epidural analgesia, followed by patient controlled epidural analgesia (PCEA) was initiated at the 2nd analgesia request in IT. Epidural analgesia followed by PCEA was initiated in Group SYS when the cervix was ≥4cm or at the 3rd request for analgesia. Parturients who first requested analgesia at cervical dilation ≥4cm, received fentanyl/bupivacaine CSE analgesia followed by PCEA (CON). Demographic characteristics, incidence of Cesarean delivery, time to complete cervical dilation and delivery (from initiation of analgesia), average verbal rating score for pain (VRSP) between the 1st and 2nd analgesia requests, Apgar scores and cord gases were compared among groups using the χ^2 , Mann-Whitney U and log-rank tests. $P < 0.05$ was significant.

Results: Demographic characteristics were similar among groups. The cervical dilation at neuraxial analgesia initiation was different. There was no difference among groups in the incidence of Cesarean delivery. The indications for Cesarean delivery were not different, nor was the incidence of operative vaginal delivery. The time from initiation of labor analgesia to complete cervical dilation, and delivery, was shorter for IT compared to SYS. The duration of 2nd stage was not different. Average VRSP was lower in IT. The 1-min Apgar score was lower in SYS compared to IT, but the 5-min Apgar score and umbilical cord gases were similar among groups.

Discussion: Early labor neuraxial analgesia did not increase Cesarean delivery rate, provided better analgesia and a shorter duration of labor compared to systemic analgesia. Neuraxial labor analgesia need not be withheld until cervical dilation = 4-5 cm.

References: 1) Am J Obstet Gynecol 1993;169:851-8. 2) N Eng J Med 1997;337:1715-9.

	IT N = 361	SYS N = 348	CONN = 135
Cervical dilation (time of neuraxial analgesia) (cm)	2 (0 - 4.5)	4 (0 - 10)†	4 (4 - 8)†
Cesarean delivery (%)	17.5	20.4	12.6
Operative vaginal delivery (%)	16.6	13.5	14.8
Duration 1 st stage labor (min)	313 (40-1969)	369 (50-1941)†	184 (35-1590)†‡
Duration 2 nd stage labor (min)	82 (4 - 363)	86 (1 - 410)	80 (13 - 347)
Average VRSP	2 (0 - 10)	6 (0 - 10)†	NA
Apgar score < 7 at 1 min (%)	17.1	23.3†	15.7
Apgar score < 7 at 5 min (%)	1.7	6.1	3.0
Umbilical artery pH	7.24 (6.89-7.44)	7.24 (6.91-7.39)	7.24 (7.0-7.38)

Data are median (range). †=different from IT. ‡=different from SYS.

ORAL PRESENTATIONS #2

SOAP A17
IS ROUTINE USE OF CSE FOR CAESAREAN SECTIONS JUSTIFIED?

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Introduction: CSE is well-recognised for providing anaesthesia for Caesareans. Reliability of the spinal and flexibility of the epidural, enables the anaesthetist to extend or prolong the block, therefore avoiding general anaesthesia. On the other hand it potentially exposes the mother to more complications than either technique alone. So should we be considering the risk/benefits of this procedure for each individual?

Method: Over four months, we prospectively audited all *de nova* regional anaesthetics for Caesareans. We reviewed all complications and the reasons for using the epidural in the CSEs, if it was used. During this period we were simultaneously conducting a research study, which involved some of the CSEs where the study design included the use of the epidural.

Results: Of the total 261 Caesareans, 146 had *de nova* regional anaesthesia. Of these 71(48.6%) had CSE and 75(51.4%) had spinals. 7 in the CSE group who were in the simultaneous study were not included in the analysis. All (except the study women) received 10mg of bupivacaine and 250µgm of diamorphine intrathecally.

Discussion: The complication rate in the CSE was 26.5% while that in the spinal was only 1.3%.

Compared to the 11 (17.1%) in the CSE, only one (1.3%) in the spinal group had inadequate analgesia from the sub-arachnoid block. Unlike the woman in the spinal group, none in the CSE required their anaesthetic to be converted to a GA. In a further 12, the epidural was topped up due to prolonged surgical time which was anticipated and in one woman with cystic fibrosis, it was used for postoperative analgesia.

Of all who had CSEs (n=71), in 40 (56.3%), the epidural was never used. In 7 (9.9%) it was used only for research purposes. In the 11 (15.4%) with inadequate block, the CSE itself may have contributed to the inadequacy of the spinal.

Is it good practice to subject women to a more complicated procedure with increased risks and side effects, in order to avoid an uncommon problem or to participate in a study?

CSE has proven to be a versatile technique and does definitely have a useful place in obstetric anaesthesia. However its use should be tailored to the individual case and the risk/benefit for each patient considered rather than be used as a routine technique.

	CSE (n=64)	Spinal (n=75)
Bloody Tap	3	0
Difficulty siting spinal	3	0
Inadequate block	2	0
Pain/Discomfort	9	1

SOAP A18
CRYSTALLOID PRE-LOADING VS. POST-LOADING FOR THE PREVENTION OF HYPOTENSION WITH SPINAL ANESTHESIA FOR CESAREAN DELIVERY

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Introduction: Hypotension remains a significant problem associated with spinal anesthesia (SA) for cesarean section (CS). It has been shown that pre-loading with crystalloid is ineffective to prevent this complication.¹ Pharmacokinetic studies have predicted that fluid loading should be more efficacious if quickly administered just after induction of the SA.² The aim of this study was to compare pre- and post-loading with crystalloid for the prevention of hypotension during SA for CS.

Methods: After IRB and informed consent were obtained, 48 healthy term parturients having an elective CS were randomized into two groups, those receiving 1 L of crystalloid slowly prior to SA (pre-load, n=24), and those receiving 1 L of crystalloid as quickly as possible with a pressure bag immediately after placement of SA (post-load, n=24). All subjects received a standard SA with hyperbaric 0.5% bupivacaine 10 mg, sufentanil 3 mcg, and morphine 100 mcg. A standardized algorithm was used to indicate the volume of vasopressor bolus (combination of ephedrine 3 mg/ml with phenylephrine 15 mcg/ml) to be administered intravenously every minute, according to systolic blood pressure (SBP) recordings. The primary outcome was the total volume of vasopressors needed to maintain the SBP greater than 90% of baseline before delivery. Secondary outcomes included correlation between vasopressor use and rate of crystalloid infusion, minimum and maximum SBP and heart rate, incidence of hypotension (SBP < 80% of baseline), presence of nausea or vomiting, umbilical artery and venous pH and APGAR scores. A power analysis (beta = 80%) indicated that 24 subjects per group were needed to show a 35% decrease at least in amount of vasopressors needed to treat hypotension after SA. p < 0.05 was considered significant.

Results: Demographic data in both groups were similar with regards to age, weight, height and baby weight. A mean ± SD of 6.0 ± 5.5 ml of vasopressor mix was used in the pre-load group, compared with 4.8 ± 3.2 ml used in the post-load group (not significant : p = 0.34). Vasopressors requirements were correlated with duration of postloading (r = 0.47, p = 0.02) but not with duration of preloading (r = 0.15, p = 0.50). We found no differences in other hemodynamic or other secondary outcome values between the two groups.

Discussion: Crystalloid post-loading did not significantly reduce vasopressor requirements, when compared to pre-loading for the prevention of hypotension after SA for CS. Nonetheless, vasopressor requirements appeared to be inversely correlated with speed of crystalloid administration, when quickly infused just after spinal anesthesia. This supports the practice of giving CS patients crystalloid infusion as quickly as possible, if loading is started during induction of SA.

References:

1. Anesth Analg 2001; 92: 997-1005.
2. Can J Anaesth 1998; 45: 443-51.

ORAL PRESENTATIONS #2

SOAP A19

THE EFFICACY OF A PROPHYLACTIC EPIDURAL BLOOD PATCH IN THE PARTURIENT AFTER DURAL PUNCTURE WITH A 17 GAUGE EPIDURAL NEEDLE

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Introduction: Controversy exists as to whether a prophylactic epidural blood patch (PEBP) decreases the incidence of post-dural puncture headache (PDPH) in obstetric patients after an inadvertent dural puncture (DP) with an epidural needle.¹ The purpose of this prospective, randomized, double-blinded trial was to determine whether PEBP would decrease the incidence of PDPH in this patient population.

Methods: Obstetric patients who suffered inadvertent DP with a 17-gauge epidural needle and subsequently had an epidural catheter placed at the same or different interspace gave informed, written consent to participate in this IRB-approved study. After resolution of epidural blockade, 20 mL autologous blood was sterilely obtained. Subjects were randomized to receive a PEBP through the epidural catheter or a sham injection. The subject and all care providers were blinded to study group. Subjects were followed by an investigator for a minimum of 5 days or until headache-free for 3 days. Treatment recommendations were based upon protocol: Mild (Verbal Rating Score for Pain (VRSP) < 4) and moderate $4 \leq \text{VRSP} \leq 6$ PDPH that did not interfere with activities of daily living (ADL) were treated with conservative measures. Moderate PDPH that interfered with ADL and severe PDPH (VRSP > 6) were treated with therapeutic epidural blood patch (TEBP). Sample size (n = 64) was determined as number necessary to detect a 50% reduction in the incidence of PDPH assuming an incidence of 75% in the SHAM group at $\alpha = 0.05$ and power = 0.80. Data were compared using χ^2 and Mann-Whitney U test. $P < 0.05$ was required to reject the null hypothesis.

Results: Demographic variables were similar in both groups. There was no difference in the primary outcome variable, incidence of PDPH. The duration of PDPH and severity of PDPH (as assessed by the area under the VRSP x time curve) were significantly less in the PEBP group compared to the SHAM group.

Discussion: When studied in a randomized, double-blinded fashion, PEBP after inadvertent DP during epidural catheter placement did not reduce incidence or peak intensity of PDPH, in contrast to the results of previous studies. It did reduce duration of symptoms.

Reference: (1) Can J Anesth 1999;46:878-86.

	PEBP N = 32	SHAM N = 32
Vaginal delivery (n)	25	26
Duration of pushing (min)	42 (0 - 150)	20 (0 - 100)
Incidence of PDPH (n)	18	18
Onset of PDPH (d)	2.0 (1 - 4)	1.5 (1 - 6)
Maximum VRSP (0 - 10)	7 (1 - 9)	6 (2 - 10)
Inability to perform ADL (n)	10	13
Duration of PDPH (d)	2 (1 - 9)‡	5 (1 - 17)
AUC (VRSP x days)	10 (1 - 42)‡	19 (5 - 49)
Recommend therapeutic EBP (n)	11	15
Perform therapeutic EBP (n)	9	14
2 nd therapeutic EBP (n)	2	1
Backache (d)	1 (0 - 7)	2 (0 - 6)

Data reported as median (range) unless specified.

‡PEBP different from SHAM.

BEST PAPERS OF THE MEETING

SOAP A20

RANDOMIZED CONTROLLED TRIAL COMPARING PCEA VS PCEA + CIEA ON LABOR OUTCOME USING AMBULATORY EPIDURAL ANALGESICS

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INTRODUCTION: PCEA reduces the amount of epidural medication received by laboring women compared to continuous infusion epidural analgesia (CIEA) (1,2). The purpose of this prospective, randomized, double-blinded study was to compare the impact of PCEA vs PCEA + CIEA on the incidence of cesarean delivery (C-D) and instrumented (forcep or vacuum) vaginal delivery (IVD) using ambulatory epidural analgesics (3).

METHODS: Following IRB approval and written informed consent, 300 nulliparous women undergoing induced labor, <6 cm dilated, in established labor, requesting labor epidural analgesia (LEA) were randomized. LEA was established with 20 ml of 0.8% Ropivacaine + 2 µg/ml Fentanyl (3), with each woman randomized to receive this same analgesic solution either via PCEA alone (5 ml bolus; 10 min lockout, No 4 hour limit) or PCEA (5 ml bolus; 10 min lockout, No 4 hour limit) plus CIEA (10 ml/hr) in a double-blind manner. LEA and obstetric management were predetermined using strict protocols. Data was analyzed using an intent-to-treat model, major protocol violations (MPV) excluded. Data analysis included 2-tailed unpaired T test and Chi Square with $P < 0.05$ considered significant.

RESULTS: 150 women were randomized in each group with no statistical differences in demographics, method of labor induction, cervical dilatation at initiation of LEA, gestational age, VAS pain scores prior to LEA and neonatal weight. Several MPV were identified including 9 PCEA (1 "wet tap"; 8 epidural catheter replacements) and 6 PCEA + CIEA (1 "wet tap"; 3 epidural catheter replacements; 1 undiagnosed breech in 2nd stage; 1 PCEA pump programmed incorrectly). Therefore, treatment allocations were administered to 141 women in the PCEA group and 144 women in the PCEA + CIEA group. Women in the PCEA alone group received significantly less epidural Ropiv (45.2 ± 34.1 mg) compared to PCEA + CIEA (78.6 ± 39.9 mg) $P < 0.0001$. There were no statistical differences in the duration (min) of the 1st stage of labor with PCEA alone (414 ± 249) and PCEA + CIEA (455 ± 254) and 2nd stage with PCEA alone (127 ± 86) and PCEA + CIEA (144 ± 114); incidence of C-D with 37 (26.2%) PCEA alone and 37 (25.7%) PCEA + CIEA or IVD with 43 (30.5%) PCEA alone and 48 (33.3%) PCEA + CIEA, nor with neonatal pH <7.20 and APGARS <7.

DISCUSSION: LEA using 0.08% Ropivacaine + 2 µg/ml Fentanyl delivered by either PCEA alone or PCEA + CIEA (10 ml/hr), provided effective analgesia throughout labor. Although, PCEA alone significantly reduced the amount of epidural medication parturients received during labor, our investigation did not identify any benefit to utilizing PCEA alone with regard to labor outcome or neonatal outcome.

REFERENCES: 1. CJA 40:211-7, 1993; 2. CJA 35:249-54, 1988; 3. Anesth Analg 90: 1384-9, 2000

BEST PAPERS OF THE MEETING

SOAP A21

ANTEPARTUM CHRONIC EPIDURAL THERAPY (ACET) USING ROPIVACAINE IMPROVES UTEROPLACENTAL BLOOD FLOW IN PREECLAMPSIA AND INTRAUTERINE GROWTH RETARDATION

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Uteroplacental blood flow (UPBF) is impaired in preeclampsia (PE) and intrauterine growth retardation (IUGR)¹. Bolus epidural local anesthetics (LA) have been shown to improve UPBF in PE². Chronic epidural LA has been described for PE in a non-randomized study using bupivacaine 0.25% (2ml/hr)³. We report preliminary dose-finding data to determine a concentration of epidural ropivacaine (10 ml/hr) that increases uterine blood flow in PE and/or IUGR.

Method: Patients were between 22-32 weeks gestation at enrollment, with uterine artery notching and either PE or IUGR. Patients were randomized to ACET or control. The first 5 days of ACET was a dose finding study, using 0.04%, 0.06%, 0.08% and 0.1% ropivacaine and saline placebo. The order of doses was randomized and blinded. The prime end point was uterine artery blood flow (systolic-diastolic ratio, S/D); based upon which an individualized dose-response relationship and optimal dose was determined for each patient. This optimal dose was administered for a successive week to determine whether the improved UPBF was maintained.

Results: To date, 5 parturients have been enrolled, all of whom had both IUGR and PE. Patients in the ACET group (n=3) demonstrated a dose-dependent improvement in UPBF with increasing concentrations of epidural ropivacaine, as shown in fig 1 with UPBF returning to baseline during the placebo day. At 0.1% ropivacaine, there was a mean reduction of S/D ratio to 68% of baseline. In both patients where pregnancy persisted beyond the second week, this improvement in UPBF was maintained and returned to baseline following an additional single placebo day. Patients in the ACET group had 11, 25 and 28 days of therapy until delivery; by comparison, control patients delivered within 1 and 2 days of enrollment. Statistical analysis of outcome data has not been performed at this stage.

Discussion: IUGR and pre-eclampsia are both important disorders of pregnancy with high perinatal morbidity, associated with impaired UPBF. We show that epidural ropivacaine may improve UPBF in a dose-dependent fashion in these few patients. If ACET can reliably improve UPBF, it may ultimately provide a therapeutic option for pre-eclampsia and IUGR, and an alternative to premature delivery.

References: 1: Kaufmann: Biol Reprod 2003; 69:1-7. 2: Ramos-Santos: Obstet Gynecol 1991; 77: 20-6. 3: Kanayama N: J Hum Hypertens 1999; 13: 167-71.

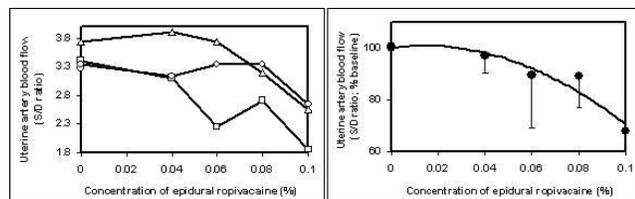


Fig 1: The effect of epidural ropivacaine on uterine artery blood flow (reducing S/D increases blood flow). A) Individualized concentration-response curves from 3 patients (S/D ratio). B) Pooled data (n = 3) (% baseline S/D ratio)

SOAP A22

CONTINUOUS WOUND INSTILLATION AFTER CESAREAN SECTION: LOCAL ANALGESIC EFFECT OF DICLOFENAC

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Introduction: Postoperative analgesia after cesarean section (CS) is commonly afforded by systemic administration of opioids and NSAIDs (1). Regional analgesic technique involving wound irrigation with local anesthetic is also effective (2). Although surgical injury locally releases inflammatory mediators (e.g. PGs) which sensitize peripheral nociceptors and produce pain and hyperalgesia, results from wound infiltration with NSAIDs are inconclusive (3). The study evaluates the local analgesic effect of diclofenac (DICLO) after CS.

Methods: After informed consent, healthy parturients undergoing elective CS under spinal anesthesia were randomly allocated to 3 groups (n=20 per group) to receive after surgery a subcutaneous continuous infusion (elastometric pump:5mL/h during 48h, Painbuster, I-Flow,Lake Forest, USA) with either DICLO 300 mg/48 h, ropivacaine 0.2% (ROPI) or saline (SAL). ROPI and SAL groups also received IV DICLO 75mg every 12h. All patients were connected to a PCA device with IV morphine for 48 h. Pain scores (VAS 0-10) evaluated wound pain at rest (R) and movement (M) and pain from uterine contractions (C) at 12, 24 and 48 h after surgery. Area of postoperative hyperalgesia was measured at 24 and 48 h with von Frey filaments and residual wound pain at 1 and 6 months was questioned. Side effects like blood losses and wound healing were recorded. Statistical analysis used ANOVA and X² for multiple groups.

Results: Patients did not differ concerning demographic data. No side effect resulted from local or IV DICLO. R and C VAS, area and % patients with postoperative hyperalgesia did not differ between groups. Results for M VAS and morphine use (mean±SD), and % residual pain at 1 and 6 months are in Table. (*) P <0.05 was significant from SAL.

Discussion: Wound infiltration with DICLO is equivalent to ROPI and more effective than systemic DICLO to relieve acute pain and to produce a morphine sparing effect after CS. At 1 and 6 months, less residual pain is present after local DICLO analgesia.

References: (1) Dahl et al. Int J Obstet Anesth 2002; 11: 91-94 (2) Givens et al. Am J Obstet Gynecol 2002; 186: 1188-91 (3) Rom-sing et al. Acta Anaesthesiol Scand 2000; 44: 672-83.

	SAL	ROPI	DICLO
M VAS at 12 h	7 ± 1.9	3 ± 2.9 *	5 ± 1.9
M VAS at 24 h	6 ± 2.8	5 ± 2.2	4 ± 1.6 *
M VAS at 48 h	4 ± 2.6	3 ± 1.4	2 ± 2.0 *
PCA morph (mg)	32 ± 19	19 ± 12 *	14 ± 9 *
Pain at 1 month	40 %	33 %	5 % *
Pain at 6 months	22 %	5.5 %	0 % *

BEST PAPERS OF THE MEETING

SOAP A23

FETAL BENEFITS OF PHENYLEPHRINE OVER
EPHEDRINE DEMONSTRATED AT CLINICAL
EQUIVALENCEG. R. Lyons¹, S. Saravanan¹, M. O. Columb²¹St James University Hospital, Leeds. UK., Leeds., United Kingdom, ²South Manchester University Hospital, Manchester, United Kingdom**Introduction:** Post spinal hypotension in obstetric practice has an incidence of 80% without preventative treatment. Comparisons¹ of fetal biochemistry following ephedrine and phenylephrine have shown phenylephrine to be associated with less acidosis but have suffered from lack of consensus on dose equivalence.**Aim:** To assess fetal biochemistry following ephedrine or phenylephrine titrated to the same endpoint in terms of hypotension at cesarean delivery.**Method:** Women with a healthy singleton pregnancy, ASA class 1 or 2, 150-180cm, 50-120kg, presenting for elective cesarean section, were randomised to receive ephedrine (group A), or phenylephrine (group B), in this prospective, double-blind, sequential allocation study. All received a standardised combined spinal-epidural anesthetic. Prophylactic vasopressor infusion was started at the end of intrathecal injection. All were laid supine with left tilt. The first patient in groups A and B received 50mg ephedrine and 500mcg phenylephrine, respectively, in 500 ml saline. All infusions began at 999ml/hr through a Gemini IMED infusion pump, and continued for 30mins or until delivery, whichever was earlier. Efficacy in prevention of hypotension (<75% of baseline systolic pressure) and bradycardia (<60bpm) / tachycardia (>130bpm) was assessed and this determined the dose for subsequent patients. If a dose was effective, the next patient received a decrement of 5mg ephedrine, or 50mcg phenylephrine, in 500ml of saline in each respective groups. Hypotension, directed an increase in vasopressor dose for the next patient by same amount in each respective group. Umbilical cord (UA) samples were obtained for blood gas analysis. Time from intrathecal injection to delivery and total dose of vasopressors infused were recorded. Results were analysed with two-tailed t-tests (Table).**Results:** Patient characteristics of the two groups were similar.**UApH, SBE, Intrathecal injection-delivery time and Total vasopressor dose shown as mean (SD)**

	Ephedrine (n=40)	Phenylephrine (n=40)	P value
UA pH	7.25 (0.09)	7.3 (0.06)	0.01
SBE (mmol/L)	-1.59 (2.67)	-0.2 (2.02)	0.03
Inj- Del (min)	31.65 (8.24)	33.92 (8.78)	0.23 (NS)
Dose (mg/mcg)	39.64 (6.33)	496.45(78.3)	Ratio = 1: 80

Discussion: Despite achieving therapeutic equivalence in clinical terms phenylephrine use is associated with less fetal acidosis than ephedrine.**References** 1. Lee A, Ngan Kee WD, Gin T. A Quantitative, Systematic Review of Randomised Controlled Trials of Ephedrine versus Phenylephrine for the management of hypotension during spinal anaesthesia for caesarean delivery. *Anesthesia and Analgesia* 2002; 94(4): 920-926.

SOAP A24

EPIDURAL MORPHINE FOR POST PARTUM TUBAL
LIGATION POSTOPERATIVE ANALGESIA

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Introduction: Postoperative postpartum tubal ligation (PPTL) pain is often under appreciated.¹ We hypothesized that epidural morphine would significantly decrease PPTL pain and the need for systemic analgesic medications.**Methods:** An IRB-approved, prospective, randomized, blinded and placebo-controlled study compared verbal rating scores (VRS) for incisional and cramping pain in 4 groups. Saline, 2, 3, or 4 mg of epidural morphine was administered immediately after lidocaine epidural anesthesia. Patients received ibuprofen 600 mg every 6 h and could ask for acetaminophen 325 mg/hydrocodone 10 mg. VRS, nausea, vomiting, and pruritus scores were collected at regular intervals for 24 hours. Time and method to first void was noted. Data were compared using Kruskal-Wallis one-way ANOVA with *post hoc* Bonferroni correction for multiple comparisons. $P < 0.05$ was considered significant.**Results:** There were no significant differences in height, weight, race, or type of perineal laceration among groups. The area under the VRS x time curve for the first 24 h postop (AUC_{24}) was smaller in all morphine groups compared to placebo for cramping pain. AUC_{24} for incisional pain was not different among groups. Patients in the morphine groups requested acetaminophen/hydrocodone analgesia later and required fewer doses than patients in the placebo group; however, there were no differences among the morphine groups. Nausea, vomiting, and pruritus occurred more often in all the morphine groups compared to placebo. The incidence of nausea and vomiting was higher in patients who received morphine 4 mg compared to 2 and 3 mg. The 4 mg group required bladder catheterization twice as often as all other groups.**Discussion:** A previous study showed PPTL patients had significantly more pain despite receiving more analgesics when compared to a cohort.¹ Epidural morphine 2-3 mg combined with regular ibuprofen provided better cramping pain relief, decreased the need for supplementation with acetaminophen/hydrocodone compared to on-demand oral opioid analgesia. Pain relief was similar to morphine 4mg but was associated with fewer side effects, suggesting that epidural morphine 2-3 mg is a useful regimen for pain management after PPTL.**References:** 1. *Anesthesiology* 2001; 95:A1038

	Saline N = 21	MS 2 mg N = 25	MS 3 mg N = 21	MS 4 mg N = 23
AUC_{24} VRS cramping	48 (0-136)	24 (0-108)†	16 (0-64)†	8 (0-64)†
AUC_{24} VRS incision	44 (0-168)	4 (0-144)	12 (0-76)	4 (0-72)
Time to 1 st opioid analgesia request (min)	220 (122-1440)	575 (52-1440)†	618 (87-1440)†	599 (46-1440)†
Acetaminophen/hydrocodone (n/24 h)	3 (0-6)	1 (0-4)†	1 (0-4)†	0 (0-6)†
Nausea (%)	19.0	44.0†,‡	47.6†,‡	73.9†
Vomiting (%)	4.8	32.0‡	28.6‡	65.2†
Pruritus (%)	4.8	76.0†	95.2†	73.9†
Bladder catheter (%)	20	18.2	23.5	44.4

Data presented as median (range). MS = morphine sulfate. AUC_{24} = VRS x time. † = different from saline, ‡ = different from morphine 4 mg ($P=0.05$). Nausea, vomiting, pruritus = overall incidence in 24 h.

BEST PAPERS OF THE MEETING

SOAP A25

FETAL RESPONSES TO MATERNAL LAPAROSCOPY AT DIFFERENT GESTATIONAL AGES

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Introduction: Laparoscopy for non-obstetric related surgery during pregnancy is increasing in popularity despite incomplete knowledge of all its effects. Anecdotal reports suggest that the safest time to operate on a parturient is during the second trimester, but this supposition has not been empirically tested. Using pregnant sheep, we explored this idea further by recording the physiologic responses of the pre-term and near-term fetus to 60 min of maternal CO₂ pneumoperitoneum.

Methods: Pre-term and near-term sheep at gestational days 90 and 120, respectively (term, 145 days), were surgically-instrumented with maternal and fetal femoral catheters. After a 3+ day recovery period, each ewe was anesthetized (1.5-2.0% isoflurane in oxygen) and prepped; throughout the pneumoperitoneum study ventilation was actively managed to keep end-tidal CO₂ below 40 mm Hg. After a baseline recording period, each ewe was insufflated with CO₂ to a final abdominal pressure of 15 mm Hg. Pneumoperitoneum was maintained for 60 min after which the animal was manually-deflated. Cardiovascular parameters were continuously recorded while blood gas status was determined before and at 15 min intervals during and after insufflation.

Results: For both gestational ages, maternal insufflation with CO₂ produced fetal acidemia and hypercarbia. However, these effects were more pronounced in the older fetus. The mean nadir for near-term fetal arterial pH was 7.09 ± 0.08 compared to 7.25 ± 0.05 for the pre-term animals ($p < 0.05$). Likewise, peak fetal arterial pCO₂ was significantly higher in the near-term group (83.43 ± 6.00 versus 67.70 ± 7.51 ; $p < 0.05$). In contrast, maternal blood gasses exhibited only modest changes during insufflation and these did not differ between the two gestational ages. The cardiovascular responses are currently being analyzed.

Conclusion: These preliminary results indicate that, while insufflation of the pre-term ewe does produce fetal hypercarbia and acidemia, these effects are muted compared to the near-term fetus. While the data need to be corroborated with outcome studies, our findings do support the dictum of conducting maternal laparoscopy in the second trimester over the third trimester.

This work was supported in part by research grants from the National Institutes of Health (HD042471 and NS42664). RJM is the recipient of a Howard Hughes Medical Student Fellowship.

POSTER REVIEW 1

SOAP A26

THE EFFECT OF INTRATHECAL COX INHIBITORS ON ACUTE PAIN FROM UTERINE CERVICAL DISTENSION

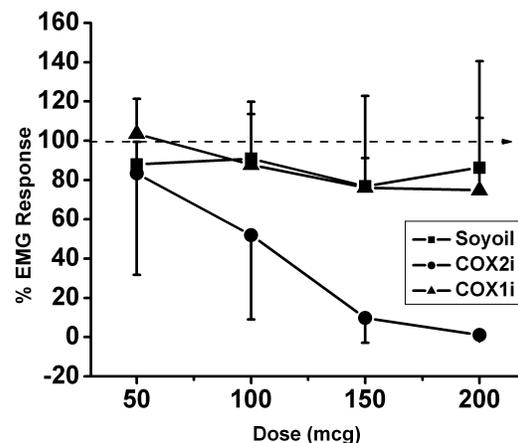
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Introduction. Cyclooxygenase (COX) enzymes are important in initiation and maintenance of the pain transmission from uterine cervical stimulation. The purpose of this study is to examine the effect of intrathecal COX inhibitors (COXi) on the response to uterine cervical distension (UCD) in rats.

Materials and Methods. After the approval by our institution's ACUC, virgin female rats were anesthetized with halothane and controlled ventilation. Following arterial and venous cannulations, two electrodes were placed in rectus abdominus muscles for EMG recording. For UCD, a lower abdominal laparotomy was performed and two fine metal rods were inserted through the cervical oses for manual distension. Initial distensions were performed until a steady response was obtained; Intrathecal SC-86238 (COX2i, n=5) or SC-58560 (COX1i, n=5) were given in a cumulative manner, soybean oil (n=6) was used for control. A 20 sec UCD every 5 min was performed, and the MAP and EMG were recorded throughout the experiment. Data are expressed as mean \pm SD, and analyzed by one way ANOVA. $P < 0.05$ is considered significant.

Results. UCD produced a stimulus-dependent EMG response from 20 to 80 g. Intrathecal COX2i injection produced a dose-dependent inhibition of the UCD-evoked EMG response; however, there was no significant inhibitory effect with i.t. COX1 inhibitor when compared to soybean oil (Figure 1).

Figure 1. The Effect of i.t. COX Inhibitors on UCD Response



Discussion. This study demonstrates that spinal COX2 plays an important role in UCD induced acute visceral pain. Targeting of spinal COX2 by spinal injection may be an alternative treatment to treat pain from uterine cervix, including that during labor. Supported in part by FAER and NIH grant GM48085.

POSTER REVIEW 1

SOAP A27
THE BEHAVIORAL RESPONSE TO UTERINE CERVICAL DISTENSION IN RATS

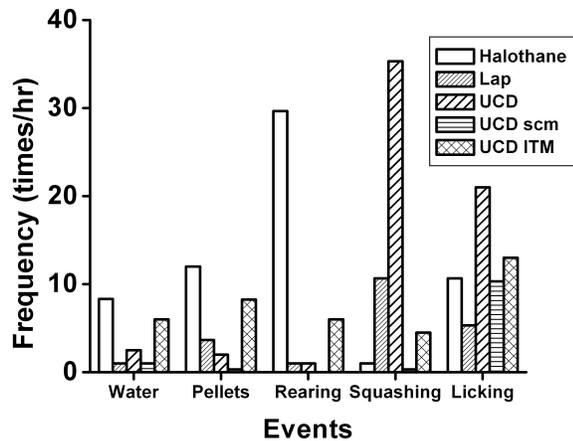
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Introduction: Pain from the female reproductive organs, such as surgical dilatation of the cervix, menstrual pain, and labor pain results from the dilatation of the uterine cervix. Previous studies shown that uterine cervical distension (UCD) increases hypogastric afferent nerve firing, and reflex abdominal muscle contraction. In this study, we examine the effect of UCD on spontaneous behavior in the undisturbed animal.

Materials and Methods: The protocol was approved by the ACUC. Female rats were anesthetized with halothane. Two metal rods were inserted through uterine cervical oses via a lower laparotomy, with a tonic distension of 70 g for 60 min; the control animals received either halothane or laparotomy only. All animals recovered 60 min after surgery. Behavior was assessed by placing the animal into an observation chamber in a dark room, with continuous infrared-light video recording for 60 min, and analyzed with EAS by a person blinded to the study assignment. Predefined behavior lasting >5 sec was scored. The incidence and duration of each behavior is classified by pre-defined criteria, such as W and P=accessing water and food pellet, R=vertical exploring, L=licking lower abdomen and genital areas, S=stretching low half body and crawling, or lateral contraction. Data are expressed as mean ± SEM and analyzed by one way ANOVA, p<0.05 is significant.

Results: Animals in the UCD group showed significant decrease in exploring activities vs. halothane (p<0.01). Squashing posture was more common in the UCD than in laparotomy alone. Licking did not differ among groups. I.t. morphine effectively improved the activity level after UCD and decreased squashing posture behavior (Figure 1).

Figure 1. The Behavioral Response to UCD



Discussion: This study demonstrates that UCD decreases general exploring activity and causes acute behaviors consistent with visceral pain. However, licking is not a specific behavior of acute visceral pain. Compared to s.c. morphine, i.t. morphine is more effective in restoring the activities and reducing visceral pain behavior in animals receiving UCD.

Supported by FAER and NIH GM48085

SOAP A28
A SURVEY OF SOAP MEMBERSHIP REGARDING INFORMED CONSENT DURING LABOR

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Introduction: Very little is known regarding the actual practice of gaining informed consent during labor by anesthesiologists in the United States. We sought to discover what risks are routinely mentioned prior to the administration of regional anesthesia during uncomplicated labor.

Methods: After obtaining IRB approval we designed a survey, which lists 15 well known risk factors associated with regional anesthesia, and assigns to each a risk level ranging from low to medium to high. In addition, we asked whether or not a written anesthesia consent form was used prior to epidural administration. We distributed our survey to participants in the 2003 SOAP annual meeting. 150 surveys were distributed and 102 were returned for a response rate of 68%. The responses were primarily from attending U.S. anesthesiologists as 77% of active SOAP members are attendings while only 5% are residents, 2% CRNA;s and approximately 12% are foreign (figures kindly furnished by Bob Specht).

Results: The results are given in table 1. They are given as an absolute number of respondents and as a percentage of total respondents within each category. In some cases of level of risk the percent total does not add up to 100% as some respondents listed the risk factor without specifying degree of risk. The table is organized so as to list risk factors in decreasing order of frequency of selection, thus the most frequently mentioned are at the left, with the least frequently mentioned at the right. When asked: "do you use a written anesthesia consent form prior to epidural administration?", 49% of respondents replied "yes", 42% replied "no" and 9% failed to respond.

Conclusion: Among the top five risks, headache was the most frequently mentioned with 94% of respondents listing it. The risk of headache was considered small. Indications of less than perfect block found expression in two of the top five risks, viz. patchy block and block failure. Perhaps the most surprising finding is the listing of permanent neurological injury among the top five risks. Other serious complications such as death and aspiration are mentioned by a quarter or less of respondents. Nearly half (49%) of respondents use a written anesthesia consent form.

table 1

RISK FACTOR	Head-ache	Failed Block	Hypotension	Patchy Block	Permanent Neurologic Injury	Infection	Back-ache	Transient Neurological Injury	Bleeding	Pruritus	Possible Conversion to General Anesthesia	Nausea/Vomiting	Death	Aspiration	Urinary Retention
NUMBER	96 (94)	73 (72)	70 (69)	68 (67)	63 (62)	62 (61)	61 (60)	60 (59)	53 (52)	43 (42)	36 (35)	28 (28)	25 (25)	17 (17)	16 (16)
HIGH RISK	4 (4.2)	4 (5.5)	14 (20)	4 (5.9)	0 (0)	0 (0)	8 (13.1)	0 (0)	0 (0)	14 (32.6)	0 (0)	0 (0)	0 (0)	1 (5.9)	2 (12.5)
MEDIUM RISK	13 (13.5)	13 (17.8)	30 (42.9)	24 (35.3)	1 (1.6)	1 (1.6)	17 (27.9)	7 (11.7)	1 (1.9)	14 (32.6)	3 (8.3)	13 (46.4)	0 (0)	0 (0)	4 (25)
LOW RISK	69 (71.9)	51 (69.9)	18 (25.7)	36 (52.9)	59 (93.6)	55 (88.7)	29 (47.5)	46 (76.7)	46 (86.8)	10 (23)	30 (83.3)	13 (46.4)	25 (100)	16 (94.1)	7 (43.8)

POSTER REVIEW 1

SOAP A29

ETHNICITY AND PARITY CONTRIBUTE TO PAIN PERCEPTION DURING LABOR

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Introduction: Recent reports suggest that significant racial disparities exist in all aspects of health care. A multi-center clinical trial was undertaken to examine ethnic differences in pain perception in an obstetric population.

Methods: Patients were recruited in the OB clinics at both institutions or at presentation to L & D (barring active labor). Antepartum: questionnaires were administered to assess demographics, coping skills, and labor experience expectations. Intrapartum: questionnaires using multiple scales to assess pain perception levels were administered at predetermined time points: 1) L & D admission; 2) first request for analgesia; and 3) request for epidural. Pain scores are rated on a scale of 1 – 10. Data were compiled from the two centers and evaluated using SPSS (version 11) software. Statistical analysis was performed using the Mann-Whitney non-parametric test. Significance is assumed at p<0.05.

Results: 350 patients (131 Caucasian, and 119 African-American) were recruited. Only patients who had completed all stages of the study, or who were not high risk were used in this analysis (N=163). Demographics were similar within the two groups except for education, household income, parity and birth weight. Significant differences in pain perception during labor were discovered between Caucasian and African-American groups at the time points examined (p-values: 0.028, 0.027, 0.001).

Pain Assessment Time	Mean Pain Score (± SD) African-Americans		Mean Pain Score (± SD) Caucasians		p-value	
	Primip.	Multip.	Primip.	Multip.	Primip	Multip.
	L&D admission	3.3 (±3.6)	5.0 (±4.3)	3.1 (±2.9)	1.6 (±2.6)	0.809
1st Analgesia	7.4 (±2.1)	8.1 (±1.9)	6.9 (±1.8)	5.8 (±1.5)	0.295	0.014
Epidural Request	8.5 (±1.9)	8.4 (±1.6)	7.8 (±1.6)	6.6 (±2.3)	0.166	0.001

Cervical dilation between the two groups was not statistically different. In the multiparous subset, significant differences in pain perception were observed between the two ethnic groups at all time points. In primiparous patients, no statistical differences were found between the two ethnic groups. Comparison of McGill pain scores between Caucasian and African-American groups demonstrated significant differences at admission (p=0.013) and at request for epidural (p=0.001) in the multiparous group, and no significant differences in the primiparous group. In all instances, the African American participants reported higher levels of pain than their Caucasian counterparts. There was no difference in oxytocin use among the groups. The arithmetic mean birth weight of the Caucasian patients was found to be significantly higher than the African American patients (3378g vs. 3103g p=0.006) and was therefore discounted because of an inverse relationship between birth weight and perceived pain.

Discussion: Ethnicity as well as parity may contribute to the perception of pain in the obstetric population.

SOAP A30

A COMPARISON OF THE NURSES VERSUS THE PATIENTS' ASSESSMENT OF PAIN SCORES DURING LABOR: THE INFLUENCE OF ETHNICITY

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Introduction: Several studies have shown that the nurses' perceptions of pain did not correlate with the patients, which generally resulted in poor pain relief and dissatisfaction. Labor pain is a unique form of acute pain and is significantly influenced by the ethno-cultural background. Our obstetric population consists of patients of different ethnicities. Their pain behavior and coping strategies can be significantly different. A lack of understanding of such diversity in pain responses can result in suboptimal care and inadequate satisfaction of the patients' analgesic needs. Since our nursing staff is also of different ethnic backgrounds, we assessed whether the patients' evaluation of the pain being experienced during labor was different from the nurse's evaluation of that pain.

Methods: After IRB approval, African American & Caucasian parturients were recruited to this study antenatally. After admission to the labor and delivery unit, the patients were asked to rate their pain using a verbal rating score (0= no pain, 10= worst imaginable pain) at three time points: admission, first request for analgesia, and epidural placement. The nurses looking after the patient were blinded from the reported score and were asked to evaluate the patients' pain at the same time points. For each patient at each time point, it was determined if the patient's ethnicity was the same or different from the nurse's ethnicity. The difference between each patient's pain ratings and nurse's pain ratings was determined at each of the three time points by subtraction. A t-test was used to compare these difference scores for patients who were of the same ethnicity of their nurses, and for those who were of a different ethnicity. Separate analyses were done for each time point.

Results: 163 patients completed the study. 97 paired pain scores were complete and included in this analysis. The results are summarized in the table. A positive sign means that the patient's rating was higher. A negative sign means that the nurse's rating was higher. There was no difference between both ratings at the three time points.

	Comparison of nurses versus patients' pain scores					
	Different ethnicity			Same ethnicity		
	Admission	First request	Epidu-ral	Admission	First request	Epidu-ral (n=53)
Mean (SD) difference in pain scores	0.9 (1.6)	2.3 (2)	1.0 (1.8)	1.1 (2.2)	-0.4 (2.6)	0.5 (1.6)

Discussion: In this study, the nurse's assessment of the patients' pain was not different from the patients' evaluation of the pain being experienced. A difference between the patient and the nurse's ethnicity did not result in a difference between both assessments.

POSTER REVIEW 1

**SOAP A31
DIFFERENTIAL PERCEPTIONS OF PAIN AND COMFORT DURING LABOR**

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Introduction: There appear to be significant differences between perceptions of pain and comfort during labor, which may affect patient satisfaction. There may also be differences in pain perception between the subject, her nursing attendants and her significant others, which may affect the quality of care and/or outcomes. Our goal was to determine whether there were any differences in parturients' perception of pain and of comfort and to compare such perceptions with assessments of the parturient's pain made by the labor and delivery nurse attending her and by her significant other present during labor.

Methods: After IRB approval and written informed consent, nineteen patients were enrolled. Inclusion criteria included: ASA physical status I or II, term parturients in active labor \leq 5 cm cervical dilation with singleton gestation between 18 and 44 years of age. All patients received combined spinal-epidurals (CSE) for labor containing 1 mL of either 0.25% bupivacaine or 0.25% levobupivacaine with 20 micrograms of fentanyl intrathecally. Following CSE placement and intrathecal dosing, patients were asked to evaluate their pain and comfort using a 10 point visual analogue pain (VAS) score and a similar 10 point comfort scale at intervals of 5, 10, 20, 30, 45, 60, 90, 120 and 150 minutes. The patient's nurse and significant other were also asked to rate the patient's pain on a 10-point VAS score at identical intervals. Patients were not given any other pain medications until they requested additional pain relief. Each pair was compared using pair-t-test. A P value of less than 0.05 was considered significant.

Results: Data including mean and standard deviation are given in table 1a, comparison of different assessments of pain and comfort with corresponding P values in 1b.

Conclusion: Comparison of the various groups demonstrated no significant difference between maternal perception of pain and of comfort, nor between maternal and significant other's rating of maternal pain. There was, however, a statistically significant difference between maternal self-assessment of comfort and obstetric nurses' assessments of maternal pain. A significant underestimation by the nurse of maternal discomfort in such a small sample suggests that this is a real factor. If so, it may help to explain the superiority of PCEA over the traditional method of intermittent bolus injections.

table 1a/1b

Patient's Pain Self-Assessment	Patient's Comfort Self-Assessment	Significant Other's Pain Assessment	Nurse's Pain Assessment
0.98+/-1.16	1.27+/-1.27	1.22+/-0.93	0.87+/-0.75
Patient's Pain Versus Patient's Comfort	Patient's Pain Versus Significant Other's Pain Assessment	Patient's Comfort Versus Nurse's Pain Assessment	Significant Other's Pain Assessment Versus Nurse's Pain Assessment
P=0.109	P=0.336	P=0.03	P=0.112

**SOAP A32
HEALTH PROVIDERS' PERCEPTIONS OF PARTURIENT EXPERIENCES RELATED TO NEURAXIAL LABOUR ANALGESIA**

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Introduction: We report the second of 4 sequential studies done to explore the meaning of "quality" neuraxial labor analgesia (NLA) and to confirm the scales required to measure it. These studies represent initial steps in developing the Quality of Labor Analgesia (QLA) Index, a multi-attribute health index for use in research. The present study examined health providers' perceptions of parturient experiences related to NLA and follows previous (unpublished) work with parturients (focus groups/in-depth interviews) examining similar issues. The information derived from health care providers will be used in a third study involving parturients to further explore and define "quality" NLA within the broader context of a "quality labor experience." This iterative triangulated research design will ensure the content validity of the QLA Index and place measurement of quality NLA within a theoretical framework.

Methods: A semi-structured questionnaire was distributed to intra-partum health care providers in 4 hospital (2 teaching and 2 community) study sites. Providers were surveyed regarding their perceptions of parturients' concerns/experiences related to NLA. Questions were asked related to perceived parturient concerns regarding NLA; what they believed parturients liked/disliked about NLA (once established); what side-effects were believed to be most bothersome to parturients; and what providers believed had to be measured to capture "quality" NLA.

Results: 183 questionnaires were returned. Respondents included anesthesiologists (46); obstetricians (35); family practitioners(19); labor nurses (78); midwives (4); doulas(1). Epidural insertion pain was thought most important to parturients by anesthesiology (22/33), nursing (20/69), family practice (5/15). Obstetricians viewed back pain as most important (10/29) followed by insertion pain (8/29). Midwives (n=2) ranked insertion pain and failure equally worrisome to parturients and doulas (n=1) viewed nerve damage as most important. Health providers (127/138), regardless of occupation, ranked pain relief as the most liked feature of epidurals. Overall, heavy legs (57/122), itching (20/122), numbness (17/122), breakthrough pain (7/122) and lack of "control" (5/122) were the most frequently ranked concerns thought important to parturients.

Discussion: Most health research has been driven by health providers' perceptions of, rather than an understanding of what is important to patients. While providers' perceptions of parturient experiences were consistent with other providers, their views differed somewhat from those of parturients voiced in previous work. This latter work suggested that most women without a history of NLA are most concerned about paralysis, nerve injury and backpain prior to NLA. Once NLA was established, women viewed pain relief as the most important component of quality with control of breakthrough pain viewed as more important than common side-effects. Parturients viewed quality NLA as complete continuous pain relief with minimal, side-effects providing more self control and preservation of physical signals related to labor progress. Heavy legs, numbness, itching and inability to urinate were common concerns voiced by parturients which detracted from quality NLA. These differences will be explored in future work.

POSTER REVIEW 1

SOAP A33

IDENTIFYING MAJOR COMPONENTS OF QUALITY NEURAXIAL ANALGESIA

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Introduction: Labour analgesia research is limited by a fragmented approach to outcome measurement which does not permit meaningful discrimination between modern drug regimens/techniques. A global quality measure of analgesia is likely to provide this level of discrimination. Valid instrument development must be guided by knowledge of parturient perceptions of "quality neuraxial analgesia" (QNA). We report preliminary research examining these issues as part of development of the Quality of Labor Analgesia (QLA) Index, a multi-attribute health index designed to measure neuraxial labor analgesia in research. This work provides the first crucial step in developing the QLA.

Methods: Qualitative descriptive methods were used to explore parturient experiences of neuraxial analgesia. After REB approval, a purposeful sample of English-speaking parturients of mixed parity, racial, socioeconomic status and delivery mode who received neuraxial analgesia was recruited from 3 urban (1 teaching, 2 community) hospitals with a combined delivery rate of >10,000/year and a range of neuraxial analgesia practice including PCEA. Focus groups/in-depth interviews were held in hospital ≤72 hours of delivery using semi-structured interviews. Parturients were asked key questions with further iterative exploration until response saturation was achieved. Transcripts were independently coded by 2 researchers and inter-rater reliability was established. Thematic content analysis was performed to identify emergent themes related to QNA.

Results: 27 parturients were interviewed. Emergent themes related to pain, control and fear. Labour pain decreased perceptions of control which was restored when "QNA" was achieved. Women feared both pain, factors associated with epidural insertion and analgesia side-effects. Ideal QNA was defined as safe, complete continuous pain relief, rapid in onset, with complete absence of side-effects. Dissatisfaction was associated with breakthrough pain (most highly ranked source of dissatisfaction), loss of control associated with motor block or numbness and inability to feel the urge to push or contractions. The latter led to fear related to loss of bodily indicators of labour progress and diminished participation in the birth. Dissatisfaction with other side-effects included pruritus and inability to urinate.

Discussion: Preliminary work suggests that the major component scales required to measure QNA must include: pain/pain relief, control, movement, numbness, itching, and ability to urinate.

SOAP A34

EXPLORING LABOUR PAIN MEASUREMENT

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Introduction: Labour pain (LP) measurement in neuraxial analgesia (NA) trials currently treats LP as if it were a single discrete pain form. Failure to account for the true nature of LP and variability in pain patterns leads to information loss. We report preliminary findings related to LP in parturients with and without NA. This information represents the first step in developing the Labour Pain Scale, the first major scale of the Quality of Labour Analgesia (QLA) Index.

Methods: Qualitative descriptive methods were used to explore LP. After REB approval, a purposeful sample of native English speaking parturients of mixed parity, racial, socioeconomic status and delivery mode (with and without NA during labour) was recruited from 3 urban (1 teaching, 2 community) hospitals with a combined delivery rate of >10,000/year. In-depth interviews were held in hospital using semi-structured interviews. Women without any form of analgesia were interviewed ≤ 24hrs after delivery. Parturients receiving NA were interviewed ≤ 24hrs postpartum or (when possible) using a 2 stage interview process (during labour after NA followed by a second interview ≤12 hours postpartum). Parturients were asked to colour pain patterns on 4 anatomic diagrams (depicting relevant anatomy) for each of 4 labour stages and to designate relevant pain descriptors (provided on the pain picture) for each pain type. Pain was ranked (least to worst intense) by location for each stage.

Results: 31 parturients were recruited (10 had no analgesia of any form, 21 had NA.). Pain was most easily described by location (uterine; back pain; vaginal, rectal pressure ± nerve pains) rather than pain descriptors. Common qualitative pain descriptors for each location were identified. Locations varied over time and were variably present between parturients. Patients were readily able to rank pain severity by location at each. Some pain forms were constantly present (eg back pain; rectal pressure) in some parturients. Prominent patterns varied with eventual mode of delivery.

Discussion: "Labour pain" consists of multiple pain forms which are variably present in location and severity over time, vary in occurrence between parturients and are readily characterized by location. Meaningful labour pain measurement must address these findings.

Reference: *Pain*, 1 (1975)277-299.

POSTER REVIEW 1

SOAP A35

FEASIBILITY STUDY EXAMINING THE USE OF 19G EPIDURAL NEEDLES AND 23G EPIDURAL CATHETERS FOR LABOR ANALGESIA

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Introduction: In vitro and clinical research suggests that use of a 20g epidural needle is associated with a large reduction in cerebrospinal fluid leak and postdural puncture headache (PDPH) respectively. We report initial findings from a prospective observational study examining the feasibility of using a 19g Tuohy needle and 23g 3port closed-end epidural catheter for labor analgesia.

Methods: Healthy ASA 1-2 parturients with uncomplicated pregnancies (<6cm cervical dilatation, singleton pregnancies, 37-42weeks gestational age) were recruited. A 19g Tuohy needle (Pajunk, Germany) was used to insert a 23g 3port closed-end 90cm epidural catheter (Pajunk, Germany) into the epidural space using loss of resistance to air or saline. After insertion, the catheter was tested with lidocaine 1.5% (3ml), the block initiated with bupivacaine 0.08% and fentanyl 2mcg/ml solution (15-20ml) followed by PCEA using a Graseby 3300 pump (bolus 5-9ml; bolus duration 4min; lockout 10minutes; infusion 5-12ml/hr). A protocol was followed for block assessment, determination of block failure and treatment of breakthrough pain. The primary outcome was the combined failure rate (failure of insertion or failed block within the first 30 minutes of initiation) of epidural catheter placement. Secondary outcomes included: incidence of catheter failure requiring replacement/alternative technique, pump occlusion (>1event), recognized dural puncture, incidence of PDPH (determined by telephone interview between days 14-21), parturient analgesia ratings during first/second stage labor (numeric rating scale 0-10), overall analgesia (none to excellent), complications associated with catheter and needle placement, and staff satisfaction with the needle and catheter (non-graduated 10cm VAS). The target study sample size is 30 participants (customary for feasibility studies).

Results: Five parturients (3 primiparous/2 multiparous) have been recruited to date. Four women had spontaneous vaginal deliveries; one was delivered by low forceps. There were no episodes of failed insertion or failed block within 30minutes of insertion (combined primary outcome). User satisfaction ratings with the 19g Tuohy needle and 23g catheter were 9.7 ± 0.19 and 9.1 ± 0.15 respectively. There were no recognized dural punctures. Four parturients rated their overall analgesia as excellent; one rated it as very good. None of the catheters had to be replaced during labor or delivery however pump occlusion related to catheter kinking was noted in 2/5 parturients that was resolved by retaping and/or cutting the catheter with sterile scissors. Methods used to prevent kinking have included sterile placement of the end of the in situ catheter through a sterile stent and use of a shorter epidural catheter.

Discussion: The incidence of dural puncture (DP) during epidural insertion varies widely. Use of a smaller epidural needle, if not associated with an increase in DP rate, should reduce both PDPH incidence and severity. It is possible to use a 23g epidural catheter for labor analgesia. Efforts to prevent catheter kinking warrant further exploration.

SOAP A36

IN VITRO VALIDATION OF 23G EPIDURAL CATHETER PERFORMANCE USING STANDARD INFUSION PUMP APPARATUS

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Introduction: Postdural puncture headache (PDPH) is a common complication of inadvertent dural puncture in parturients but cadaver studies suggest that the volume of CSF leakage and hence the incidence and severity of PDPH may be reduced by using smaller epidural needles (> 18g). Recently, a 23g catheter designed for use with a 19g epidural needle has become available for use in Canada. The purpose of the current study was to compare the *in vitro* performance of this catheter with the standard 20g catheter currently available in our unit using standard infusion pump apparatus.

Methods: We chose at random ten 23g (Pajunk, Germany) and ten 20g (Portex, Keene NH) closed end triple-port epidural catheters for performance testing. The patency of the holes in each catheter tip was confirmed with N saline prior to experimentation. Each primed epidural catheter was connected to a syringe containing 50-ml of N saline and seated in a Graseby (Watford, UK) 3300 PCEA pump. The epidural catheter tip was submerged 20cm below the meniscus of an inverted 1L bag of N saline which was held level with the pump. The pump was configured to deliver a 5-ml bolus of solution. Following bolus actuation, the minimum duration of time over which the bolus could be administered without pump occlusion was determined. A second 5-ml bolus was then actuated with the catheter tip sitting in the barrel of a 10-ml syringe and the volume of solution contained in the syringe recorded. The above procedures were then repeated using a 9-ml bolus of solution.

Results: The differences between programmed and delivered boluses ranged from 0.5-1.0 ml for both types of catheters for each programmed bolus. 2-way RANOVA examining the differences in volume of delivery between 23g and 20g catheters did not reach statistical significance for 5-ml ($p=0.10$) or 9-ml ($p=0.55$). The minimum median (range) duration of time over which the 5-ml and 9-ml boluses could be administered without pump occlusion via the 23g catheter were 2 (1.5-4.0) and 3 (1.5-5.0) minutes respectively. All boluses administered via the 20g catheter were completed without pump occlusion in 1.5 minutes.

Discussion: In this experiment, we have demonstrated the suitability of a 23g epidural catheter for use in one type of PCEA pump commonly found in the labour ward. Although the time taken to satisfactorily deliver a pre-programmed bolus of solution was longer with a 23g catheter compared with a 20g catheter, the actual volume of solution delivered by each catheter upon demand was similar. Further studies require to be undertaken *in vivo* to determine whether delayed epidural bolus delivery when using 23g catheters has a clinically significant impact upon the quality of labour analgesia provided.

POSTER REVIEW 1

SOAP A37

PREVENTION OF PRURITUS FOLLOWING NEURAXIAL OPIOID ANALGESIA FOR CESAREAN SECTION: A SYSTEMATIC REVIEW

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Introduction: Neuraxial opioid analgesic drugs are widely used to provide pain relief following Cesarean section (CS) but their use can cause troublesome pruritus which may limit their beneficial effects. The purpose of this systematic review was to investigate the effective prevention of pruritus in this clinical setting.

Methods: The authors independently searched for articles reporting the administration of drugs designed to prevent pruritus among women receiving neuraxial morphine or diamorphine for post-CS analgesia. A decrease in the incidence or severity (as measured by VAS or VRS) of pruritus post-operatively was used to indicate a successful outcome. The search strategy included the use of electronic databases without language restriction [Medline 1966-2003, Embase 1980-2003, Cochrane Central Register of Controlled Trials and Database of Abstracts of Reviews of Effectiveness (including the following key words: pruritus, itch, morphine, diamorphine, spinal and epidural)] and a hand search of the major anesthetic journals from the last five years. Abstracts from major scientific meetings including ASA, IARS, SOAP and CAS (1998-2003) and the reference lists of retrieved articles were searched. The last search was conducted in October 2003. Review articles and letters were not included for analysis. Only randomized clinical trials (RCTs) and abstracts of RCTs meeting relevance and quality (≥ 3 points on the Jadad scale [1]) criteria were analyzed.

Results: In total we retrieved 34 RCTs, 12 abstracts, 6 reviews and 8 letters following our preliminary search. There were 17 RCTs and 2 abstracts that met the criteria for relevance and quality. There were no articles meeting the relevance and quality criteria that described the use of neuraxial diamorphine. Drugs reported to be effective, compared with placebo in preventing pruritus attributed to neuraxial morphine included; oral naltrexone 6-12.5 mg (4 articles), iv ondansetron 4-8 mg (2 articles), iv alzipride 50 mg (1 article) and iv hydroxyzine 50 mg (1 article). Drugs reported to be ineffective, compared with placebo included; iv propofol 10 mg (1 article) and iv nalmeferene 0.25-0.5 mcg/kg (2 articles). Drugs reported in separate studies to be both effective and ineffective compared with placebo included; iv nalbuphine 4-20 mg (3 articles), iv naloxone infusion (4 articles) and both iv (2.5 mg) and epidural (1.25-5 mg) droperidol (4 articles).

Discussion: This review highlights the wide variety of pharmacological agents that may be used to minimize post-CS pruritus following neuraxial opioid administration. No one agent can reliably claim to abolish this symptom completely. This fact must be considered when contemplating the use of opioid antagonists that may potentially reverse the beneficial effects of opioid analgesia.

References:

[1] Controlled Clinical Trials 1996; 17: 1-12.

SOAP A38

IS NITROUS OXIDE AN EFFECTIVE ANALGESIC FOR LABOR? A SYSTEMATIC REVIEW

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INTRODUCTION: A qualitative systematic review was conducted to assess the efficacy of nitrous oxide for labor analgesia. While nitrous oxide is inexpensive, easy to administer, and well tolerated by mothers with minimal effect on uterine tone and fetus, detractors argue that it provides little analgesic benefit over inhaled oxygen/air. However, it remains in widespread use where neuraxial analgesic techniques are not available or affordable or where minimal intervention for analgesia in labor is desired.

METHODS: Randomized controlled trials of nitrous oxide for labor pain relief were sought. Electronic search strategies were used to identify eligible studies in MEDLINE (1966-2003), EMBASE, (1980 - 2003), Cochrane Central Registry of Clinical Control Trials 2003 and Cochrane Data Base of Systematic Reviews 2003. Hand searches were conducted of text-books of anesthesia texts published prior to 1985 and published abstracts from January 1998 to September 2003 of meetings of the ASA, IARS and SOAP. Included were full journal publications of any randomized controlled trial evaluating nitrous oxide analgesia for labor. Each study was assigned a quality score using the Jadad scale.

RESULTS: Seventeen randomized controlled trials were identified. Six trials compared nitrous oxide to either oxygen or air. Two trials compared different concentrations of nitrous oxide. Nine trials compared nitrous oxide to other inhalational agents. Quality scores ranged from one to five with the majority of trials receiving a score of two. The study designs of randomized controlled trials differed in mode and timing of nitrous oxide administration, duration of use and stage of labor, as well as measurement of analgesic efficacy. Numbers ranged from 17 to 1300 subjects. The majority of studies used a concentration of 50% nitrous oxide.

DISCUSSION: Most of the randomized controlled trials found that laboring women receiving nitrous oxide for analgesia obtained some measure of pain relief. Most studies did not obtain a high quality score. The design of several raised questions of validity of results. Further well designed clinical studies are required to investigate factors that can optimize efficacy of nitrous oxide use in labor.

Control Clin. Trials 17:1-12

POSTER REVIEW 1

SOAP A39

DETERMINATION OF THE EFFECTIVE DOSE OF REMIFENTANIL FOR PATIENT-CONTROLLED ANALGESIA IN LABOUR: A PILOT STUDY

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Introduction: Remifentanyl administered via an intravenous patient-controlled analgesia (IV-PCA) system has been used with success in a select number of parturients in labour¹, and when epidural analgesia was contraindicated². To date only a small number of trials using remifentanyl for labour analgesia have been published. The literature has not defined the most effective IV-PCA dose of remifentanyl for labour analgesia³. It seems appropriate to identify an appropriate weight-based dose of remifentanyl for use in an IV-PCA system. This pilot study was designed to determine the remifentanyl dose that would provide labour analgesia.

Methods: With ethics approval, 60 ASA I/II consenting, labouring, multiparous women will be randomly allocated, in a double-blind procedure, to receive one of three IV-PCA doses of remifentanyl (0.3 µg/kg, 0.4µg/kg or 0.5µg/kg) with the dose calculated using pre-pregnant weight. The remifentanyl is diluted to the respective concentration in 500 mls normal saline by Pharmacy and administered through a Baxter IPump, connected to an in-line anti-syphon valve with a normal saline infusion. The Baxter IPump is programmed to give a weight-based dose on demand with a lockout time of two minutes. Clinical observations (VAS pain score [0-10 cm], cervical dilatation, NIBP, HR, respiratory rate, SpO₂, sedation score, presence of nausea/vomiting and pruritus score) are recorded every 15 minutes for the initial hour and then hourly. Subject indications for removal from the study are defined as patient request, inability to obtain adequate analgesia in the initial 60 minutes of the study, hypotension (mean BP < 70 mmHg), bradycardia (heart rate < 60 bpm), RR < 8 breaths per minute, SpO₂ < 96% with supplemental oxygen, excessive sedation (not rouseable by command), failure to respond to medication to treat nausea/vomiting or pruritis or any obstetric indication for urgent delivery. The primary outcome is effectiveness of analgesia (a reduction of 3 cm or greater in the VAS pain score) with statistical analysis of the differences in VAS scores compared at the same cervical dilatation. Comparisons will be made of the incidence of desaturation < 96%, excessive sedation, nausea or vomiting, pruritus and the frequency of delivered and requested IV-PCA doses, neonatal Apgar scores and maternal satisfaction scores. Sample size calculation has been performed to enable detection of a significant difference in VAS scores.

Results: As the study is ongoing preliminary statistical analysis has not yet been performed to enable completion without breaking the randomisation code.

Discussion: The purpose of this pilot study is to determine an effective bolus dose of remifentanyl delivered via an IV-PCA system for relief of labour pain in multiparous women with minimal side effects.

References: ¹ British Journal of Anaesthesia 2001; 87(3) : 415-420. ²Anesthesia and Analgesia 2002; 94: 918-9. ³Clinical Pharmacokinetics Aug 1995; 29(2):80-94.

SOAP A40

COMPARING THE PAIN REPORTED BY TWO LOCAL ANESTHETIC INFILTRATION TECHNIQUES WITH EPIDURAL PLACEMENT IN PARTURIENTS: WHEEL VS. DART

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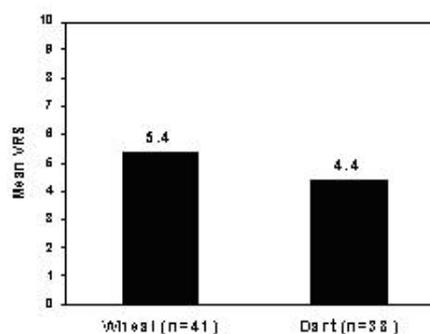
Introduction: The steps required to produce effective epidural anesthesia are not innocuous. Although local anesthetic (LA) infiltration is not "the worst part" of the procedure it does cause pain.¹ One mechanism proposed to cause some of this pain is mechanical shearing of the dermal layers from raising a skin wheal. In this study we evaluated if there was a difference in the reported pain associated with two common techniques for LA infiltration ("wheal" and "dart").

Methods: This randomized, prospective study was approved by our institution's IRB. After providing informed consent, laboring women received an elective epidural using a PERIFIX custom epidural anesthesia tray (product code CESK). A 3 cc volume of 1.5% lidocaine with 1:200,000 epinephrine (at room temperature) was infused with a 25 Ga. x 5/8 inch needle. Infiltration lasted five seconds and was performed according to the patient's randomization to the dart or wheal group. The dart technique was performed by first inserting the infiltrating needle to the hub and then injecting LA as the needle was withdrawn to the skin, ending by raising a subcutaneous wheal. The wheal technique was performed by first raising a subcutaneous wheal followed by deeper infiltration down to the hub. Data collected from both groups included verbal response scores (VRS whole number scale 0 to 10) during LA infiltration along with patient height, weight, race, cervical dilation, and anesthesia provider experience.

Results: A total of 79 patients were enrolled: 41 in the wheal group and 38 in the dart group. The results show a mean VRS of 5.4 (SD 2.85) for the wheal technique, 4.4 (SD 2.85) for the dart technique, and a mean difference of 0.97 [95% CI -0.29]. Based on these data, it appears that the pain produced by LA infiltration is not dependent upon the method of drug administration. Lowering the VRS for LA infiltration is the focus of ongoing research.

Reference: 1. Evaluating the Pain of Epidural Placement in Parturients. Anesthesiology 2003;98 (Supp 1): A117

Mean VRS Scores for Local Anesthetic Infiltration by Wheal and Dart Techniques



Local Anesthetic Infiltration Technique, P=0.067

POSTER REVIEW 1

SOAP A41
A COMPARISON OF ULTRASOUND IMAGING VS. CONVENTIONAL LANDMARKING TO IDENTIFY THE L3-4 INTERSPACE IN TERM PARTURIENTS

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Introduction: In 2000 Broadbent¹ demonstrated that anesthetists' ability to correctly identify a marked lumbar interspace by palpation of bony landmarks was unreliable when compared to MRI imaging. Correct identification occurred in only 29% of cases, with the actual interspace being higher than assumed in 68%. Diagnostic imaging such as plain radiography, CT scan, and MRI can be used to identify a particular interspace, but they are clinically impractical. Previous studies have utilized bedside ultrasonography for identification of the epidural space, and also documented that ultrasound can easily identify bony landmarks such as spinous and transverse processes². The purpose of our study was to determine if conventional landmarking reliably identifies the L3-4 interspace when compared to ultrasound identification, with emphasis on term obstetrical patients.

Methods: After obtaining ethics approval and informed consent, we studied 43 women with term pregnancies. Attending anesthetists marked the L3-4 interspace with a pen after identifying it by palpation of iliac crests and spinous processes. An independent person used ultrasound to identify the T12 spinous process and count downward to determine the actual level of the previously marked interspace. Confirmation was made by using ultrasound to count the spinous process echoes from the sacrum upward. Time was recorded. The results of the palpation method were expressed as a percentage of the results by ultrasound.

Results: Anesthetists correctly identified the L3-4 interspace by palpation in 21/43 patients (49%) compared to ultrasound identification. Of the 22/43 (51%) incorrectly identified occurrences, 18/22 (82%) were marked one level higher than L3-4, 1/22 (4.5%) were 2 levels higher, and 3/22 (13.5%) were one level lower. The average ultrasound time was 3.5 minutes. Analysis by logistic regression showed no significant correlation between identification and the variables of patient BMI, gestation, birth weight, or marking anesthetist.

Discussion: In conclusion, this study demonstrates that anesthetists cannot accurately locate L3-4 in term obstetrical patients by palpation of bony landmarks when compared to ultrasound identification; the majority err one space higher. Several case reports document damage to the conus medullaris following spinal anesthesia in obstetric patients³. The combination of anesthetists' tendency to place neuraxial blocks at higher than desired interspaces, possibility for a low lying conus medullaris (below L1 in 19%¹), and interpatient variability of Tuffier's Line as a landmark (L3-4 to L5-S1)⁴ can lead to intrathecal needles passing close to the spinal cord. If in doubt, anesthetists should place intrathecal blocks one space lower. Ultrasound is not only more reliable than palpation to locate L3-4, but is also time-efficient, practical and a readily available tool in the obstetrical suite.

References:

1. Anesthesia 2000; 55 (1122-1126)
2. Regional Anesthesia and Pain Medicine 2001; 26 (64-67)
3. Anesthesia 2001; 56 (238-247)
4. Anesthesia and Analgesia 1994; 78(194)

SOAP A42
EPIDURAL NEOSTIGMINE WITH CLONIDINE TO INITIATE LABOR ANALGESIA

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Introduction : Epidural α 2-adrenergic agonist Clonidine (C) is analgesic and produces local anesthetic sparing effect during labor (1). Epidural cholinesterase inhibitor Neostigmine (N) also provides effective pain relief at the beginning of labor (2). Further, epidural C potentiates N analgesia in human volunteers (3). The study evaluates the analgesic efficacy of epidural C and N combination in early labor.

Methods: After informed consent, at the beginning of labor (cervical dilatation 2-5 cm), a lumbar epidural catheter was inserted at L3-L4 level in healthy parturients. When VAS (value 0-100) was ≥ 30 , after a test dose, they were randomly allocated to receive: C 150 μ g (C150; n=13), N 750 μ g (N750; n=13) or C75 μ g combined with N250 μ g (C75N250; n=13), N500 μ g (C75N500; n=18) or N750 μ g (C75N750; n=20) in a total volume of 12 mL. Pain score (VAS 0-100) at 5, 10, 20 and 30 min, time until request for a supplemental epidural injection and Ropivacaine (Ropi) use throughout labor were assessed. Maternal and fetal vital parameters and side effects were also recorded. Statistical analysis used ANOVA; p<0.05 was significant.

Results: Parturients did not differ concerning demographic data and initial VAS. Analgesia efficiency (AE)= % parturients with VAS < 30/100 at 5, 10, 20 and 30 min post injection, duration (D) of analgesia (mean \pm SD), subsequent Ropi use (mean \pm SD) are expressed in Table. Fetal parameters remained stable. Sedation and hypotension occurred in group Clonidine 150 μ g.

	C150	N750	C75N250	C75N500	C75N750
AE 5	25%	62.5%	37.5%	38.9%	64%
AE 10	42.8%	83.3%	46%	47%	78%
AE 20	50%	62.5%	46%	72.2%	84%
AE 30	57%	50%	50%	72.2%	84%
Duration (min)	54 \pm 29*	53 \pm 23*	63 \pm 47*	103 \pm 38	106 \pm 48
Ropi use (mg/h)	9.9 \pm 3.5	16 \pm 2.9#	10.4 \pm 1.2	10.2 \pm 2.7	9.3 \pm 3.6

(*) p<0.05 with C75N750; (#) p<0.01 with other groups

Discussion: Epidural C150 μ g does not reach satisfactory level of analgesia and induces maternal unwanted side effects. N750 μ g provides short-lasting analgesia. Epidural combination of C75 μ g with N500 μ g, or better N750 μ g, is effective to initiate epidural analgesia without side effects. In contrast with C, epidural N is devoid of Ropivacaine sparing effect.

References: (1) Landau R et al. Anesth Analg 2002 ; 95 : 728-34 (2) Roelants F et al. Anesthesiology, in press (3) Hood D et al. Anesthesiology 1996;85:315-25.

POSTER REVIEW 1

SOAP A43

DOES HIGH EPIDURAL INFUSION RATE INCREASE THE INCIDENCE OF C-SECTIONK. Chaudhuri, J. Solis-Estrada, P. Heller, S. Chaudhuri
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Introduction: Epidural analgesia for labor pain has been reported to increase the need for C-section due to dystocia (1,2). Although several studies (3) have refuted this concern, the influence of higher doses of local anesthetics on C-Section rate has not been studied before. The objective of this retrospective study was to determine whether the rate of epidural infusion increases the incidence of C-Section.

Methods: An extensive chart review was conducted of all parturients who received labor epidural analgesia in 1999. Ropivacaine(0.2%) was utilized in all cases, and the mean epidural rate ranged between 8 ml/hr and 20 ml/hr. Based on gravid status and mean epidural infusion rate, patients were divided into the following groups: Group I - Primigravida: 8 to 12.9 ml/hr, Group II - Primigravida: >13 ml/hr, Group III - Multigravida: 8 to 12.9 ml/hr, Group IV - Multigravida: >13 ml/hr.

Results:**Table 1. Demographic Characteristics**

Variables	Mean	Std. Deviation
Age	23.1	5.7
Weight (kg)	77.9	14.9
Height (m)	1.6	0.1
BMI (w/m ²)	30.9	5.6
Gravida	2	1
Cervical dilatation @ presentation	3	1

The total number of patients in this study was 1332. Incidence of C-Section in the different groups was as follows:

Gravida	Mean epidural infusion rate 8 - 12 ml/hr	infusion rate ≥ 13 ml/hr	p value
Primigravida	(131/613)	(22/54)	< 0.01
Multigravida	(99/601)	(13/64)	> 0.05

Statistical analysis of the above data demonstrated a significantly higher incidence of C-Section among primigravida patients with the higher mean epidural rate, when compared to those at the lower infusion rate. Among the multigravida patients, however, there was no significant difference in the rates of C-Section between the two groups.

Discussion: This study indicated that when primigravida patients were maintained on a higher epidural infusion rate (higher than the usual 10-12 ml/hr), they was a significantly higher incidence of operative delivery. To the best of our knowledge, this is one of the first studies that has demonstrated a positive correlation between a high epidural infusion rate and the incidence of C-Section among parturients.

References: 1. Am J Ob Gyn 1989. 2. Am J Ob Gyn 1993. 3. Am J Ob Gyn 2001.

SOAP A44

COMPARISON OF EPIDURAL AND COMBINED SPINAL-EPIDURAL ANALGESIA FOLLOWED BY PATIENT CONTROLLED EPIDURAL ANALGESIA DURING LABORO. A. Sezer, B. Gunaydin
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Introduction: The aim of the present study is to compare the effects of epidural and combined spinal-epidural analgesia techniques followed by patient controlled epidural analgesia (PCEA) on hemodynamics, cervical dilatation rate, duration of labor, first analgesic requirement, type of delivery, side effects, and patient satisfaction.

Methods: 40 ASA I nulliparous women at term having cervical dilatation less than 6 cm were allocated into two groups to perform either epidural analgesia (EA) or combined spinal-epidural analgesia (CSEA) for pain relief in labor. Heart rate (HR), mean arterial pressure (MAP) and peripheral oxygen saturation (SpO₂) were monitored and recorded. EA and CSEA were performed with loss of resistance and needle through needle techniques, respectively at the sitting position between L_{2,3} or L_{3,4} interspaces. After onset of active labor, 7 mL 0.1% bupivacaine with 50µg fentanyl in group EA and 20 µg intrathecal fentanyl in group CSEA were administered for the induction of labor analgesia. In both groups, analgesia was maintained by PCEA which was adjusted to 5 mL bolus with a 10-minute lock out interval and a 15 mL per hour limit including 0.1% bupivacaine and 2 µg mL⁻¹ fentanyl. Parturients were told to assess their pain according to a 10 point visual analogue scale (VAS) (0= no pain and 10=worst pain) and to push the demand button of PCEA in case of having VAS>3.

Results: MAP did not show a significant change within both groups. In group CSEA, MAP measured at the 30th minute was significantly lower with respect to group EA. In group EA, HR did not show a significant change during the study but HR measured between 5th to 45th minutes showed a significant increase with respect to group CSEA. In group CSEA HR measured only at the time of delivery was significantly higher than the baseline value. SpO₂ remained within normal limits in both groups.

	Group EA (n=20)	Group CSEA (n=20)
Cervical dilatation (cm hr ⁻¹)	2.26±1.27	2.37±0.94
Duration of labor (min)	270.19±73.21	299.69±138.21
First analgesic requirement (min)	108.4±23.2	89.2±33.7*
Time to VAS < 3 (min)	9.5±4.26	5.26±1.15*
Total bupivacaine dose (mg)	38.9±16.4	27.5±15.7
Total fentanyl dose (µg)	114.4±34.1	72.5±33.4*
Cesarean section rate (n)	4/20	4/20
Pruritus incidence (n)	0/0	12/20 **
High patient satisfaction (n)	20/20	20/20

*:P<0.05 and **:P<0.001 (between the groups)

Discussion: We showed that both EA and CSEA techniques followed by PCEA provided adequate pain relief for labor without significant changes in cervical dilatation, duration of labor and incidence of cesarean section. Although early first analgesic requirement and onset of analgesia with lower fentanyl consumption were observed in group CSEA, pruritus was more common but not leading to low patient satisfaction.

POSTER REVIEW 1

SOAP A45
INTRATHECAL MORPHINE REDUCES
BREAKTHROUGH PAIN DURING LABOR EPIDURAL
ANALGESIA

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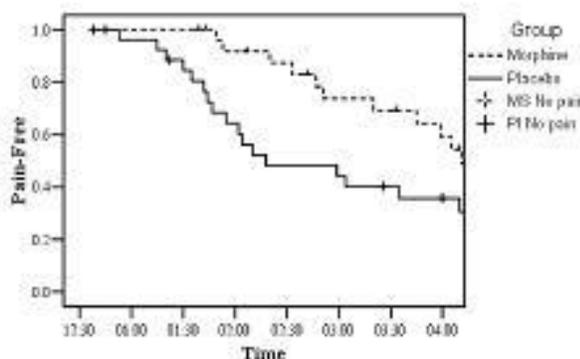
Introduction: Breakthrough pain is common during labor epidural analgesia. We assessed the effect of low dose intrathecal morphine as an adjunct to an ultra low-dose labor epidural solution for the prevention of breakthrough pain.

Method: This was a placebo controlled, prospective, randomized, double-blind study, approved by the IRB. Healthy parturients in active labor (<7 cm dilation) received a Combined Spinal-Epidural (CSE) with bupivacaine 0.2% and fentanyl 12.5mcgs. The morphine group (MS) also received 100mcgs(0.2cc's) of preservative free morphine, and the placebo group (PLCB) received 0.2cc's of saline. After negative test dose, the epidural infusion commenced at 15ccs/hr (bupivacaine 0.04%, fentanyl 1.66mcgs/cc and epinephrine 1.66mcgs/cc). Treatment of breakthrough pain (BTP) was strictly standardized; each episode of BTP was treated with 8ccs of bupivacaine 0.125% and fentanyl 100mcgs. If this did not relieve pain by 15 minutes, 10ccs of bupivacaine 0.125% was administered at 15-minute intervals. On third episode of BTP, the concentration of the epidural infusion would be increased to bupivacaine 0.8% and fentanyl 1.66 mcgs and after the sixth episode, to bupivacaine 0.125% and fentanyl 3.33mcgs. NPS at 0, 5, 10, 15 minutes and post partum pain scores at 1 hr, and 24hrs were documented. Mode of delivery and side effects like vomiting, pruritus and respiratory depression were documented. Mann Whitney U test and chi-square test were used. p value of 0.05 was considered significant.

Results: Fifty-six patients were enrolled, 27 in morphine group 29 in placebo group. There was no statistical difference in the demographics, mode of delivery, and all pain scores. The incidence of breakthrough pain was significantly lower in the MS group than in the PLCB group (0.57+/-0.6 vs. 1.26+/-0.9, p=0.005). The Median time of pain-free analgesia was 4hr 11min(MS) and 2hr 18min(PLCB) which was significant by Log-Rank analysis p=0.02.

Conclusion: The results from this study suggest that low-dose intrathecal morphine significantly reduces breakthrough pain during ultra low-dose labor epidural analgesia. This result confirms a previous finding¹, and suggests a very effective method of pain control for women with excessive breakthrough pain.

Reference:1 Anesth.Analg.2003;97:247-252



SOAP A46
A COMPARISON OF BUTORPHANOL AND MEPERIDINE
FOR LABOR ANALGESIA

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Introduction: Intravenous opioids such as butorphanol and meperidine are frequently used to treat labor pain, yet controlled clinical trials question whether they reduce pain intensity^{1,2}. In spite of this negative evidence, intravenous opioids are commonly used to treat labor pain, suggesting they have benefit despite failure to demonstrate analgesia by traditional measures of pain (verbal analog pain scores). The purpose of the current study was to assess both dimensions of pain – sensation intensity and emotional impact³ - to determine the effectiveness of standard doses of butorphanol, meperidine, and their combination.

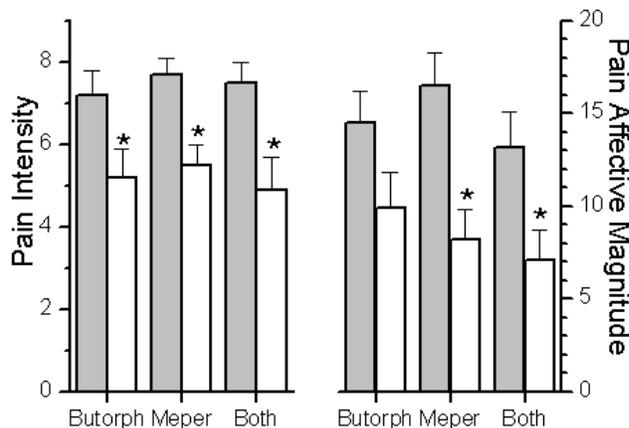
Methods: Forty five healthy pregnant women in labor were randomized to three groups of 15 parturients each. Group I received butorphanol 1mg, Group II received meperidine 50mg, and Group III received a combination of butorphanol 0.5mg plus meperidine 25mg. Two methods of pain assessment were used before and after administration of the study drug. First, a verbal analog scale (VAS) from 0 to 10 was used, and then the parturient was asked to choose from a list of affective descriptors³.

Results: Pain intensity based on VAS scores was reduced similarly in all three groups by approximately 30%. Affective pain magnitude was reduced in the meperidine and combination groups, but not in the butorphanol group. Combining the two drugs provided no benefit over meperidine alone.

Discussion: The intensity of labor pain can be reduced using meperidine, butorphanol, or their combination, but butorphanol does not lower the affective pain score. When treating labor pain, any of these three treatments could be considered effective, but meperidine has a greater impact on the emotional response to pain.

References:

- 1.Br J Obstet Gynaecol 1996 Oct;103(10):968-72.
- 2.Anaesthesia 1987 Jan;42(1):7-14.
- 3.Pain. 1978 Jun;5(1):5-18



POSTER REVIEW 1

**SOAP A47
NALMEFENE FOR OPIOID-INDUCED PRURITUS IN LABOR**

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Introduction: Pruritus occurs in up to 85% of labor patients who receive neuraxial opioids.(1) Naloxone, an opioid antagonist, is effective in treating side effects of neuraxial opioids, but is very short acting and usually requires a continuous intravenous infusion.(2) Nalmefene, on the other hand, is another pure opioid antagonist, but has a longer duration of action (12-15 hours). To our knowledge, no one has evaluated the use of nalmefene during labor. We are reporting an open-label pilot study of nalmefene for opioid-induced pruritus in labor.

Methods: After approval from our Human Investigation Committee, 20 labor epidural patients complaining of pruritus were prospectively enrolled and given nalmefene 100 mcg as an intravenous bolus in an open-label manner. A second 100 mcg bolus was offered after 30 min if pruritus persisted. Pre- and post-nalmefene pruritus was assessed using a treatment-based score: mild (pruritus without request for intervention), moderate (intervention requested), severe (unbearable pruritus), or none. Pain was assessed using a 10-cm visual analog scale (VAS) before and 30 minutes after intervention.

Results: Rate of overall improvement to mild or no pruritus was 80%. Complete resolution of pruritus occurred in 65% of patients within 30 min of nalmefene administration. Non-responders (20%) were given a second dose of nalmefene 100 mcg IV for severe pruritus, but none showed subsequent improvement. After treatment failure with nalmefene, half of the non-responders received naloxone infusions, completely aborting pruritus in each. Before and after nalmefene, all patients reported adequate labor analgesia (VAS < 4/10); and no analgesia regimen changes were required after nalmefene. None of the responders required additional pruritus treatment prior to delivery, and no side effects or adverse events occurred after nalmefene administration.

Discussion: Our results suggest that nalmefene is a safe and effective alternative to naloxone for opioid-induced pruritus during labor. Though nalmefene did not appear to antagonize analgesia in our small cohort, the study was not powered to detect small differences in analgesia. Regardless, nalmefene is easier to dose and administer than naloxone. Consequently, randomized, placebo-controlled trials are needed to further evaluate this drug during labor for opioid-related side effects.

References:

1. Baraka A, Noueihid R, Hajj R. Intrathecal injection of morphine for obstetric analgesia. *Anesthesiology*. 1981 Feb;54(2):136-40.
2. Kjellberg F, Tramer MR. Pharmacological control of opioid-induced pruritus: a quantitative systematic review of randomised trials. *Eur J Anaesthesiol*. 2001 Jun;18(6):346-57.

**SOAP A48
PATIENT-CONTROLLED EPIDURAL ANALGESIA (PCEA) DURING LABOR: A COMPARISON OF BASAL RATES**

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Introduction: PCEA reduces anesthetic consumption and anesthesiologist interventions.(1) Yet, the need and benefit of basal rates (BR) in PCEA regimens is controversial. Many studies have compared low BR's (3-5 cc/h) with no BR finding no difference in analgesia. These studies conclude BR's should be avoided, as they only increase side effects.(2) No one has evaluated high BR's, nor measured effects on anesthesiologist satisfaction. Our prospective, double blind trial compared BR's in labor PCEA.

Methods: After Ethics Committee approval, laboring patients randomly received PCEA regimens consisting of 1/8% bupivacaine and fentanyl 2 mcg/ml, and one of three BR's: 10, 4, or 0 ml/h. The other PCEA regimens were the same for all groups: 5 ml demand doses up to every 5 min with a 30 ml/hr maximum. When additional analgesia was requested, the blinded anesthesiologist administered 5 ml top-off boluses of 1/4% bupivacaine. Patients' and anesthesiologists' satisfaction scores (10-cm VAS), number of top-off's required, and side effects were recorded, including motor blockade (Bromage score). Student t-test and chi-square analyses were employed as appropriate.

Results: We have enrolled 24 patients (8/group). Patient and provider satisfaction were similar between groups. Number of top-off's required was also equal. Yet, both basal rate groups had more drug consumption than the no BR group. Pruritus was the most common side effect in all groups, with no differences between basal rate assignments. Little motor block occurred in this study, with no differences between groups. When short labors (<150 min) were excluded, results again remained similar except for hourly bupivacaine usage.

	Mean data; *P=NS; **P<0.03 for 0x4 and 0x10		
	0 ml/h	4 ml/h	10 ml/h
Patient satisfaction (%)	93.6	93.8	93.1
Provider satisfaction (%)	87.7*	82.5*	84.9*
Bupivacaine (mg/hour)	1.1**	3.0	2.4

Conclusion: Few differences were found between our BR groups. PCEA with no BR resulted in reduced drug consumption, but did not translate into reductions in side effects and motor weakness. However, our study was not powered to detect small differences in side effects. Regardless, higher BR's were not harmful, but they did not increase patient nor anesthesiologist satisfaction. Future studies should examine high-BR PCEA regimens with more dilute drugs to further reduce side effects.

References:

1. Van der Vyver M, Halpern S, Joseph G. Patient-controlled epidural analgesia versus continuous infusion for labour analgesia: a meta-analysis. *BJA* 2002;89:459-465.
2. Wong K, Chong J, Lo W, Sia A. A comparison of patient-controlled epidural analgesia following gynaecological surgery with and without a background infusion. *Anaesthesia* 2000;55:212-216.

POSTER REVIEW 1

SOAP A50

SUPRASTERNAL DOPPLER ESTIMATION OF CARDIAC OUTPUT FOLLOWING INTRAVENOUS FLUID PRELOADING FOR CESAREAN SECTION UNDER SPINAL ANESTHESIA

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Introduction: Hypotension may occur in up to 83%¹ of women during spinal anesthesia for cesarean section, despite different fluid preloading regimens. We used suprasternal measurements of various linear and volumetric Doppler indices, including maternal cardiac output (CO) and corrected flow time (FTc, a measure of intravascular volume) following three preload regimens, before and after spinal anesthesia.

Method: After ethics approval, 60 healthy term women awaiting elective cesarean section under spinal anesthesia were recruited for this randomized double blind study. Baseline HR, BP, CO & FTc were recorded in the left lateral tilt position before fluid preload, with one of three regimens, was given over 15 min: 1.5 L Hartmann's solution (CSL), 500 ml of 6% w/v Hydroxyethyl Starch solution (HES 0.5) or 1 L of 6% w/v HES solution (HES 1.0). Measurements were made after fluid loading every 5 min for 30 min. After 30 min, spinal anesthesia was induced with 12.5 mg hyperbaric bupivacain and 15µg fentanyl. Recordings continued every 5 min for 20 min or until surgery started. Hypotension incidence (20% reduction in systolic BP treated with 6 mg ephedrine boluses), ephedrine use & umbilical cord blood gases were also recorded. Statistical analyses included RAMANOVA, ANCOVA and Tukey-Kramer tests ($P < 0.05$).

Results: Patient data, HR, BP and cord gases were similar in groups. Although CO and FTc increased after preload in all groups ($P < 0.005$), this was only maintained with HES 1.0 following spinal anesthesia ($P < 0.005$). The hypotension incidence (%: 70 v 35 v 65; $P = 0.069$) and ephedrine use (mg: 10.4 v 5.7 v 9.7; $P = 0.26$) between CSL, HES 0.5 & 1.0 groups respectively were not statistically significant.

Group	Parameter	Baseline	Post preload	Post spinal
CSL (n=20)	CO (L/min)	4.3 (0.66)	5.5 (0.94)*	4.8 (0.71)
	FTc (ms)	340.3 (29.34)	383.6* (28.11)	349.0 (27.71)
HES 0.5 (n=20)	CO (L/min)	4.9 (0.79)	6.2 (1.16) [∇]	5.5(1.10)* ^{#∇}
	FTc (ms)	346.3 (39.43)	403.3 [∇] (42.71)	364.9 (42.8)
HES 1.0 (n=20)	CO (L/min)	4.9(0.62)	6.5(1.31) [∇]	6.1(1.41) [∇]
	FTc (ms)	348.3 (30.16)	409.5 [∇] (27.49)	383.4 ^{∇*} (31.47)

Data are mean (SD) for all recorded measures; $P < 0.05$ compared to baseline*, post preload[#] or CSL[∇]

Conclusion: Despite CO and FTc increases, following fluid preload, particularly with HES 1.0, hypotension still occurred. This could be due to the inability of these preload regimens to compensate for reductions in systemic vascular resistance after spinal anesthesia.

References: 1. Rout C, Rocke D. Prevention of hypotension following spinal anesthesia for cesarean section. Int Anesthesiol Clin 1994; 32:117-35

POSTER REVIEW 1

SOAP A51

PRELOADING VS. POSTLOADING OF COLLOID FOR THE PREVENTION OF HYPOTENSION AFTER SPINAL ANESTHESIA FOR CESAREAN SECTION

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Introduction: Hypotension is a significant problem associated with spinal anesthesia (SA) for cesarean section (CS). It has been shown that pre-loading with colloid decreases the incidence and severity of this hypotension.¹ Recent studies have predicted that fluid loading should be more efficacious if administered rapidly immediately after induction of the SA.^{2,3} This study was designed to compare pre- and post-loading of 6% hetastarch for the prevention of hypotension after SA for CS.

Methods: After IRB approval and informed consent were obtained, 46 healthy term parturients having elective CS were randomized into two groups, those receiving hetastarch prior to SA (pre-load, n=23), and those receiving hetastarch immediately after placement of SA (post-load, n=23). Pre-load subjects were given 500 ml of 6% hetastarch in the 30 minutes prior to arrival in the OR. Post-load subjects were given the same amount of hetastarch via a pressurized infusion immediately after SA. All subjects received SA with bupivacaine 12 mg, fentanyl 10 mcg, and morphine 200 mcg. The primary outcome was the volume of "pressor mix" (containing ephedrine 5 mg/ml with phenylephrine 25 mcg/ml) needed to maintain BP greater than 90% of baseline. Secondary outcomes included umbilical artery and vein pH, APGAR scores, minimum and maximum BP, time to first pressor use, block height at 10 and 20 minutes after SA, and presence of nausea or vomiting. A *priori* power analysis indicated that 23 subjects per group were needed to show a 33% difference in the amount of pressor needed to treat hypotension. The appropriate statistical calculations were conducted with p <0.05 considered significant.

Results: Demographic data in both groups were similar with regard to age, weight and height. There was no statistically significant difference between the two groups in the amount of pressor required. A mean of 2.9 ± 2.2 ml of pressor mix was used in the pre-load group, compared with 2.5 ± 2.8 ml in the post-load group. We found no differences in any of the hemodynamic or other secondary outcome values between the two groups.

Conclusions: Colloid post-loading appears to offer no advantage with regard to pressor use or hemodynamic stability compared to pre-loading for the prevention of hypotension after SA for CS. Whether this holds true for crystalloid pre-loads remains to be determined. However, because post-loading with colloid is just as effective as pre-loading, this supports the practice of administering hetastarch after the induction of SA in emergency cases or when the start time of the CS is not known. CS need not be delayed to allow a predetermined preload to be administered before the SA is performed.

References:

1. Anesth Analg 1995; 81(4): 838-42.
2. Br J Anaesth 2001; 87: 406-14.
3. Can J Anaesth 1998; 45: 443-51.

SOAP A52

EFFECT OF ENOS GENETIC POLYMORPHISM ON HYPOTENSION AND TREATMENT RESPONSE DURING SPINAL ANESTHESIA FOR CESAREAN SECTION

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Introduction: Large inter-individual variability exists in the incidence, severity, and response to treatment of hypotension during spinal anesthesia for cesarean section (CS). A single nucleotide polymorphism of the endothelial nitric oxide synthase (eNOS) gene at position 298 of the enzyme results in an Glu→Asp substitution.¹ Asp298 has been associated with hypertension and vascular diseases,¹ preeclampsia,² impaired vascular adaptation to pregnancy,³ placental abruption,⁴ and increased response to phenylephrine.⁵ We sought to determine if polymorphisms of eNOS alter the occurrence or response to treatment of hypotension during spinal anesthesia for CS.

Methods: Healthy women undergoing elective CS were studied. Bupivacaine 12 mg/fentanyl 25 mcg/morphine 200 mcg was injected intrathecally in the sitting position, and the patient was then placed supine with LUD. Ephedrine (EPH) 5-15 mg or phenylephrine (PE) 40-80 mcg IV were given for hypotension (< 85% of baseline SBP). EPH was used if maternal HR was 120; clinician choice determined drug and dose if HR was 90-120. eNOS genotype was determined by pyrosequencing. Quantitative data are expressed as mean (SD). ANOVA and t-tests were utilized to compare quantitative data between genetic groups; χ^2 for categorical data.

Results: ANOVA revealed no differences between the heterozygous genotype and Glu298 homozygotes. Comparison of Asp298 homozygotes with the other genotypes (Glu298 and Glu298Asp) is shown in the table. Total EPH or PE given in the 15 minutes after spinal (1 ml = 5 mg ephedrine or 40 mcg phenylephrine) are denoted as ml vasopressor 15.

	Asp298 9*	Glu298&Glu298Asp 113**	p
n			
Baseline SBP, mm Hg	125 (13)	119 (13)	ns
Maternal weight, kg	77 (14)	82 (14)	ns
Neonatal weight, g	3465 (387)	3459 (480)	ns
PE15=0, n (%)	6 (67%)	47 (42%)	0.17
EPH15=0, n (%)	3 (33%)	8 (7%)	0.03
No tx for hypotension, n (%)	1 (11%)	3 (3%)	ns
EPH in 15min post-spinal, mg	18 (19)	28 (17)	0.11
PE in 15min post-spinal, mcg	27 (53)	89 (123)	0.07
"ml vasopressor 15"	5.5 (5.7)	7.8 (4.9)	0.18
UA pH	7.24 (0.08)	7.17 (0.11)	0.12
UA base deficit (mM)	7.3 (4.3)	9.5 (5.1)	0.26
UV pH	7.29 (0.08)	7.25 (0.08)	0.21
UV base deficit (mM)	5.3 (3.1)	7.6 (4.1)	0.13

* n=7, **n=83 for ABG results

Discussion: Genetic variation in the eNOS gene may result in differences in cardiovascular response to spinal anesthesia. There were several trends towards less EPH and PE use and better umbilical blood gases in Asp298 homozygotes, but none achieved statistical significance except for the percentage of subjects not receiving EPH. The low incidence of Asp298 homozygosity in our population necessitates approximately 200 patients to determine statistically significant effects of this genotype. The impact of variations in genes other than eNOS on these cardiovascular parameters and responses is under investigation.

References:

1. Trends Pharm Sci 2001; 22: 361-2.
2. J Soc Gynecol Invest 2000; 7:238-41
3. Hypertension. 2001;38:1289.
4. Hum Genetics 2001 ; 108 :181-3
5. Circulation 1999; 99:3096-8.

POSTER REVIEW 1

SOAP A53

FETAL AND MATERNAL EFFECTS OF BOLUS OF METARAMINOL OR EPHEDRINE DURING SPINAL ANESTHESIA FOR CESAREAN DELIVERY

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INTRODUCTION: Ephedrine has been considered the gold standard to prevent and treat hypotension during spinal anesthesia for C-section for many years (1). However, the use α -agonists have been associated with superior umbilical acid-base status compared with ephedrine (2). The purpose of this study was to compare the maternal and fetal effects of the use of bolus of metaraminol or ephedrine to control hypotension during spinal anesthesia for C-section.

METHODS: After IRB approval, 42 patients, ASA-1, who were not in labor and scheduled for elective C-section were studied. After preload with 10ml/kg of lactate ringer, patients were submitted to spinal anesthesia with 15mg of 0.5% hyperbaric bupivacaine and 25-50mcg of spinal morphine. Patients were then randomly allocated to one of two groups: the Metaraminol Group (GMET) (n= 21) received 0.2mg bolus of metaraminol for reductions of blood pressure (BP) greater than 10% of the control value and a bolus of 0.4mg of the same drug for a fall greater than 20%; the Ephedrine Group (GEPHED) (n=21) received 5.0 mg bolus of ephedrine for reductions of BP greater than 10% of the control value and a bolus of 10mg of the drug for a fall greater than 20%. BP was measured at 1 min intervals beginning 1 minute after spinal injection. Control arterial blood pressure and the control heart rate were defined as the mean of three successive measurements 1 min apart after the end of the preload. Left uterine displacement was maintained until delivery. The study was double blinded. Hypotension and hypertension were defined as variations greater than 20% of the control value and bradycardia and tachycardia variations greater than 30%. Apgar scores were assessed at 1 min and 5 min and arterial umbilical cord blood was sent for analysis. Statistical analysis was performed using the Wilcoxon and the t test. P<0.05 was considered significant.

RESULTS: The incidence of hypotension (5/21 patients in GMET and 5/21 patients in GEPHED), hypertension (12/21 patients in GMET and 15/21 patients in GEPHED), bradycardia (2/21 patients in GMET and 2/21 patients in GEPHED) were similar. The GEPHED had more tachycardia (17/21 patients) and nausea (5/21 patients) than the GMET (5/21 patients with tachycardia and 1/21 patients with nausea). No patient in both groups vomited. There was no difference between groups in mean umbilical artery pH (7.31 in GEPHED and 7.30 in GMET), in umbilical artery pCO₂ (45.9 mmHg in GEPHED and 48.8mmHg in GMET) and Apgar scores at 1 and 5 minutes.

DISCUSSION: Both ephedrine and metaraminol can be safely used to treat maternal hypotension during spinal anesthesia for C-section. However, metaraminol may be advantageous for the mother as it is associated with less nausea and tachycardia than ephedrine.

REFERENCES: 1. Anaesth 2001;56:794-8; 2. Br. J. Anaesth.1996;76:61-65

SOAP A54

NITROUS OXIDE ANXIOLYSIS FOR CESAREAN SECTION

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Introduction: Nitrous oxide (N₂O) is commonly used to supplement general anesthesia. 50% N₂O is widely used in Europe for labor analgesia. The role of N₂O as an anxiolytic has yet to be determined in obstetrics. The purpose of this study is to determine if N₂O is an effective anxiolytic in women undergoing elective cesarean section under spinal anesthesia.

Methods: After local IRB approval and informed consent, 60 patients for elective cesarean section were randomized to either Group 1: 100% O₂ via facemask or Group 2: 30-40% N₂O in O₂. Oxygen or N₂O in O₂ was started in the operating room and given for 3 minutes before the spinal procedure. All patients received a standardized spinal anesthetic [Bupivacaine (12mg)/Morphine (0.2 mg)/fentanyl (20 µg)]. Anxiety Visual Analogue Scores (Anx-VAS), (0=no anxiety, 100-worst anxiety) were obtained by a blinded observer at specific time periods during the surgical procedure (preoperatively, spinal injection, skin incision, uterine incision, and at delivery). Results expressed as mean ± SD, median with range in parenthesis. Interval data was analyzed using t-test, ordinal data with Mann-Whitney, nominal data with X². P < 0.05 is significant.

Results: No differences were noted with respect to gravidy, parity, gestation, 1 and 5 minute Apgar scores, and nausea/emesis. Median N₂O anxiety VAS scores were significantly lower at skin incision and uterine incision (Table). Also, median ephedrine dose and phenylephrine dose were significantly less in the N₂O group.

Discussion: Elective cesarean section under spinal anesthesia can be an anxiety producing procedure. The emotional component of the procedure is often overlooked. N₂O provides effective anxiolysis for elective cesarean section without apparent deleterious effects in either the mother and baby. The sympathomimetic properties of N₂O accounts for the lower dose of vasopressor used to maintain maternal blood pressure > 100 mmHg (1).

Reference: 1. Am J Obstet Gynecol 2002; 186: S110-26.

	O ₂ (n = 30)	N ₂ O (n = 30)	P
Gravidy	2.5 (1-12)	2 (1-6)	0.37
Parity	1 (0-7)	1 (0-3)	0.09
Gestation (weeks)	38.53 ± 1.04	38.53 ± 1.07	1.00
Preop Anx-VAS	42.5 (0-100)	47.5 (10-100)	0.73
Spinal Anx-VAS	80 (0-100)	50 (15-100)	0.06
Incision Anx-VAS	67.5 (0-100)	45 (0-100)	0.01
Uterine Anx-VAS	50 (0-100)	30 (0-100)	0.02
Delivery Anx-VAS	40 (0-100)	20 (0-100)	0.08
Nausea/Emesis (n)	13	15	0.80
Apgar 1 min	8 (3-9)	8 (4-9)	0.09
Apgar 5 min	9 (8-9)	8 (7-9)	0.67
Ephedrine (mg)	13.67 ± 11.29	7.83 ± 11.65	0.05
Phenylephrine (µg)	105.67 ± 224.53	15.0 ± 43.85	0.03

POSTER REVIEW 1

SOAP A55
ETHNICITY AND INCREASED INCIDENCE OF ELECTIVE CESAREAN

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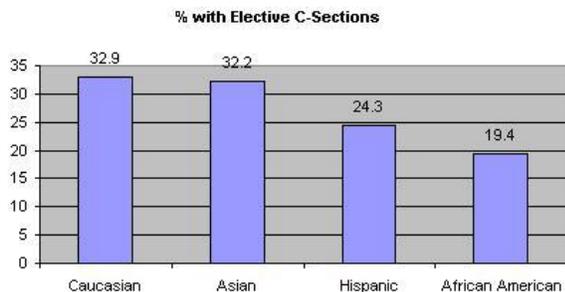
Introduction: Elective cesarean section provides increased safety and convenience over non-elective surgical delivery. Early work from other institutions has suggested that patient demographics may influence the incidence of cesarean versus vaginal delivery¹. In this study; we wanted to see if there was a trend based on ethnicity toward elective cesarean section versus emergent cesarean section. We suspect the rates for elective cesarean section are not the same among the four major ethnic groups that make up our patient population.

Methods: After IRB approval, we evaluated our obstetrical anesthesia data base for the years 2001 through Sept 2003 (i.e. after the relationship between race and delivery method was well publicized). Ethnicity data was collected for all patients who underwent a cesarean section delivery during this period. Proportions were compared with Pearson's Chi-Square tests with a Bonferroni correction for multiple pairwise comparisons.

Results: A total of 1912 cesarean sections were conducted during the study period. Of these, 753 patients were identified as Caucasian, 747 as African American, 325 as Hispanic, and 87 as Asian. The percent of patients with elective versus emergent sections were as follows: Caucasians, 33%; African Americans, 19%; Hispanics, 24%; and Asians, 32%. African Americans had a significantly lower proportion of elective sections (and conversely a higher ratio of emergent deliveries) than Caucasians ($p < 0.0001$) or Asians ($p = 0.0054$), and Hispanics had a lower proportion than Caucasians ($p = 0.0047$).

Conclusions: This retrospective analysis demonstrated significantly different rates for elective cesarean section among major ethnic groups. Our results show routine elective caesarean section was more common for Caucasian and Asian patients than for traditional minority patients. The cause of this phenomenon is unclear. Determining the causes behind this discrepancy (e.g. socio-economic status, lack of prenatal care, education levels, or language barriers) is the focus of ongoing work.

Reference: 1. Maternal Birth Weight and Cesarean Delivery in Four Race-ethnic Groups, American Journal of Obstetric & Gynecology. 182(6):1363-70, 2000 June

**SOAP A56**
DOES ETHNICITY INCREASE THE INCIDENCE OF GENERAL ANESTHESIA FOR CESAREAN SECTION?

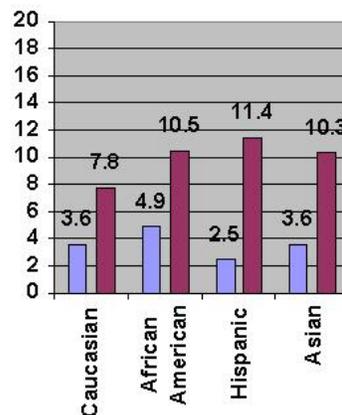
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Introduction: Neural-axial anesthesia is accepted as the anesthesia of choice for cesarean section; general anesthesia being associated with increased risk of maternal death due to difficulties in securing the airway, failed intubation, and aspiration of gastric contents.¹ It is recognized there is a difference in the incidence of cesarean section delivery based on ethnic background.² The authors wanted to look at data from our institution to determine if there is an inherent risk for general anesthesia for cesarean section based on a woman's ethnic background. We hypothesized the rates of general anesthesia for cesarean section will differ among the various ethnic groups studied.

Method: After IRB approval, we evaluated our obstetrical anesthesia data base for the years 2001 through Sept 2003 and reviewed 1,905 cesarean sections completed during that time. We compared regional anesthetic rates, general anesthetic rates, and those anesthetics, which were converted to general anesthesia for four major ethnic groups (Hispanics, Caucasians, African-Americans and Asians). Group comparisons of treatment rates were made with Pearson's Chi-Square test or Fisher's exact test.

Results: General anesthesia was used in 155/1,905 (8.1%) of the women at any point during their cesarean section. General anesthesia was used in 19/499 (3.8%) of the elective cesarean sections and 136/1406 (9.7%) of those non-elective surgical deliveries ($p < 0.0001$). There was no significant difference ($p = 0.86$) in rate of general anesthesia between any ethnic group having an elective cesarean section. Likewise, there was no significant difference in rate of general anesthesia ($p = 0.31$) between any ethnic group having non-elective cesarean section.

■ % GA for elective CS ■ % GA for non-elective CS



Conclusion: The rate of general anesthesia, and thus regional anesthesia, in elective and non-elective cesarean delivery is not significantly different among the four major ethnic groups at our institution. Intuitively, in non-elective cesarean delivery, the rate of general anesthesia is significantly higher, underscoring the inherent increased anesthesia risk of urgent or emergent cesarean delivery. Although these data represent our particular demographics, ethnic differences in socio-economic level, premature delivery, or lack of prenatal care do not seem to translate into higher general anesthetic rates for any ethnic group.

Reference: 1. Anesthesia-related deaths during obstetric delivery in the United States, 1979-1990. Anesthesiology 1997; 86:277-84
2. Maternal birth weight and cesarean delivery in four race-ethnic groups, American Journal of Obstetrics & Gynecology. 182(6):1363-70, 2000 June

POSTER REVIEW 1

SOAP A57
DOES PARTNER PRESENCE IN THE OPERATING ROOM DURING REGIONAL ANESTHESIA REDUCE PATIENT ANXIETY?

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Introduction: The majority of elective cesarean sections (C/S) in the United States are performed under regional anesthesia. Preoperative anxiety can significantly impact patients' mood, communication, and family dynamics and is also associated with more postoperative pain and decreased postoperative coping skills.¹ Typically, the patient's partner is not allowed to accompany the patient during the regional anesthesia placement for C/S. Partner support may help reduce patients' stress levels,² but it is unknown whether their presence would actually reduce patients' anxiety during the regional anesthesia placement.

Methods: This study was approved by the institutional review board. The patient undergoing elective C/S under regional anesthesia and her partner were randomized to one of two groups: Group 1 did not have partners present for the regional anesthesia placement and Group 2 had partners present for the regional anesthesia placement. Both groups received standard anesthetic care. In the preoperative area, the patient and her partner completed a survey that included their baseline anxiety as measured by Spielberger's Trait Inventory,³ demographics, and previous anesthetic experiences and rated their current anxiety on a visual analogue scale (VAS) from no anxiety to maximum anxiety. Immediately after regional anesthesia placement, the patient and partner rated their current anxiety on the VAS, and the patient rated her satisfaction with her regional anesthesia experience on a VAS from not satisfied to extremely satisfied. The anesthesiologist rated the difficulty of the procedure on a VAS from not difficult to extremely difficult. Information on any health or obstetric complications was noted. Descriptive data were analyzed using frequency distributions and Chi-square. Parametric continuous data were analyzed using t-tests and non-parametric data by Mann-Whitney-U tests. Significance was accepted as $P < 0.05$.

Results: 250 patients and their partners were recruited for this study. The two groups did not differ in demographics, previous anesthetic experiences, and previous birthing experiences. There was no difference in the two patient groups with respect to anxiety levels preoperatively and postoperatively or the degree of satisfaction. However, the anxiety level of the partners between the two groups, 41.6/100.0 in Group 1 and 32.3/100.0 in Group 2, were significantly different ($P = 0.003$).

Discussion: The etiology of preoperative anxiety is multi-factorial, and the exact contribution of fear of anesthesia to anxiety is undetermined. Certainly, separation of patients from their families provokes a major proportion of preoperative anxiety. However, allowing patients to have their partners accompany them during regional anesthesia placement was not found to affect their anxiety levels nor their satisfaction.

References: 1. Best Pract Res Clin Obstet Gynaecol 2001; 15:109-26. 2. J Obstet Gynaecol 1992; 12:407-11. 3. Manual for the State-trait Anxiety Inventory (Form Y). Palo Alto, CA: Consulting Psychologists Press, 1983.

SOAP A58
SHOULD ANESTHESIA CARE PROVIDERS BE PRESENT DURING DELIVERY?

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INTRODUCTION: The labor and delivery suite presents the opportunity for a unique patient-physician relationship for the anesthesia care provider (ACP) because they are present during one of the most emotionally important events in a woman's life. Arguments in favor of the ACP being present during delivery include the availability to give additional medicine as needed for pain, and for assistance with maternal or neonatal resuscitation if required. The primary reasons cited for not being present are invasion of the woman's privacy, and an increased workload. In order to answer the question of whether or not women want an ACP to be present, we administered a survey after delivery asking women to state their preferences.

METHODS: 483 anonymous questionnaires were provided to patients who had lumbar epidural analgesia (LEA) for vaginal delivery. The questionnaires were administered on the day following delivery during the routine anesthesia post-op visit. The questionnaire asked if anyone from the ACP team was present during their delivery, whether or not they were in pain during delivery, and whether they did or did not want the ACP to be present during delivery.

RESULTS: 283 (59%) of the questionnaires were returned. Of these, 10 (4%) were not interpretable, and the remaining 273 were analyzed. The ACP was present at the time of delivery in 189 (69%), absent in 65 (24%), and 19 (7%) of the parturients were not sure whether the ACP was present or not. Of the 189 cases where the ACP was present: 178 (94%) of the patients were glad the ACP was there, 2 (1%) of the patients were not glad and 8 (4%) did not care whether or not the ACP was present at the time of delivery. Of the 65 cases where the ACP was not present: 5 (8%) of the patients were glad the ACP was not there, 19 (29%) of the patients were not glad and 37 (57%) did not care that the ACP was not present at the time of delivery. Of the 5 patients who were glad an ACP was not there, 0 (0%) had pain during their delivery.

DISCUSSION: The decision of whether ACPs should be present during delivery remains controversial. Invasion of privacy and workload issues must be balanced with optimal continuity of care and maternal satisfaction. Although patient preferences can be expected to vary by culture and geographic region, the parturients we surveyed overwhelmingly desire our presence at delivery. Based on these data, we believe the ACP should attend all deliveries when feasible in order to maximize patient satisfaction.

POSTER REVIEW 1

SOAP A59

PATIENT PREFERENCES REGARDING CESAREAN SECTION ANESTHESIA OUTCOMES

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Introduction: When providing cesarean section (CS) anesthesia, anesthesiologists make treatment decisions which "trade-off" relieving intra- and post-operative pain with the potential for increased risk of side effects (e.g., with spinal opioids). Provision of anesthesia for CS might be improved with a better understanding of patients' preferences. No previous studies have examined this issue in CS patients. The objectives of this survey were to determine women's preferences about various anesthesia outcomes with the goal of improving future patient care and satisfaction.

Methods: 100 anonymous, IRB-approved written surveys were distributed over 6 months to pregnant woman presenting for scheduled CS and to those attending a prenatal class designed to educate patients about CS. Patients' preferences, expectations and fears regarding CS, as well as any past experiences with anesthesia and related side effects were determined. Women ranked the importance of specific intraoperative and postoperative anesthesia outcomes and potential side effects using priority ranking and relative value scales. They also were asked to rank possible perioperative outcomes from the most to least desirable (1-10). In addition, they were asked how they would distribute \$100 to prevent these outcomes, allocating proportionally more money towards outcomes they considered less desirable. Data were analyzed with SPSS using the appropriate statistical methods.

Results: 82 surveys were returned and analyzed. Pain during CS was the greatest concern, with the highest ranking and relative value scores (Table). Ranking and relative value scores were closely correlated ($r^2=0.7$), with internal data consistency demonstrated. Previous anesthetic experiences with side effects did not impact significantly on current preferences. Of those surveyed, 42% ranked intraoperative pain as their most undesirable outcome. Despite 62% of patients expecting mild pain after CS, postoperative pain remained a significant concern. Possible paralysis was the principal fear expressed in over 40% of patients.

Conclusion: Pain during and after CS is the most important concern of parturients. This contrasts with previous surveys in the general surgical population that found nausea and vomiting were the primary concerns.^{1,2} Pruritus and shivering after CS caused only moderate concern. These findings emphasize the importance to patients of providing superior peri-operative analgesia. This information should be used to guide anesthetic choices, e.g. inclusion of spinal opioids given in adequate doses.

References:

1. Anesth Analg 1999;89: 652-8
2. BJA 2002;89: 760-1

Ranking and Relative Value Scores
(*Medians; #Mean \pm SEM dollar value)

Outcome	Rank*	Relative Value #
Pain During CS	9.2	27 \pm 2
Pain After CS	8.6	19 \pm 1
Vomiting	7.9	12 \pm 1
Nausea	6.7	11 \pm 1
Cramping	5.9	10 \pm 1
Pruritus	5.2	9 \pm 1
Shivering	4.2	6 \pm 1
Anxiety	3.6	5 \pm 0.5
Somnolence	2.5	4 \pm 0.4

SOAP A60

THE INCIDENCE AND ETIOLOGY OF POSTPARTUM HEADACHES

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Introduction: The incidence of headaches in the postpartum period may be as high as 39%¹. The majority of these headaches are primary disorders (e.g. tension-type, migraine), whereas some will be caused by secondary disorders (e.g. post-dural puncture, hypertension). Anesthesiologists are often called upon to assess post-partum headaches after patients have had regional anesthesia. In our hospital population, the frequency of primary and secondary headaches was unclear. We surveyed our postpartum population to establish the incidence and etiology of headaches in this group and to evaluate risk factors for postpartum headaches.

Methods: With hospital REB approval, women who delivered a fetus greater than 20 weeks gestation from June to August 2003 were eligible to participate in this prospective cohort study. Those who consented underwent a structured interview and chart review within 3 days of delivery. The primary outcome of interest was development of postpartum headache and/or neck/shoulder pain. Participants were reassessed at one week postpartum and given a contact number to inform the interviewer of any subsequent occurrences over the remaining postpartum period. Headaches were diagnosed by an anesthesiologist and a neurologist independently and then by consensus, using an algorithm based on the diagnostic criteria of the international headache society². Logistic regression would evaluate the association of potential risk factors (age, parity, headache history, labour duration, pushing duration, method of labour analgesia, anesthesia operators' experience, use of air to identify epidural space and known large bore dural puncture) with postpartum headache.

Results: 985 women consented to the study within a delivery population of 1606 women. Preliminary analysis reveals that 381 participants (38.7%) reported headaches and/or neck/shoulder pain. The etiologies and incidence are displayed below. Of these, 80 (21%) reported relief when supine, 8 (2.1%) were bed-ridden and 7 (1.8%) were unable to take care of their baby. The average and median durations were 20.7 and 4 hours respectively.

Headache Type	Number (percent of headaches)
Tension-type	146 (38.3%)
Migrainous	102 (26.8%)
Musculoskeletal	43 (11.3%)
Undetermined	31 (8.1%)
Migraine without aura	25 (6.6%)
Post-dural puncture	17 (4.5%)
Cervicogenic	14 (3.7%)
Migraine with aura	4 (1%)
Cluster, Secondary	0

Discussion: Primary headaches were 20 times more frequent than secondary headaches. Post-dural puncture headaches made up only 21% of all headaches with postural symptoms. It appears that the high incidence of primary headaches may confound the diagnosis of post-dural puncture headaches and that the incidence of post-dural puncture headaches might be under-estimated.

References: 1. Acta Neurol Scand. 1984; 69: 74-9. 2. Cephalalgia. 1988; 8 Suppl 7: 1-96.

POSTER REVIEW 1

SOAP A61
COMPLIANCE WITH THE CONSORT CHECKLIST IN OBSTETRICAL ANAESTHESIA RANDOMIZED CONTROLLED TRIALS

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Introduction: The Consolidated Standards for Reporting of Trials (CONSORT)[1] checklist is an evidence-based approach to help improve the quality of reporting randomized controlled trials (RCT's). The purpose of this study was to determine how closely RCTs in Obstetrical Anaesthesia adhere to the CONSORT checklist.

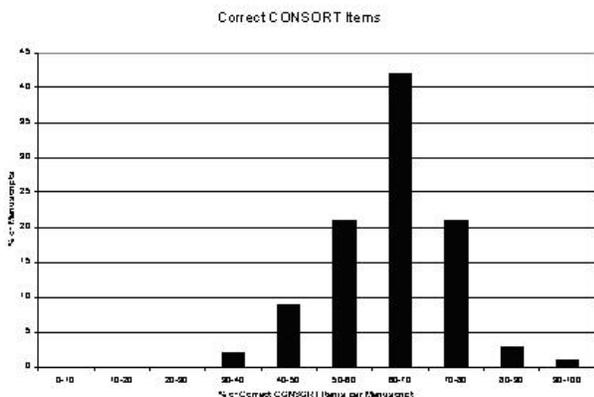
Methods: We retrieved all RCTs (N=100)* pertaining to the practice of Obstetrical Anesthesia and summarized in *Obstetric Anesthesia Digest* between March 2001 and December 2002 and compared the quality of reporting to the modified 30 item CONSORT checklist.

Results: The median number of correctly described CONSORT items was 65% (range 36% to 100%) [Figure]. Important information was often omitted. This included information pertaining to randomization (42%), binding (60%), sample size calculation (40%) and reliability of measurements (68%). Reporting of analysis, particularly when multiple outcomes were present, was often incomplete (83%).

Discussion: It is difficult to determine the usefulness and quality of many obstetrical anesthesia clinical trials because journal editors do not insist that this important information is made available to readers. Both clinicians and clinical researchers would benefit from uniform reporting of randomized trials in a manner that allows rapid data retrieval and easy assessment for relevance and quality.

References: 1) Ann Int Med 2001; 134: 657-62.

*RCT's available from the authors.



SOAP A62
HISTOPATHOLOGICAL PROFILE OF ONDANSETRON IN GUINEA PIG SPINAL CORD. A PILOT STUDY

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Introduction. Studies have shown that prophylactic treatment with intravenous ondansetron significantly reduce the incidence of intrathecal fentanyl-induced pruritus in patients undergoing elective surgery under spinal anesthesia [1]. A recent report of epidurally administered ondansetron [2] suggested that it might be effective for intrathecal fentanyl induced side effects, although, there are no studies evaluating the efficacy nor the safety of intrathecally administered 5-HT₃ receptor antagonists. The aim of this study is to look at histopathological sections of guinea pig spinal cords after administering spinal ondansetron to look for cellular changes, which might indicate damage.

Material and Methods. After IRB review and approval, a pilot study was performed in 6 adult Hartley guinea pigs. Under general anesthesia, a single bolus intrathecal dose was given to all the subjects with a 25G Whitacre spinal needle, delivered in a volume of 2 ml in an interspace caudal to the conus medullaris (L₆-S₁). Randomization was to 5 groups: Group Ondansetron preservative free: 40 ug in 2 ml volume; Group Ondansetron-Morphine: ondansetron 40 ug + Morphine 5 ug/kg in 2 ml volume; Group supramaximal ondansetron: 4 mg in 2 ml volume; Group Morphine: Morphine 5 ug/kg in 2 ml volume; Control: No injection. After recovery, evaluations were done at 1 and 24 hours of injection observing arousal, motor coordination and motor tone as previously described [3]. Sensitive testing was performed using the panniculus reflex [4] and evaluation of sensory and motor responses to a toe pinch in all four feet to elicit the pedal reflex [5]. On completion of the study, the animals were sacrificed and the spinal cords were removed for fixation and staining. Representative cross-sections of the spinal column from cervical, thoracic, upper and lower lumbar areas were taken. A blinded histopathologist (ST) examined the sections from all animals for signs of tissue damage. All data is presented as mean ± SD for quantitative data.

Results. Six guinea pigs were studied. All of them were two months old females, weighting 459± 42 gr. Pre and postoperative assessments were unremarkable in terms of behavior, sensory or motor dysfunction. After fixation, four representative portions of the spinal cord were examined, showing no signs of drug induced tissue damage.

Conclusion. This is the first study assessing for the toxic effects of ondansetron in the spinal cord in animals. In the current pilot study, we found no toxic effects derived from the drug injected.

References. 1) Anesth Analg, 2002. 95(6): p. 1763-6, 2) Anesthesiology, 2003. 98(Suppl): p. A36, 3) Anesthesiology, 1995. 82(2): p. 412-27, 4) Lab Anim Sci, 1994. 44(5): p. 486-90, 5) The Laboratory Guinea Pig.1998 Boca Raton, Fla: CRC Press LLC. 168.

POSTER REVIEW 1

SOAP A63

PRECEDEX (DEXMEDETOMIDINE) DEPRESSES FETAL AND MATERNAL CARDIOVASCULAR ACTIVITY AND INCREASES BLOOD GLUCOSE CONCENTRATION IN THE MID-TERM PREGNANT EWEJ. D. Reynolds¹, S. Ganapathy², K. Uemura¹, R. J. McClaine¹, K. A. Campbell¹, D. J. McClaine¹, J. V. Booth¹¹Duke University Medical Center, Durham, NC, ²University of Western Ontario, London, ON, Canada

Introduction: The alpha-2 agonist Precedex (dexmedetomidine) is used in a variety of clinical situations to produce sedation and provide analgesia. Currently, this drug is not recommended for obstetric procedures because its safety in this patient population has not been established. With this in mind, the purpose of the present study was to delineate the maternal and fetal responses to an iv infusion of Precedex.

Methods: Using an established surgical procedure, preterm sheep at gestational day 90 (term, about 145 days) were instrumented with maternal and fetal arterial catheters. In addition, an electromagnetic flow probe was placed around the left uterine artery to measure uterine blood flow (UBF). The study was conducted 3 days later and consisted of a baseline recording period, 3 h of drug administration, and 2 h post-drug monitoring. Each ewe received a bolus iv injection of Precedex (1.0 ug/kg) given over 10 min followed by a constant iv infusion at a rate of 1.0 ug/kg/hr. Hemodynamic data were continuously recorded while maternal and fetal arterial blood samples were obtained at 30 min intervals.

Results: Drug infusion produced overt sedation but no lethality. On the maternal side, Precedex decreased heart rate (35% decline from baseline), mean arterial pressure (10%), and UBF (15%); nadirs were reached after 60 min of exposure and all three parameters remained depressed until the infusion was stopped. In the fetus, pressure decreased by 10% while heart rate went down by 5%; the depressions were cyclical in nature. Precedex produced a modest increase in fetal pCO₂ (from 39.0 ± 3.0 to 48.7 ± 1.2 mm Hg) and fetal lactate (from 1.03 ± 0.31 to 1.47 ± 0.21 mg/dl) but no change in oxygenation or pH. In the ewe and fetus, drug infusion produced significant elevations in arterial blood glucose concentration: fetal, from < 20 mg/dl (lower limit of sensitivity) to a peak of 46.3 ± 4.0 mg/dl; maternal, from 43.3 ± 12.9 to 105.0 ± 20.4 mg/dl. For both, the peaks occurred at the 3 h infusion time point. The other maternal blood gas parameters stayed constant during the study. All of the observed changes resolved within 2 h of terminating the Precedex infusion.

Conclusions: Infusion of the alpha-2 agonist Precedex to pregnant ewes produced significant alterations in maternal and fetal physiologic status. While the long-term consequences of these effects remain to be determined, the data collected to date suggest that Precedex may be a less than ideal agent for sedating parturients.

This work was supported in part by a research grant from the National Institutes of Health (NS42664). RJM is the recipient of a Howard Hughes Medical Student Fellowship.

SOAP A64

THE INFLUENCE OF TYPE OF ANESTHESIA PROVIDER ON THE COSTS OF LABOR ANALGESIA TO THE TEXAS MEDICAID PROGRAMA. E. Abouleish, R. B. Vadhera, D. S. Prough
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Introduction: The Texas Medicaid program defines billable time for labor analgesia as face-to-face time only. The amount of billed time depends on the anesthesia provider, in contrast to surgical anesthesia care, where the billed time depends on surgical duration. We sought to determine whether or not the type of anesthesia provider, as determined by the modifier used to bill anesthesia care, affects the costs of labor analgesia billed to the Texas Medicaid program.

Methods: Under the Freedom of Information Act, the Texas Health and Human Resource Commission provided data (procedure code, modifier, provider name, minutes billed [if applicable]) on claims paid for labor analgesia ending in vaginal delivery for last 6 months in 2001. Claims were either time-based (codes 00946 or 00955) or flat-fee (codes 26311 or 26319 with a pregnancy-related diagnosis). Time-based claims with medical direction modifiers were excluded because patient identifiers were unavailable for determining whether two claims were for the same delivery. Time-based claims were grouped into two categories based on the modifier used—AA (performed by an anesthesiologist) and QZ (provided by a CRNA not medically directed by an anesthesiologist). Flat-fee codes were grouped based on the time-based code modifier used by the provider (for other claims). Cost/claim to Medicaid was based on the 2001 fee schedule with \$18.21/ASA unit or \$152.50/flat-fee codes (CRNA services at 85% of the fee schedule). Mean min/claim, the % providers with >4 h billed time, and cost/claim were determined for each group. Large providers were identified as handling >120 claims, and data were analyzed similarly for all providers.

Results: 21,378 claims were included in the study representing 12,698 claims from 219 providers in the AA group and 8,680 claims from 117 providers in QZ group. The mean time/claim was significantly higher in the QZ group (146 min) than the AA group (105 min). The QZ group (\$225.11) cost/claim to Medicaid was 19% more than the AA group (\$189.26). The difference in cost/claim was greater among the large providers—\$213.10 QZ group, and \$168.76 AA group.

Conclusions: Anesthesiologists provided care for labor analgesia for Texas Medicaid patients at 19%-26% less cost than CRNAs because CRNAs billed significantly more face-to-face time per epidural than anesthesiologists.

References: Texas Department of Health. 2001 Texas Medicaid Provider Procedures Manual.

	AA Group Time-based claims	(n=219) Flat-fee claims	QZ Group Time-based claims	(n=117) Flat-fee claims
Number of claims	7,006	5,692	8,388	292
Fee schedule	\$18.21/unit	\$152.50/unit	\$15.48/unit	\$129.63/unit
Base units	5	n/a	5	n/a
Mean time units	7.03	n/a	9.76	n/a
Total units	12.03	n/a	14.76	n/a
Cost/claim/code	\$219.12	\$152.50	\$228.43	\$129.63
Average cost/claim	\$189.26		\$225.11	

POSTER REVIEW 1

SOAP A65
ARE OBSTETRIC CARE PROVIDERS AWARE OF THE INCREASED ANESTHETIC RISKS OF MATERNAL OBESITY?

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Introduction: Maternal obesity is a well established maternal-fetal risk factor and is increasing in prevalence¹. Recognition of the obstetric and neonatal health risks of maternal obesity seems to be widespread within the obstetric community.²

Methods: We surveyed 56 obstetric care providers at our institution to assess how obstetric care providers define maternal obesity and which anesthetic risks and complications are routinely associated with maternal obesity. All OB/GYN physicians, nurse-midwives, and family physicians who participate in obstetrics were included in the sample. We performed a literature review to determine the strength of evidence in the literature for each risk.

Results: There were 37 completed surveys (66% response rate): 7 from family physicians, 9 from nurse midwives, and 21 from obstetricians. Forty-two percent of surveyed providers (n=15) use the Institute of Medicine (IOM) definition of BMI \geq 30 when evaluating their patients for obesity. All other definitions, including >100 kg, 25%>IBW, 35%>IBW, and BMI \geq 35, were each selected by between 3 and 4 respondents. One third of respondents recommended a weight gain of <12kg for their obese patients. 39% recommended <15kg, and 22% recommended up to 18kg (39.6 pounds). When considering risk for complications of pregnancy in obese women, 92% reported that prepregnancy weight is more important than weight gain during pregnancy. Most risks of interest to anesthesiologists were widely recognized by obstetric care providers as being either more frequent or more severe among obese women. These included difficult intravenous access (recognized by 100%), gestational diabetes (97%), chronic hypertension (92%), difficult intubation (92%), sleep apnea (86%), failed epidural placement (81%), thromboembolism (78%), failed intubation (72%), preeclampsia (69%), aspiration (67%), and uneven epidural block (64%). Anesthetic risks characterized as under-recognized were respiratory suppression by opioids (33%), intraoperative maternal blood loss (44%), right heart failure (47%), and transient hypoxemia (50%). One third of respondents knew that obesity reduces the risk of post-dural puncture headache, but 25% thought that obesity increased the risk.

Discussion: For the most part, anesthetic risks associated with maternal obesity were recognized by the obstetric care providers surveyed. However, a number of risks do appear to be underappreciated, including the potential for increased respiratory sensitivity to opioids. We emphasize this example because in most institutions, obstetric care providers supervise the administration of intravenous opioids for labor analgesia. Despite widespread awareness of the risks of maternal obesity, this survey found considerable variability in the working definitions of obesity and the recommendations for pregnancy weight gain. Although IOM guidelines advise obese women to gain between 15 and 25 pounds during pregnancy³, 61% of obstetric care providers in this survey selected more generous recommendations.

References: 1) AJOG 2002; 187:1189-93. 2) J of Reproductive Medicine 2001; 46:941-946. 3) Institute of Medicine: Nutrition During Pregnancy; National Academy Press, 1990.

SOAP A66
ANESTHETIC RISKS OF MATERNAL OBESITY ARE NOT ROUTINELY DISCUSSED IN PRENATAL CARE

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Introduction: Maternal obesity is one of the leading risk factors for maternal anesthetic mortality¹, and is increasing in prevalence. Optimal management of the obese parturient involves early intravenous and epidural or spinal catheter placement, among other precautions. In the absence of prenatal discussion about anesthetic risk, obese pregnant women may assume that they are "low risk" and may construct their delivery plans accordingly. In order to increase maternal satisfaction and safety, realistic maternal expectations are necessary.

Methods: We surveyed 56 obstetric care providers at our institution to assess which obesity-related risks and complications are routinely discussed with obese patients in the prenatal period. All obstetricians, nurse-midwives, and family physicians who participate in obstetrics were included in the sample.

Results: There were 37 completed surveys (66% response rate); 7 from family physicians, 9 from nurse midwives, and 21 from obstetricians. Risks associated with obesity by over 60% of respondents were taken to represent those risks for which a consensus had formed. Focusing our analysis on these widely recognized risks, we characterized them further based on frequency of routine discussion. Routine discussions were defined as those taking place with over 50% of obese parturients at any point during the prenatal period. All rates are based on self-reported survey data.

The most commonly recognized and routinely discussed risks (by >60% of respondents) included gestational diabetes, hypertension, macrosomia, cesarean section, and preeclampsia.

Risks with wide recognition but less discussion (discussed by 20-40% of respondents) included deep venous thrombosis, prolonged operative time for cesarean section, wound infection or dehiscence after cesarean section, birth trauma, neonatal hypoglycemia, and overall perinatal morbidity.

Finally, the risks with wide recognition but the least amount of prenatal discussion (by <20% of respondents) included sleep apnea (11% routinely discuss), difficult intubation (19%), failed intubation (14%), difficult IV access (11%), aspiration of gastric contents (14%), patchy epidural (6%), failed epidural placement (19%), and NICU admission (19%).

Discussion: Among the perinatal complications associated with obesity, those with the least reported discussion by obstetric care providers prenatally were all anesthetic risks, with the exception of increased NICU admission. The self-reported rates in this survey may even overestimate the true rate of routine discussion. This survey shows that obstetric care providers do not routinely discuss anesthetic risks with their obese patients, despite widespread recognition that such risks are associated with obesity.² Discussions of anesthetic risk should be incorporated into the prenatal care and education of obese women.

References: 1) AJOG 1988; 159:187-93. 2) 04-A-1021-SOAP.

POSTER REVIEW 1

SOAP A67
SURVEY OF OBSTETRIC ANESTHESIA PRACTICES IN CROATIA

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Introduction: Croatia is a country of 4.5 million inhabitants that was devastated by war in the 1990's. During that time, nearly 500,000 people were killed, wounded or displaced as refugees and vital health information was lost. Health care in Croatia is probably better than could be expected, given the economic rebuilding, and maternal mortality is reported as 18 deaths/100,000 live births¹. Croatia has a government supported national health care system and childbirth occurs in 34 Croatian hospitals (7 university affiliated and 27 regional/city hospitals). Two Croatian university hospitals are reported to have anesthesiologists dedicated to obstetric anesthesia but there is no information regarding obstetric anesthesia practices in Croatia. The purpose of this survey was to learn if regional anesthesia (RA) techniques are being utilized for childbirth in Croatia.

Methods: Short questionnaires were sent to Croatian anesthesiology departments regarding analgesia and anesthesia practices for childbirth during 2002 and 2003. The information sought included number of deliveries, cesarean section (C/S) rate, type of anesthesia for C/S, type of analgesia for vaginal delivery, and maternal mortality.

Results: Three university and 5 regional hospitals responded to the survey. The 14,133 deliveries reported by the surveyed hospitals, accounted for 35% of the registered Croatian births for 2002. For 2002 and 2003, the C/S rate was 14% and 15%, respectively and ranged from 9-23%. General anesthesia was used more commonly for C/S, particularly in regional/city hospitals (Table). Among university hospitals, RA for C/S varied widely (range 5-68%). For vaginal delivery, epidural analgesia was used infrequently (Table). The 2 university hospitals with specialized anesthesiologists reported greater use of RA for vaginal delivery (17%, 20%) and C/S (63%, 68%), compared to the other hospitals (p<0.05). There was a slight increase in RA use during 2003, compared to 2002 (data not shown). Maternal mortality reported by university hospitals was 0.4-0.8%.

Conclusion: Dedicated obstetric anesthesia services increase the use of RA in Croatia. Obstetric anesthesia training in other hospitals may also increase the use of RA and educational efforts are underway to promote obstetric anesthesia training throughout Croatia.

Reference: Estimates of Maternal Mortality for 1995. Bulletin of the WHO 2001;79(3), 182-93.

This study was supported by Kybele, Inc., a 501(c)(3) organization to promote obstetric anesthesia education.

2003	Regional Anesthesia for Obstetrics in Croatia				
	Anesthesia for C/S (%)	Anesthesia for C/S (%)	Analgesia for SVD (%)	Analgesia for SVD (%)	Analgesia for SVD (%)
Hospital	GA	RA	None	IV	LEA
University	61	39	58	31	11
Reg/City	93	7	63	37	<1

POSTER REVIEW 2

SOAP A68
QUANTITATIVE AND QUALITATIVE RELATIONSHIP OF PLATELETS IN PREGNANCY

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It remains unclear when thrombocytopenia affects coagulation. Variations in clinical practice exist when deciding on regional anesthesia in the setting of thrombocytopenia (1). This in-vitro study evaluated the effect of decreasing the number of platelets on coagulation from blood obtained from healthy pregnant subjects.

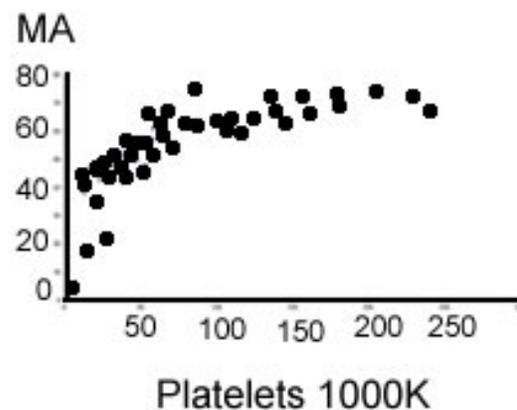
Methods: After IRB approval, 15 ml of blood was drawn into three buffered citrated tubes. Three pre-calibrated Haemoscope dual channel Thrombelastograph® analyzers were used for this study. One ml of citrated blood was added to a tube containing 35 uL celite, producing 1% celite activated blood and 340 uL of this activated blood was added to a pre warmed cup containing 20 uL of 0.2 M calcium chloride, and a thrombelastograph® tracing (TEG) was obtained to determine the baseline coagulation profile (n=13). Baseline platelet count and hematocrit were also obtained. Citrated tubes were then centrifuged at 3000 RPM in Sorval RT centrifuge to separate platelets that were subsequently removed by aspiration; centrifugation was performed for different time intervals (10 to 30 minutes) to obtain different degrees of thrombocytopenia. TEG and platelet counts were obtained for all centrifuged blood samples as described above within an hour of blood collection.

Results: Figure shows the relationship between platelet number and MA. MA curve is horizontal beyond platelet number >100,000/uL. It begins to decrease at platelet counts <100,000/uL. Table shows the mean (SD) for hematocrit, platelet count and TEG variables, with MA and R reflecting platelet function and clotting initiation time respectively. MA decreased significantly (t-test, P<0.05) with platelets below 70,000/uL. Of note, there was no change in R, indicating that the technique of platelet reduction did not alter other coagulation factors.

Platelets x1000/ uL	MA mm	R min	HCT %
Baseline-166(38)	67.4 (4.7)	3.88 (0.7)	31 (3)
>99 k (n=8)	64.1 (3.1)	4.26 (0.7)	31 (3.2)
70-99 (n=7)	63 (6.8)	3.6 (0.5)	30 (3.6)
50-69 (n=9)	58 (7.2) *	4 (1.6)	31 (3)
30-49 (n=13)	50.5 (3.2) *	3.9 (1.6)	31 (3.3)
<30 (n=11)	35.6 (15) *	3.6 (1.2)	31 (3.7)

Conclusion: Our study suggests that platelet counts below 70,000/uL are associated with decreased coagulation. Platelets > 100,000/uL contribute to mere platelet function reserves.

Reference: (1). Anesth Analg 1996;83:735-41.



POSTER REVIEW 2

SOAP A69

ANTENATAL HIGH-RISK ANESTHESIA
CONSULTATION SERVICE: A REVIEW OVER TWO AND
A HALF YEARS

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Introduction: Antenatal consultation with obstetrical anesthesiologists is important for safe care of the high-risk parturient. Brigham and Women's Hospital is involved in approximately 10,000 deliveries per year of which 25-30% are high-risk. We encourage our obstetricians and midwives to refer patients to our high-risk anesthesia consultation service for evaluation when medical, obstetric or potential anesthetic problems are noted.

Methods: We reviewed our obstetrical anesthesia high-risk consultation service from July 2001 – December 2003. For each patient the reason for referral, individual anesthetic plans and recommendations, and the necessity for additional consults were recorded. In December 2002 we contacted all obstetrical care providers encouraging referral to our service for antenatal consultation. We observed the change in the number of consults following this formal request.

Results: We saw 450 patients over a two and a half year period. Most patients presented for initial consultation in the third trimester, but some were seen as early as the first. Common reasons for consultation included musculo-skeletal problems (24%), hematological disease (18%), cardiac disease (11%), previous anesthetic problems (9%), neurological disease (6%). 7% of patients presented with high-risk obstetrical conditions such as placenta previa/accreta, history of uterine rupture, higher order multiple gestations or fetal anomalies. The remaining 25% included obesity, previous adverse drug reactions, airway concerns and Jehovah's Witnesses. We observed a 79% increase in the number of high-risk consultations following notification of the availability of our service. 44 (9.8%) of the patients were referred for further consultation with other specialists. Half of these patients were referred to the hematology service, 16 to cardiology, and 2 patients were referred to an allergist for alleged local anesthetic allergy. In some cases multidisciplinary conferences with appropriate consultant physician and nursing services were held to discuss patient care and formulate a plan for management at time of delivery. Potential contraindications to regional anesthesia existed in 29 patients with over half of these being due to hematological reasons and the remaining due to extensive spinal surgery or acquired or congenital spinal deformities.

Discussion: A high-risk obstetrical anesthesia consultation service has many advantages. We have observed improvement in interdisciplinary communication, caregiver education, and improved patient satisfaction through advanced preparation for complicated cases, education and reassurance.

SOAP A70

ENHANCED EPIDURAL LABOR PAIN RELIEF WITH
THE ADDITION OF A SPINAL TECHNIQUE

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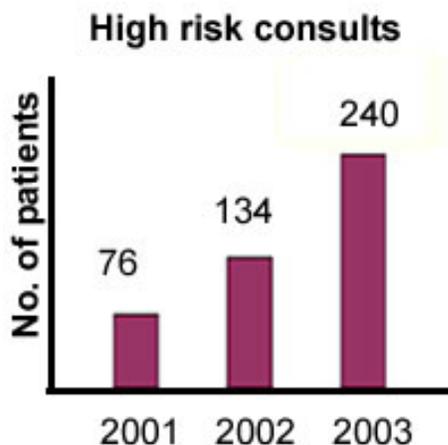
Introduction: Although the combined spinal epidural technique (CSE) offers potential advantages over the epidural and spinal techniques, hemodynamic instability and the inability to confirm the functional status of the epidural catheter are potential risks. A novel solution to realize the benefits and minimize the risks would be to perform the CSE technique, with the placement of medications only in the epidural space. Suzuki et al (1), in patients undergoing knee surgery, demonstrated that this approach yielded faster onset times and improved sacral anesthesia. We speculated that this approach, using analgesic concentrations of local anesthetics, could be beneficial for labor analgesia when compared with the epidural technique alone.

Methods: Following IRB approval, 26 of 40 nulliparous parturients to date, who were less than 5cm dilated, were randomized in a double blind fashion to receive a standardized epidural technique with or without a single dural puncture with a 25G Whitacre needle. Following successful placement of the needle (s) and the epidural catheter, the catheter was dosed with 20 mL of 0.125% bupivacaine followed by an infusion of 0.125% bupivacaine with 0.2 mcg/mL of fentanyl at 10 mL/hr. Onset of analgesia, sensory and motor level, and side effects (hypotension, pruritis, nausea, fetal heart rate changes, PDPH) were recorded.

Results: In demographically similar groups, women with the dural puncture (n = 14) demonstrated a trend towards faster onset (14 vs 25 min, p = .08) and less one sided analgesia (7% vs 33%, p = 0.09) than parturients with standard epidurals (n = 12). No differences were observed in the highest or lowest sensory levels or the onset of sacral analgesia. No side effects were observed in either group.

Discussion: We preliminarily conclude that the addition of a dural puncture to the epidural technique may improve the onset and quality of labor analgesia. We hypothesize that this difference is manifested by epidural medications passing into the intrathecal space.

References: 1. Suzuki et al. Anesth Analg 1996;82:1040-2.



POSTER REVIEW 2

SOAP A71

BIRTH PLANS: WHAT IS IMPORTANT TO THE LABORING PARTURIENT?

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Introduction: With the improvement of obstetric and anesthesia care in the labor ward, pregnant women have developed higher expectations of their care. They are often encouraged to develop a birth plan that physicians and nurses can work towards to ensure a pleasant and satisfactory experience. Original and template guided birth plans are available. We therefore wanted to examine written birth plans to gain insight into the priorities of the parturient.

Method: A retrospective examination of the birth plan log in the delivery suite was examined for years 2002 and 2003. 50 completed birth plans were randomly examined and every request tabulated with its associated frequency.

Result: 150 request points were written down by parturients. The commonest are presented in the table below

Percentage of Birth plan having stated requests (%)	
Breast feed immediately	100
Epidural	90
Father to cut cord	78
Baby placed immediately on abdomen	78
Prefer full mobility during labor	74
Partner's name mentioned	72
Partner to assist baby bath	72
Partner present at first physical	72
Partner present for all procedures	70
Cord blood donor	66
Liquids/ chap stick/ ice chips	60
Water therapy	58
Circumcision	50
Hepatitis B vaccine	48
Lamaze	46
Calm quiet atmosphere	46
No episiotomy	46
Pediatrician Named	42
No visitor sign/minimal visitors	40
Breathing/ relaxation	40
Intermittent monitoring	40
Baby in room at all times	38
Baby in room except when resting	36
Semi-reclined or squatting for delivery	34
Will agree to episiotomy	34

Conclusion: The desire to breastfeed, the availability of epidural analgesia, the role of partners/husbands and the desire for mobility are the most important issues for women presenting in the labor ward of a tertiary center. Nurses, physicians and administrators should note the significance of these requests. Many are easily achievable and may impact improving patient satisfaction and experience on the labor floor.

SOAP A72

A UNIQUE LOSS OF RESISTANCE SYRINGE FOR EPIDURAL NEEDLE PLACEMENT

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Introduction

The loss of resistance technique (LOR) is the most commonly used technique for locating the epidural space. With this technique, the operator's thumb pushes against the syringe plunger to supply pressure. The amount of force to use is an acquired skill that is gained with experience. In order to standardize the force, we have modified the Portex Pulsator LOR syringe so that the intra-syringe pressure during needle placement is provided by a compression spring, not the operator's thumb (see picture). To evaluate the syringe before using it clinically, we tested its performance on closed cell foam and on an anesthetized pig.

Materials and Methods

Experiment 1: The point of a #17 Touhy needle was introduced into closed-cell foam, the experimental syringe was filled with air and attached, and the needle was then advanced until there was a LOR when the needle-tip passed the back end of the foam into air.

Experiment 2: The epidural space of an anesthetized pig in the prone position was located using the experimental LOR syringe filled with air or saline with a #17 Touhy needle.

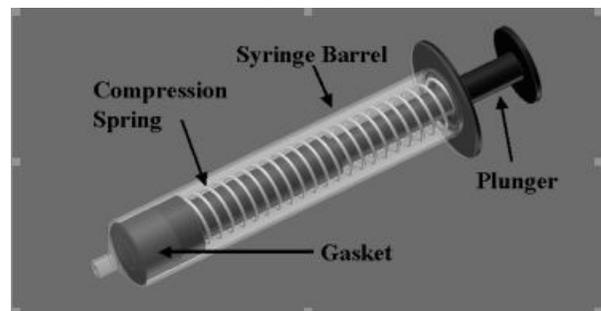
Results

Experiment 1: There was no movement of the barrel of the syringe until the tip of the epidural needle passed through the back end of the closed cell foam. At that point, the syringe barrel moved forward crisply to the end of the syringe.

Experiment 2: When the syringe was filled with air and the needle advanced, there were many false LORs. When the syringe was filled with saline, there were no false LORs and the barrel moved forward quickly when the epidural space was entered. X-rays confirmed epidural placement of the needle tip.

Conclusion

This LOR syringe provides a unique method of placing the tip of an epidural needle in the correct space. Filling the syringe with saline worked much better than using air. This was probably due to a greater incompressibility of saline. Possible advantages of using the compression spring to supply force for epidural needle placement include: the ability to use both hands for manipulating the needle, an objective LOR that is not dependent on operator experience or skill, and that it allows someone teaching the procedure to see when the LOR occurs.



POSTER REVIEW 2

SOAP A73

A PRELIMINARY COMPARISON OF 2 FLEXIBLE, WIRE-REINFORCED EPIDURAL CATHETERS FOR LABOR ANALGESIA AND CESAREAN SECTION: ARE 3 EYES STILL BETTER THAN 1?

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Introduction: An ideal labor epidural catheter design incorporates ease of placement, and consistent and uniformly distributed analgesia. Using these criteria, some studies have shown superiority of multi-orifice, nylon catheters over single-holed, nylon catheters for labor analgesia. This prospective, randomized study compares the efficacy of 2 flexible, wire-reinforced catheters; the Arrow single-holed catheter, and the Portex, 3-holed (lateral-eye), epidural catheter for labor analgesia and C-section.

Methods: With IRB approval, parturients were randomized to receive 1 of 2 flexible wire-reinforced epidural catheters: a single, end-hole catheter (Arrow), or a 3-holed, lateral-eye (Portex) catheter at the time of request for epidural labor analgesia. An initial (15cc) bupivacaine 0.04/fentanyl 1.67mcg/cc bolus was administered followed by 15cc/hr of the same bupivacaine/fentanyl mixture for labor analgesia. Patients were assessed for initial quality of analgesia, inadvertent intrathecal or intravascular placement, bolus rate, catheter failure, need for replacement, and success of analgesia for C-section. Data was analyzed by Chi Square Analysis, where $p < 0.02$ for interim analysis, was considered significant.

Results: To achieve statistical significance, the total number of patients required is 500. We enrolled 150 as of January, 2004. Currently, there appears to be no difference with respect to patient demographics, parasthesias, and unintentional intrathecal or intravascular placements between the groups. Unsuccessful analgesia is defined by initial asymmetric analgesia, breakthrough pain, unilateral blockade, and no blockade. Group A has a 58% successful analgesia rate versus Group B, 47%. The authors remain blinded to the group designations.

Discussion: One reason to explain any differences in catheter function or quality of analgesia between the Arrow and Portex catheters may be explained by differences in catheter stiffness rather than by the number and configuration of the holes. Increased stiffness of an epidural catheter results in increased parasthesias and less success in threading the catheter into the epidural space. A 3-holed, lateral-eye catheter may not be superior to a single hole catheter with respect to quality of analgesia; this is explained by the mechanics of differential flow for slow continuous epidural infusions. Within the current interim analysis, no significant conclusions may be drawn, although there appears to be no clear benefit to a 3-hole design over a 1-hole design, with respect to catheter effectiveness for labor analgesia, using the newer, flexible catheters. No comparison has been made between the flexible catheters and success of analgesia for C-section. Compared to the stiffer, nylon epidural catheter, the flexible, wire-reinforced catheter, regardless of hole number and location, is easier to place, provides less painful parasthesias, and is less often placed intravascularly or intrathecally.

1. J Clin Anesth 1997;9:109-112. 2. BJA 1990;64:183-185

SOAP A74

A 3-DIMENSIONAL MAGNETIC RESONANCE IMAGING MODEL FOR THE ASSESSMENT OF LUMBOSACRAL CEREBROSPINAL FLUID VOLUME

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Introduction: Factors that have been associated with the variable clinical response of spinal anesthesia have been described as dose, baricity, patient positioning, site of injection, body habitus, speed of injection and age.^{1,2} A possible factor associated with variation in the spread of intrathecal local anesthetic may be interindividual variability in lumbosacral CSF volume. A previously developed model to estimate lumbosacral CSF volume was based on segmental digitally-assisted measurements of anterior-posterior intrathecal and spinal cord distances using MRI.² Although limited by a small number of patients, the authors of the model concluded that CSF volume may play an important role in predicting spread of sensory blockade. With advancements in 3-dimensional imaging technology, rapid, precise assessment of lumbosacral CSF volume is now obtainable.

Methods: After IRB approval, lumbosacral images are obtained from consenting human volunteers using a 3D long echo time (TE=198 msec) turbo spin echo sequence with fat suppression. This sequence allows for contiguous (1mm) sagittal images with a high degree of contrast between CSF and the remaining central canal structures. From these MR data, imaging analysis software (Brain Voyager 2000, V 4.9.6.0) utilizing a region growing method is used to calculate CSF volume. A 3-dimensional construct of the CSF without the spinal cord and nerve roots is developed (Figure). An *ex-vivo* validation of this volume analysis was conducted by pouring a known volume of water (1500.0 mL) over a dissected cadaveric lumbosacral spinal cord with nerve roots and calculating the water volume using the MR technique.

Results: We describe a new model for assessing lumbosacral CSF volume. The calculated water volume in the validation experiment was 1488.48 mL, a 1.3% difference from measured value.

Discussion: This new imaging and post-processing technique is being evaluated as a model for determining lumbosacral CSF volume. This will further aid in the understanding of neuraxial anesthesia physiology. We are currently using this model to define the lumbosacral CSF volume variability in women of childbearing age.

References: ¹Reg Anesth, 1991; 16:1-6

²Anesthesiology, 1996; 84:1341-9

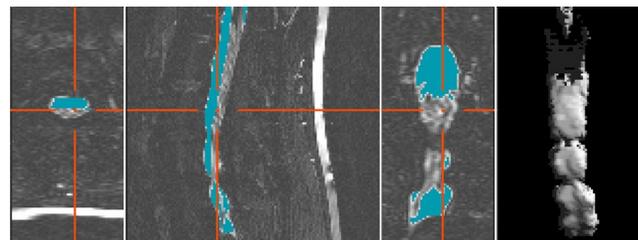


Figure: From left to right; axial, sagittal, coronal and 3-dimensional constructs of lumbosacral CSF

POSTER REVIEW 2

SOAP A75

LABOR NEURAXIAL ANALGESIA AND MATERNAL TEMPERATURE

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Introduction: An increase in maternal temperature during continuous lumbar epidural analgesia (LEA) during labor has been frequently reported^{1,2}. We undertook this study to investigate whether the duration of the neuraxial analgesia had any impact on the increase in maternal temperature.

Methods: We identified two groups of laboring women who received combined spinal epidural (CSE), from our prospective continuous quality improvement (CQI) database. No IRB approval was necessary as no chart reviews were performed. In both groups, analgesia was commenced with intrathecal bupivacaine 2.5mg and fentanyl 25mcg, following which an epidural catheter was inserted. In Group I (catheter used), patients received further analgesia during labor, after the initial intrathecal dose wore off. This was achieved by administering a continuous infusion (bupivacaine 0.125% + fentanyl 2mcg/hr at 10ml/hour), through the epidural catheter, continued till delivery. In Group II, patients delivered without needing further analgesia (catheter not used). Unpaired t-tests were performed to check for significance.

Results: (Table). The two groups were demographically similar, with statistical difference in height and age. Maternal temperature at delivery was significantly higher than maternal baseline temperature in both groups, with the temperature increase being similar in both groups.

Discussion: The difference in age and height were not clinically significant. Epidural infusion after the initial intrathecal block was not needed in Group II as these women were more advanced in their labor and they delivered within the duration of action of the intrathecal bupivacaine. Hence Epidural-Delivery time (and by implication, the duration of the neuraxial block) was shorter in this group. Our observation of a similar, significant rise of maternal temperature in both groups indicates that the neuraxial block itself may result in rise of temperature in laboring women.

Conclusion: The increase in maternal temperature seems to be related to the neuraxial block itself and not to the duration of block. More studies with higher number of patients are needed to elucidate the reason for the rise in maternal temperature.

References. 1. Leiberman E et al. Pediatrics 1997;99:414-9.

2. Kaul et al. Anesth & Analg. 2001;93:986-90

Table: NS=not significant; * =p<0.000 & ** =p<0.01 as compared to baseline

	Group I Mean(SD)	Group II Mean(SD)	P
Number	121	51	
Age(years)	34.2(6.1)	31.9(6.4)	<0.05
Height(cm)	163.3(6.3)	165.73(6.1)	<0.05
Weight(kg)	81.74	78.1(14.9)	NS
Maternal Baseline Temperature(°C)	36.58(0.47)	36.58(0.53)	NS
Maternal Temp@ Delivery	36.86(0.71)*	36.89(0.57)**	NS
Epidural to Delivery time(hours)	5.35(3.89)	1.43(0.92)	<0.000
Cervical Dilation(cm)	3.59(1.35)	6.11(1.66)	<0.000

SOAP A76

EPIDURAL ANALGESIA AND INTRAPARTUM FEVER: DOES BUPIVACAINE CONCENTRATION MATTER?

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Introduction: Lumbar epidurals are associated with development of maternal intrapartum fever, which may produce temporary adverse outcomes in the neonate¹. Studies to date have used bupivacaine concentrations of 0.125% to 0.375%. Intrapartum fever occurred in 12-15% of women receiving these epidurals versus 1-5% of women without an epidural^{1,2,3,4}. The influence of bupivacaine concentration has not been studied. We investigated the incidence of intrapartum fever with low dose epidurals using bupivacaine 0.04%-0.08%.

Methods: With ethical approval we conducted a retrospective chart review of all women labouring at our institution between January and June 2001. We excluded: women with fever or an admission temperature at the upper range of normal, positive or unknown Group B Streptococcal colonization, gestational age <37 weeks, ruptured membranes at <37 weeks gestation or >18 hours before delivery, active infection, diabetes, hypertension, Cesarean or instrumental delivery or labor >12 hours duration. The following data was collected: parity, type of labor analgesia, body temperature (fever defined as >37.9° C) epidural bupivacaine concentration, top ups and whether antibiotics were given if fever developed. Our fever incidence with an epidural was compared to our fever incidence without an epidural, and also compared to 4 similar historical data sets. Statistical analysis applied Fisher's exact test and the two-sided P value. Statistical significance was set at a P value <0.05.

Results: 602 women were included in the study. 414 (69%) received epidural analgesia and 188 (31%) received parenteral narcotics or no analgesia. All epidural solutions included fentanyl 2ug/cc +/- epinephrine 1-2ug/cc in addition to bupivacaine. 351/414 (84.8%) of initial boluses and maintenance infusions contained 0.04% bupivacaine, 10/414 (2.4%) 0.05% bupivacaine, 6/414 (1.4%) 0.06% bupivacaine and 47/414 (11.4%) 0.08% bupivacaine. Intrapartum fever >37.9° C occurred in 15/154 (9.7%) of the nulliparous women and in 7/260 (2.6%) of the multiparous women (P<0.003). Intrapartum fever developed in 22/414 (5.3%) of the epidural group and in 0/188 of the women without an epidural (P<0.003). We compared this data to 4 sets of similar historical data. (1,2,3,4). Our 5.3% incidence of intrapartum fever with low dose epidurals was significantly lower than the 12-15% incidence previously reported (P<0.001).

Conclusion: Reinforcing previous data, we found that labour epidural analgesia and nulliparity are associated with maternal intrapartum fever. However, the use of low dose bupivacaine concentrations (0.04-0.08%) is associated with a significantly reduced incidence of intrapartum fever compared to higher bupivacaine concentrations previously reported.

References: (1) Pediatrics 1997; 3:415-419. (2) Anesthesiology; 1999;90:1271-1275. (3) Am. J. Perinatology 2000; 17:127-130. (4) Obst. Gynecol. 2001; 98:763-769.

POSTER REVIEW 2

SOAP A77 PROPHYLACTIC EPHEDRINE AND FETAL HEART RATE DECELERATIONS AFTER CSE

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Introduction: Fetal heart rate decelerations have been identified as a potential complication of combined spinal epidural (CSE) analgesia for labor. The incidence of this complication has been estimated between 12-18% although the incidence of emergency cesarean delivery is not elevated¹. The etiology of the decelerations that occur after CSE is controversial and the nature of these changes in fetal heart rate has not been reported. Moreover, the effect of prophylactic intramuscular ephedrine on fetal heart rate has not been studied in a controlled manner. To examine this effect, we studied the effect of prophylactic intramuscular ephedrine given just prior to CSE.

Methods: In a double blind, randomized trial, we administered either ephedrine 25 mg, or saline by intramuscular injection to 100 parturients immediately prior to receiving CSE (bupivacaine 2.5 mg and fentanyl 20 microg) for labor analgesia. The women were of mixed parity; hypertension and cardiovascular disease were exclusion criteria. An obstetrician who was blinded to treatment group, evaluated the fetal heart rate using archived fetal heart rate recordings from 1 hour prior to- and 1 hour after the CSE. NIH consensus guidelines were used for fetal heart rate evaluation. If a deceleration occurred, the patient was treated with oxygen, position change, fetal stimulation and intravenous ephedrine.

Results: In the control group (no ephedrine), there was an increase in the number of variable decelerations ($P<0.03$) and the incidence and number of late deceleration ($P<0.005$, 0.01) during the hour after CSE. Uterine contraction rate was also slowed slightly in the control group ($P<0.02$). In the prophylactic ephedrine group, the fetal tracings had more variability, reactivity and accelerations after the CSE then before ($P<0.01$, 0.001, 0.001). Variable decelerations, but not late decelerations were also increased after CSE in the ephedrine group ($P<0.001$, NS). The baseline fetal heart rate and the incidence of fetal tachycardia ($HR>180$) were elevated after CSE in the ephedrine group ($P<0.001$, 0.001). No patient from either group required emergency cesarean section during the study period.

Discussion: The majority of decelerations identified after CSE analgesia were variable and late decelerations. Prophylactic ephedrine prevented the increase in late, but not variable decelerations. The fetal tracings appeared more reassuring in the patients who received prophylactic ephedrine based on variability, reactivity and number of accelerations per hour. However there was a 12% incidence of fetal tachycardia and a significant increase in baseline heart rate when the mother had received prophylactic ephedrine. Ephedrine clearly crosses the placenta and likely increases fetal heart rate through a direct action. It is less clear why variability, reactivity and number of accelerations would be increased. It is possible that these signs of fetal well being are based on improved uteroplacental perfusion in women who received prophylactic ephedrine.

SOAP A78 RELATIONSHIP BETWEEN THE CHANGES IN THE AUTONOMIC NERVOUS SYSTEM AND SOMATOSENSORY BLOCK LEVELS AFTER EPIDURAL ANALGESIA IN LOBORING PATIENTS

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INTRODUCTION: Epidural analgesia for labor pain results in a somatosensory block as well as a functional sympathectomy. The somatosensory block, essential for pain relief, is typically evaluated by sensation to ice or pinprick, while autonomic nervous system changes are largely recognized by changes in heart rate and blood pressure. No clear relationship between the progressions of these two processes has been established to date even though a high somatosensory block is often associated with hemodynamic instability due to changes in autonomic tone. Thus, the objective of this study was to use heart rate variability (HRV) and blood pressure variability (BPV), as markers of autonomic tone, to determine the relationship between changes in parasympathetic and sympathetic outflow and the progression of the sensory block with loss of sensation to ice following epidural anesthesia.

METHODS: With hospital ethics approval, beat-to-beat R-R intervals and non-invasive continuous blood pressure were obtained and saved on a computer for analysis of HRV and BPV in 12 laboring patients. Baseline ECG, BP, respiratory rate, and fetal heart rate were recorded for 10 minutes before 20 ml of 0.125% bupivacaine and 50 mcg of fentanyl were injected through the epidural catheter. The measurements were repeated for 10 minutes after the block, and sensory block levels were measured bilaterally with ice at 2 minutes intervals. Analysis of HRV and BPV was obtained by Wavelet Transform every 2 minutes post-epidural. Wavelet Transform allows for the analysis of rapidly changing heart rate and blood pressure. Changes in high-frequency power of HRV have been shown to indicate changes in parasympathetic activity, while changes in BPV have been correlated to changes in sympathetic activity.

RESULTS: The sensory block level increased steadily with time post-epidural analgesia to a mean height of T9 level. This increase in block level was nicely reciprocated by a progressive decrease in sympathetic activity as estimated by the total power of BPV. Conversely, there was an abrupt one-step increase in high frequency HRV following epidural analgesia indicating an increase in parasympathetic activity. Absolute levels for heart rate, blood pressure and respiratory rate remained stable before and after epidural for labor pain. No fetal heart rate deceleration was observed post epidural.

DISCUSSION: We conclude that the gradual increase in height of the sensory block after epidural analgesia correlates well with the decrease in sympathetic activity as observed by the decrease in BPV. Such a tight relationship was not found with the changes in HRV, which reflect changes in parasympathetic activity. Therefore, analysis of BPV after epidural analgesia can give information concerning the extent of sympathectomy, which is often the cause of hemodynamic instability, and could potentially be used as predictors of the level of somatosensory block.

POSTER REVIEW 2

SOAP A79

COMBINED SPINAL EPIDURAL VERSUS EPIDURALS, ASSOCIATION OF SEVERE FETAL BRADYCARDIA WITH HIGH DISTRESS LEVEL DURING LABOR.

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INTRODUCTION: Controversy exists whether combined spinal epidural analgesia (CSE) causes more fetal bradycardia than epidurals. We postulated that high levels of sympathetic tone (pain or distress) combined with high circulating oxytocin are ideal conditions for fetal bradycardia. CSE can cause a rapid withdrawal of sympathetic tone and unopposed uterine contractions resulting in fetal bradycardia. Epidurals may result in a more gradual withdrawal with less deceleration. Before testing this hypothesis, prospective data were collected to verify the relationship between distress level, inductions, CSE and epidurals.

METHODS: We collected data on 224 patients receiving CSE (124) or an epidural (100). Decision to give a CSE or an epidural was based on clinical judgment and on preferred technique. CSE contained bupivacaine 1.25 mg and fentanyl 25 mcg. Epidurals consisted of 20 to 25 mg of bupivacaine with 50 mcg of fentanyl. We also recorded age, parity, gestational age, cervical dilatation, distress scores (0= no distress, 10=maximal distress) and the dose of exogenous oxytocin. Blood pressure (BP) and fetal heart rate (FHR) were recorded at baseline and every five minutes for 15 minutes. Only severe fetal bradycardia requiring interventions such as ephedrine, sublingual nitroglycerin, or vaginal stimulation were counted. Data are presented as mean \pm SD. Statistical analyses included the Fisher's exact test, the Mann-Whitney test, the unpaired t-test or linear correlation where appropriate. A p value of <0.05 was considered significant.

RESULTS: Severe fetal bradycardia occurred in 14 of the 224 patients and was more prevalent in CSE than in the epidural group (9.35%(12) vs 2%(2), RR=1.607, CI=1.253-2.061). FHR decreased from 135 ± 10 to 83 ± 11 , $p<0.0001$. Distress scores were higher in the 14 parturients with fetal bradycardia (9 ± 1.6 vs 7 ± 1.7 , $p=0.001$), but also higher in the CSE group compared to the epidural group (7.9 ± 1.4 vs 6.4 ± 1.9 , $p<0.0001$). There was no difference in the induction rates between the CSE and epidural groups, and no increase in fetal bradycardia in the induction group. CSE was associated with a greater cervical dilatation than epidurals ($4.2\text{cm}\pm 1.75$ vs $3.5\text{cm}\pm 1.59$, $p=0.0018$). Blood pressure remained clinically stable after regional analgesia. Parturients with fetal decelerations were older (35 ± 5 vs 31 ± 5 years). However, no correlation was found between age and distress scores. Also, no difference was found with gravid, gestational age, parity and ethnicity.

CONCLUSIONS: The results agree with our hypothesis that high sympathetic tone (high distress scores) is associated with increased fetal bradycardia. It cannot be concluded, however, that CSE per se causes more fetal bradycardia. The theory that exogenous oxytocin increased the chance of fetal bradycardia was refuted. Randomizing patients with high distress level to either epidurals or CSE should help to clarify which factor has the most impact on the occurrence of fetal bradycardia.

SOAP A80

PREDICTING PROLONGED FETAL HEART DECELERATION WITH INTRATHECAL BUPIVACAINE/FENTANYL

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Introduction: Fetal bradycardia has been associated with intrathecal bupivacaine/fentanyl with uterine tetany as the proposed mechanism. We postulated that it is possible to predict which parturient will develop a prolonged deceleration by examining the progress of labor and maternal demographics.

Methods: In a retrospective fashion, all patients receiving intrathecal bupivacaine(2.5 mg)/fentanyl(25 ug) by a CSE technique from 8/03 to 12/03 were reviewed. All patients received a cervical exam prior to CSE placement. Maternal height, weight, and vital signs at placement were recorded. Cervical dilation, station, effacement, and use of pitocin at placement were also recorded. A prolonged deceleration was defined as a fetal heart rate of 100 or less lasting 2 or more minutes. Statistical analysis included students t-test and chi-square.

Results: A total of 31 patients are included in this on-going study. Of these, 13 patients developed a prolonged deceleration. The average fetal heart rate deceleration was 75 ± 18 bpm for 4.2 ± 2.4 min. Of the decelerations, one patient required terbutaline and three required ephedrine. The rest resolved with oxygen and change in maternal position. Table 1 shows maternal demographics and table 2 shows the progress of labor at placement. The statistically different difference was in station ($p=0.008$). The odds ratio for fetal station of 0 or less and prolonged deceleration is 18.8 (95% Confidence Intervals, 1.9 - 178.8).

Conclusions: A fetal station of 0 or less has a significantly higher risk of the fetus developing a prolonged deceleration. This information should be considered when performing the CSE with bupivacaine/fentanyl.

References: (1)Mardirosoff C. BJOG 2002;109:274-81.
(2)Friedlander JD. Reg Anesth 1997;22:378-83.

	Maternal Demographics	
	Prolonged Deceleration (n=13)	No Prolonged Deceleration (n=18)
Maternal Height (cm)	164.9 \pm 5.8	165.5 \pm 7.0
Maternal Weight (kg)	84.1 \pm 15	82.5 \pm 17.2
Maternal Age (yrs)	26.3 \pm 6.1	29.2 \pm 6.2
Mean Maternal Blood Pressure (mmHg)	96.1 \pm 13.0	90.1 \pm 11.2
Maternal Heart Rate (bpm)	91 \pm 14	89 \pm 10
Maternal Temperature (C)	36.7 \pm 0.4	36.7 \pm 0.4

	Progress of Labor at Placement	
	Prolonged Deceleration (n=13)	No Prolonged Deceleration (n=18)
Pitocin	4/9	6/12
Cervical Dilation (cm)	5.8 \pm 2.0	6.2 \pm 2.0
Fetal Station 0 or less	11/13	11/18
Effacement (%)	87 \pm 14	81.1 \pm 26

POSTER REVIEW 2

SOAP A81
EFFICACY OF PROPHYLACTIC EPIDURAL BLOOD PATCH

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Introduction: Rates of post dural puncture headache (PDPH) in parturients after unintentional dural puncture with an epidural needle are 70% or greater (1,2). Epidural blood patch has been shown to relieve PDPH in up to 95% of patients. For the last 12 years, our department has offered parturients in whom there have been known accidental dural puncture the option of a prophylactic epidural blood patch (PEBP). Our study reviewed CQI records and patient charts to determine the efficacy of PEBP.

Methods: Our institution's IRB policies were followed. CQI records collected between 1993 and the present identified 37 instances of a PEBP administered through the epidural catheter at the conclusion of the patient's labor. Our forms also tracked development of headache and therapies offered for two to five days after the dural puncture, as well as the development of further complications. Failure of the prophylactic patch was defined as the development of a severe postural headache within 24 to 96 hours after the patch. Additional data collected on CQI forms and chart review are patient age, height, weight, level of dural puncture, level of subsequent catheter, loss of resistance (LOR) with air or saline, time elapsed until PEBP, and volume of blood administered. Data will be collected through April, 2004.

Results: Preliminary analysis shows that out of 37 patients who received a prophylactic patch, 14 developed a severe postural headache. This proportion (37.8%) is significantly lower than the published incidence of headache in patients with untreated accidental dural puncture (Z-statistic = 4.27, p-value < 0.0001). No significant difference in blood volume, age, or weight was observed between patients who did develop headache and those who did not. Through logistic regression, a secondary analysis will reveal whether the additional variables of LOR medium and time elapsed until PEBP affect the likelihood of a severe postural headache. No complications were observed.

Discussion: The symptoms of a PDPH can make it difficult for the patient to provide care for a newborn. Given our conclusions and lack of complications, patients with known accidental dural puncture should be offered PEBP as standard of care. Additional procedures, expense, and debilitating symptoms may be significantly decreased.

References: 1. Crawford JS: Br. J Anaesth 1972; 44: 66-74 2. Colonna-Romano P, Shapiro BE: Anesth Analg 1989; 69: 522-3

SOAP A82
SHOULD WE OFFER EPIDURAL-PCA ANALGESIA WITH AMBULATION FOR MULTIPARAE FOR LABOR PAIN?

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Introduction: We have recently shown in a study of ambulating laboring primiparous and multiparous patients that ropivacaine 0.04% + sufentanil 1 mcg/ml + epinephrine 2 mcg/ml provided adequate analgesia with minimal hypotension, motor block and bladder catheterization. However, it has been the impression of our staff that multiparae have a shorter labor duration and may not benefit from the time consuming epidural analgesia with ambulation. We have, therefore, compared the benefits of epidural analgesia with ambulation in primiparae with the benefits in multiparae to learn whether the latter do benefit from this procedure.

Methods: Following IRB approval and informed consent 408 patients who received epidural-PCA analgesia with ambulation for labor pain were included. Group I (n=221) primiparae. Group II (n=187) multiparae. All patients received ropivacaine 0.04% + sufentanil 1 mcg/ml + epinephrine 2 mcg/ml and were allowed to ambulate. After epidural needle insertion all patients received 10 ml study solution. Five minutes later, after catheter insertion, patients received an additional 10 ml study solution, followed by initial infusion rate of 4 ml/hr, PCA dose 4 ml, lockout 10 min (Abbott pump). Patients were evaluated and treated every hour for pain and side effects of the epidural medications. Data were expressed as mean \pm SD; p < 0.05.

Results: The total infusion time was 371 ± 267.6 and 315.6 ± 209.7 minutes for Group I and II respectively (p < 0.03). Of 221 primiparae, 134 (60.6%) ambulated. Of 187 multiparae patients, 109 (58.3%) ambulated. The duration of ambulation was 43.8 ± 50 and 39.2 ± 52.7 minutes for Groups I and II respectively. The incidence of side effects was similar among the groups.

Conclusion: Even though the total epidural infusion duration was shorter for multiparae, there was no difference among the groups with respect to ambulation and ambulation duration. Multiparae should be offered continuous epidural-PCA with ambulation when required for labor pain.

POSTER REVIEW 2

SOAP A83

EPIDURAL BLOCK FOR CESAREAN SECTION WITH GRAVITY FLOW TECHNIQUE: DOES THE ADDITION OF EPINEPHRINE TO ROPIVACAINE REDUCE THE INCIDENCE OF EPIDURAL BLOOD VESSEL PUNCTURE?

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Introduction: We initiate epidural block via needle by gravity technique & then inserted the catheter¹. We have shown that epinephrine (E) affects systemic absorption of epidural opioids².

Methods: To determine whether the addition of E to epidural ropivacaine (R) administered by gravity via needle into the epidural space is associated with fewer epidural vessel punctures by the catheter, we conducted a prospective, randomized double blind study of 300 consenting C/S pts receiving lumbar epidural block. Group (G) I (n=150) received R 0.75% with fentanyl 5 mcg/ml; GII (n=150) received R 0.75% with E 5 mcg/ml & fentanyl 5 mcg/ml. Both groups received the anesthetic solution by gravity into the needle via 22" extension tubing before insertion of the "Braun" 18 g closed-end catheter 5 cm into the epidural space. All pts received 3, 5, 5 & 5 ml of the anesthetic solution administered by gravity through the needle, followed by catheter insertion & injection of 3 ml to a total of 21 ml. Values are mean \pm SD.

Results: Groups did not differ in time to pain score >5, time to recovery from motor block, overall satisfaction, distance of epidural space from skin, incidence of pruritus, N&V. 19 & 8 pts complained of sedation in GI & GII respectively (p<0.04). Time to incision was 43 \pm 8 & 41 \pm 8 min for GI & GII respectively (p<0.05). Time to end of surgery was 95 \pm 25 & 88 \pm 29 minutes for GI & GII respectively (p<0.02). GI required more additional local anesthetics than GII to achieve satisfaction (1.9 \pm 3.7 ml vs 0.6 \pm 2.7 ml, p<0.0006). There were 14 pts in G I and 4 in G II for whom the epidural block alone did not provide satisfactory analgesia (p<0.05). Apgars in GI & II were high and similar at 1 & 5 minutes. All pts had satisfactory epidural-PCA analgesia for post C/S pain.

Conclusions: The addition of E to epidural R solution for C/S via the needle is associated with fewer epidural blood vessel punctures, fewer readjustments or reinsertions of the catheters, improved quality of the block, less sedation, shorter time to incision & surgery duration without affecting time to return of pain, recovery of motor block or overall satisfaction.

	Epidural Catheter Problems					
	Difficult Insertion	Blood Vessel Puncture (%)	Dural Puncture (%)	Readjustment (%)	Reinsertion (%)	Paresthesia (%)
Group I	8 (5.3)	27 (18)	0 (0)	28 (19)	12 (8)	60 (40)
Group II	4 (2.7)	6 (4)*	1 (0.7)	7 (4.7)*	3 (2)**	52 (35)

Group I > Group II, *p<0.00001; p<0.04

SOAP A84

IS REGIONAL ANESTHESIA SAFE FOR CESAREAN SECTION IN SEVERE PREGNANCY INDUCED HYPERTENSION?M. N. Siddiqui¹, S. Ranasinghe², J. L. Steadman², S. M. Siddiqui², T. Toyama²¹Fairview Hospital, Great Barrington, MA, ²Jackson Memorial Hospital/University of Miami, Miami, FL

Introduction: Use of regional anesthesia (RA) for a cesarean section in severe pregnancy induced hypertension (PIH) is controversial. Our anecdotal experiences make us believe that RA is effective and safe for CS in severe PIH. The objective of this study is to find out the safeness of regional anesthesia for cesarean section in severe PIH.

Method: This is a retrospective data analysis of four hundred and sixty five patients admitted to the obstetric floor with the diagnosis of severe PIH had cesarean section under either epidural or CSE anesthesia. The diagnosis of PIH was based on either a blood pressure above 160/100 or the presence of 5mg/24 hrs. or more proteinuria. All the patients were placed on Magnesium Sulfate. One hundred and ninety eight out of four hundred and sixty five patients had catheter placed on the floor and two hundred and sixty seven had CSE anesthesia using needle through needle technique in the OR. Mg++ was stopped before the administration of anesthesia, and restarted once the surgical anesthesia was achieved and vital signs were stable. Vital signs were monitored in accordance with ASA guidelines. Fetal Heart Rate was monitored during administration of spinal and epidural anesthesia.

Result: There is no significant demographic data difference between the epidural and CSE groups.

Patients in the epidural group required an average of 18 \pm 6 ml of 2% Lidocaine to achieve a T-4 sensory level to pin prick. The CSE group required of 7.88 \pm 0.96 mg of bupivacaine intrathecally. Seventy-seven patients in the CSE group achieved T 4 level with spinal medication, 5 patients required 4 – 6 ml of 2% Lidocaine epidural supplement to achieve T – 4 sensory level to pin prick. Fourteen patients in the CSE group had a 20% decrease in SBP or MAP within the first ten minutes after spinal injection, requiring multiple treatments with vasopressors. The average amount of ephedrine used to prevent and treat hypotension was 25 \pm 3.6 mg and 29.5 \pm 4.1 mg in the epidural group and CSE group respectively. The average amount of Phenylephrine utilized for the treatment of hypotension was 135 \pm 35 and 146 \pm 39 mcg in the epidural group and CSE group respectively.

There was no single case of failed spinal or failed epidural anesthesia. None of the patients were converted to general anesthesia. There was no incidence of nonassuring FHR secondary to decrease in MAP. None of the patients had any complications in the OR, post-anesthesia care unit, or on the floor.

Conclusion: This retrospective study confirms our anecdotal experience that Regional anesthesia is a safe anesthetic technique for C/S in PIH.

POSTER REVIEW 2

SOAP A85

DOES CHLOROPROCAINE INHIBIT THE ACTION OF OPIOIDS?

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Introduction: The objective of this study is to compare the effectiveness of the epidural Fentanyl and epidural Preservative Free Morphine Sulfate for post-operative cesarean section pain control after epidural anesthesia with 3% Chloroprocaine vs. 2% Lidocaine.

Methods: After Institutional Review Board (IRB) approval, retrospective analysis of data from two hundred and eighty two patients who underwent cesarean section with epidural anesthesia using 2% Lidocaine or 3% Chloroprocaine was performed. Both groups received preservative free morphine sulfate (PFMSO4) for post-operative pain relief immediately after the delivery. There were 144 patients in the 2% Lidocaine group (LG) and 138 patients in the Chloroprocaine group (CG).

Following collected data was reviewed

Demographic data

Time interval between first complaint of post-operative pain and epidural fentanyl administration in the OR.

Time interval between first complaint of post-operative pain and epidural PFMSO4 administration in the OR.

Time interval between first complaint of post-op pain and epidural 2% Lidocaine or 3% Chloroprocaine administration in the OR.

The unpaired Student's *t* test was used to analyze data.

Result: There is no significant statistical difference in demographic data of both groups. The number of patients reporting postoperative pain was higher in the CG group (21 patients) compared with the LG group (7 patients) (*p* 0.01). Time interval between the end of the surgery and onset of postoperative pain was 61.43 min. in CG vs. 190 in LG (*p* 0.00). Time interval between the last dose of epidural anesthesia and first c/o pain was 155.7 ± 3 min. in CG vs. 266.7 ± 5.92 min. in LG (*p* 0.036). Time interval between the administration of fentanyl and the first c/o pain was 162.7 ± 30.66 min. in CG vs. 286.7 ± 5.77 min. in LG (*p* 0.017). Time interval between administration of epidural PFMSO4 and first c/o pain 118.6 ± 40.14 min. in CG vs. 236.3 ± 7.76 min. in LG (*p* 0.073). Most of the patients in LG group (6 out of 7 patients) responded well to a single treatment with 5 to 10 mg of Nalbuphine. Fifteen patients in CG responded to single treatment with 5 – 10 mg of Nalbuphine IV, while six required IV morphine also for pain management due to poor response to IV Nalbuphine. When pain medication was switched from Nalbuphine to IV morphine, the CG group responded well.

Discussion: We believe the high incidence of post-operative pain after chloroprocaine is neither due to pH influence nor receptor antagonism. The existence of a window period wherein PFMSO4 is not yet reached its peak effect while both the chloroprocaine and epidural fentanyl effects are worn off due to their shorter duration of action.

Reference:

Anesth Analg 1991 Aug; 73(2): 119-23
Anesthesiology 1990 Nov; 73(5): 860-3

SOAP A86

TRENDS IN INTRA-PARTUM BLOOD TRANSFUSION AT PARIS PORT-ROYAL MATERNITY 1995-2003

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Introduction: Obstetric hemorrhage remains the first significant and avoidable cause of maternal mortality and morbidity in France. Blood transfusion may be life saving but involves exposing the patient to additional risks. The aim of this study was to identify obstetric conditions in intra-partum transfused patients, appraise the justification for the transfusion and discuss trends over time in our transfusion clinical practice.

Methods: All case records of obstetric patients transfused at Port-Royal Hospital between the period 1st January 1995 and 31 December 2003 were reviewed. Data collected prospectively from our database included obstetric and medical conditions, mode of delivery, amount of blood-transfused (packed red blood cells PRBC, fresh-frozen plasma FFP, and platelets), transfusion thresholds, and perinatal morbidity. The effects of potential risk factors on blood loss and transfusion requirements were analyzed.

Results: These are preliminary datas. There were 31,159 cases out of which 263 were transfused during parturition. The overall transfusion rate was 0.8%. Mean age was 32.6 ± 5.7 years (range 18-49 years), mean gestational age was 36 ± 4, nulliparous/multiparous ratio was 52/48. Last available pre-partum hemoglobin value was 10.7 ± 1.7 mg/dl. 238 patients were transfused with PRBCs (mean 3.6 ± 2.9 units, median 2 units), 52 with FFP (mean 4.9 ± 5.5 units, median 3 units), and 19 with platelets. 31 patients were transfused before delivery. Lowest per-partum hemoglobin value before PBRC transfusion was 6.5 ± 1.1 mg/dl. Obstetric conditions in the transfused patients were vaginal delivery (55%) or cesarean section (45%), either elective (20%) or urgent (80%). Post-partum hemorrhage required sulprostone treatment for 127 patients, radio-interventional uterine arterial embolisation in 27 cases, surgical arterial ligations in 13 cases, and finally 10 hysterectomies. While transfusions thresholds were decreased over time, blood transfusion requirement increased, probably related to an increased risk of peripartum hemorrhage observed in our unit and related to an increased incidence of cesarean section, prior cesarean delivery, and placenta praevia and accreta.

Discussion: Further analysis of our exhaustive datas are currently under progress to evaluate trends and impact of our transfusion policy on peripartum morbidity, and will be discussed during the meeting.

POSTER REVIEW 2

SOAP A87

CESAREAN SECTION FOR PLACENTA PREVIA (PP): A 10-YEAR RETROSPECTIVE STUDY

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INTRODUCTION: The aim of this study was to evaluate risk factors, anesthetic management, blood transfusion and maternal morbidity of 197 consecutive Cesarean Section (CS) performed for placenta praevia in our institution during a 10 year period.

MATERIAL AND METHODS: Analysis of our prospectively collected perinatal database of cesarean section performed for placenta praevia in Port-Royal (≈ 3500 delivery/year) from 1993 to 2002 was realized. Following information was recorded for each patient: gestation, parity, number of previous CS or uterine surgery, position of placenta, nature of surgery (elective or emergent), anesthetic technique, estimated blood loss, perioperative Hb levels and blood transfusion, and maternal and fetal morbidity. Blood loss was evaluated by the usual formula: $85 \text{ ml/kg} \times \text{weight} \times ((\text{preopHt} - \text{H48 Ht})/\text{preopHt})$.

RESULTS: 197 consecutive cases of PP progressing to CS were identified and analyzed (incidence of 0.7%). Incidence of PP and placenta accreta increased with time, maternal age, and uterine scar. An increased use of regional anesthesia was observed over time. Blood transfusions were required for 15% of parturients.

	Regional Anesthesia (n=59)	General Anesthesia (n=138)
Age (y)	34 \pm ;5	33 \pm ;4
Patients with prior CS	23%	30%
Patients with uterine scar	55%	61%
Preoperative Hb level (mg/ml)	11.2 \pm ;1.2	11.3 \pm ;1.3
Fetal gestational age (wk)	36 \pm ;3	35 \pm ;3
Placenta Accreta/Percreta (n)	3	28
Transfusion required (%)	4%	20% *
Postoperative Hb level (mg/dl)	10.3 \pm ;1	9.3 \pm ;1.2 *
Estimated blood loss (ml)	481 \pm ;399	1215 \pm ;1086 *
Hysterectomy/Embolisation (n)	1/1	8/6
Sulprostone (n)	7	26
Apgar 5 ^o	9.1 \pm ;1.8	8.1 \pm ;2.6
Maternal transfer to ICU (%)	16%	39% *
Neonatal death (n)		

* p<0,05

CONCLUSION: Yet based on a retrospective analysis with bias, it seems that general anesthesia increased intraoperative blood loss and transfusion requirements. Regional appeared to be a safe alternative, except for high probability of placenta accreta and emergent CS.

SOAP A88

LABOR EPIDURAL CATHETER-IN-SITU FOR POSTPARTUM TUBAL LIGATION SURGERY - A REVISIT

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Introduction: Epidural catheters placed for labor and delivery analgesia are often reactivated in the postpartum period for tubal ligation surgery. The success rate of epidural catheter reactivation is reported to be 74-92%,¹⁻³ although controversy exists regarding the optimal timing of surgery for epidural anesthesia success. This study was conducted to compare the success of epidural catheter reactivation for postpartum tubal ligation (PTL) in patients delivering less than, or more than, 6 hours from the time of surgery. In addition, anesthesia and operative times were compared in patients with preexisting catheters to those who had general (GA) or spinal anesthesia (SA) for PTL.

Methods: Patients scheduled for PTL were prospectively analyzed from 2/03-12/03. In patients without preexisting epidural catheters, GA or SA was selected at the anesthesiologist's discretion. In patients with preexisting labor epidural catheters, the catheters remained in-situ until surgery. After a negative test dose, catheters were reactivated with 3% 2-chloroprocaine in 3-5 ml increments up to 30 ml. For block asymmetry, the catheter was withdrawn to 3 cm in the epidural space and additional local anesthetic (usually 10 ml) was given. Patients with preexisting epidural catheters were divided into 2 groups based on the delivery to surgery time interval; early EPTL occurred <6 hours from delivery and late EPTL >6 hours from delivery. The outcomes measured included: success of epidural catheter reactivation, anesthesia time, OR time, and time from entering OR to incision.

Results: Of the 407 patients evaluated, 317 patients had pre-existing epidural catheters (149 early EPTL and 168 late EPTL). In the 90 patients without epidural catheters, 68 underwent GA, and 22 SA. Demographics were similar among groups. The overall epidural reactivation success rate was 87%; with 94% for early EPTL compared to 80% for late EPTL group (p<0.01). Of the 51 epidural catheters that failed, 72% of patients received general anesthesia, 19% spinal anesthesia and 9% had surgery cancelled. The patients with preexisting epidural catheters had longer total anesthesia times (77m vs 65m GA, 57m SA) but shorter total OR times (44m vs 56m GA, 50 m SA) or anesthetic related OR times (15m vs 29m GA, 25m SA), when compared to patients with GA or SA from the start.

Discussion: Epidural reactivation success is improved with early EPTL, similar to other reports.¹⁻³ At our institution, nurse anesthetists dose the epidural catheters in the holding area, making the actual OR time shorter in those with preexisting catheters, but the total anesthetic time longer when including the time for epidural dosing in the holding area. Sub-analysis of patient characteristics may provide further insight into which epidural catheters are most likely to succeed for PTL.

Reference: 1. J Clin Anesth 1993;5:289-91. 2. J Clin Anesth 1995;7:380-83. 3. RAPM 1989;23(3):258-61.

POSTER REVIEW 2

SOAP A89 SURVEY OF LABOR IV PCA PRACTICES AMONG SOAP 2003 PARTICIPANTS

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Introduction: Analgesia in labor, when neuraxial analgesia is either unavailable or contraindicated, is often poorly managed and may result in unnecessary pain or danger to this subgroup. Due to the lack of information or guidelines on the safety and efficacy of IVPCA for labor analgesia, the practice of IVPCA for laboring parturients varies widely among individual practitioners, institutions and geographic locations. The purpose of this study is to survey the practice of labor IVPCA among the obstetrical anesthesiologists attending SOAP 2003.

Method: After institutional IRB approval, survey forms were distributed to the participants and collected at SOAP 2003. The survey form consisted of a 2-page questionnaire with multiple choices and areas for comments. The key areas of investigation for labor IVPCA included: practice demographics, whether a formal/informal IVPCA protocol exists, drug of choice, use of basal infusion, range of doses used, use of (hourly or 4-hourly) limits, monitoring practices, and the immediate presence of anesthesiologist to L/D suite.

Results: There was a total of 427 attendances for the SOAP 2003 according to SOAP headquarter data. 370 survey forms were distributed, and 155 forms were received back, with a 42% response rate. With the interim data analysis, 45% participants did not have a labor IVPCA protocol of any form (either verbal, informal or written), and 72% did not have a written or formal protocol/guideline for labor IVPCA at their institutions. If labor IVPCA was used, over 90% participants chose fentanyl; but 27% of them included the use of a basal infusion in the IVPCA. However, the range of loading doses, demand doses, lock out times and hourly limits varied widely. 65% participants allowed start of IVPCA at any stage of labor or cervical dilatation and 75% allowed continuation of IVPCA through 2nd stage of labor. Over 30% participants reported not requiring routine pulse oximetry monitoring on all parturients receiving IVPCA. The person most likely responsible for monitoring oximetry (continuous or intermittent) was reported to be the labor nurse. Not all anesthesia providers were at the L/D suite, but most reported to be at least in hospital. Only 6/10 of the participants have neonatologists to be present at all delivery of parturients receiving IVPCA.

Discussion: The preliminary results indicated a wide range of practices in labor IV PCA. The wide variation may indicate lack of information and guidelines, as well as areas for potential risks and errors. Because the rarity of labor IV PCA in practice, it is even more important to have guidelines and safety recommendations to minimize untoward outcomes. The final analysis and presentation of the results should stimulate further discussion, research and improvements in this area.

SOAP A90 INTRATHECAL MORPHINE FOR ANALGESIA FOLLOWING POSTPARTUM BILATERAL TUBAL LIGATION

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Introduction: Postpartum bilateral tubal ligation (PPBTL) is associated with considerable postoperative pain. In our institution spinal anesthesia (SA) is routinely used for this procedure using hyperbaric bupivacaine with added fentanyl. As the neuraxial sensory blockade recedes in the postanesthesia care unit (PACU), patients experience progressively increasing pain which can impair their ability to ambulate and look after their newborns. The aim of this study is to determine if the addition of 50 mcg intrathecal morphine (ITM) would provide improved postoperative analgesia with a satisfactory side effect profile compared to SA without ITM.

Methods: After IRB approval and written informed consent, 65 women scheduled to undergo PPBTL were enrolled in this double-blind, prospective, randomized controlled trial. Patients were randomly assigned to receive SA with 1.7 ml hyperbaric bupivacaine 0.75 % + 20 mcg intrathecal fentanyl + either 0.1 ml of preservative free 0.9 % saline or 50 mcg ITM. Patients received ketorolac 30 mg IV prior to performing the SA, and preincisional infraumbilical skin infiltration with 5 ml 0.5 % bupivacaine. Pain at rest, pain on movement, pruritis, and nausea were measured by continuous VAS scores ranging from 0 to 100 at hours 0, 4, 12, and 24 postoperatively. These scores were compared in separate repeated-measures ANOVAs with group, time, and group x time effects on log-transformed scores. Post-hoc group comparisons at separate times were done with Wilcoxon Rank-Sum tests on raw scores, and adjusted for multiple comparisons with the Bonferroni method. Sedation was measured at the same periods on a categorical scale 0, 1, or 2, and was compared with a Cochran-Mantel-Haenszel test. Satisfaction with postoperative analgesia, number of rescue medications, and time to first rescue medication were compared by a single Wilcoxon test.

Results: Eight women were excluded because of protocol violations. Of the remaining 57 patients, 28 received SA with ITM and 29 without ITM. Overall, satisfaction was higher ($p=0.0025$), and pain was lower both at rest ($p=0.0081$) and on movement ($p<0.0001$) in the group receiving morphine. There was no significant difference overall in nausea, pruritis, or sedation between the groups. In post-hoc comparisons at specific times, for the morphine group pain at rest was significantly lower at 4 hours ($p=0.006$); pain on movement was significantly lower at 4 ($p=0.002$) and 12 hours ($p=0.0004$); and pruritis was significantly higher at 12 hours ($p=0.002$) compared to the other group. The number of percocet tablets used for rescue analgesia was significantly lower ($p=0.006$) and the time to first request of analgesia was significantly longer ($p=0.006$) in the morphine group.

Discussion:

The addition of 50 mcg ITM to bupivacaine and fentanyl resulted in improved postoperative analgesia and patient satisfaction in patients undergoing PPBTL under SA.

POSTER REVIEW 2

SOAP A91

THE USE OF TRANSCUTANEOUS ACUPOINT ELECTRICAL STIMULATION FOR THE PREVENTION OF POSTOPERATIVE NAUSEA AND VOMITING FOLLOWING CESAREAN SECTION WITH NEURAXIAL OPIATES

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Introduction: Neuraxial opiates provide excellent pain relief following cesarean section (CS) performed under a subarachnoid block (SAB). However postoperative nausea and vomiting (PONV) have been reported in 56-66 % of patients in the first 24 hours postoperatively. This may distress the patient and decrease satisfaction. The ReliefBand, which produces acupoint electrical stimulation, is an FDA approved device for the management of morning sickness and PONV. It is especially efficacious in preventing nausea, which has been shown to be difficult to control with traditional antiemetics. The aim of this study is to assess the efficacy of acupoint electrical stimulation for PONV prophylaxis in patients undergoing CS. We present an interim analysis of this ongoing study.

Methods: After IRB approval and written informed consent, 50 patients scheduled to undergo elective CS were enrolled in this double-blind randomized controlled trial. Patients were randomly allocated to one of two groups: patients in the active group had the ReliefBand applied to the P6 point, while patients in the placebo group had the band applied to the dorsum of the wrist. Stimulation was applied at the lowest level that the patients could feel. In both groups the SAB was performed using 12 mg hyperbaric bupivacaine + 20 mcg fentanyl + 200 mcg morphine. Incidence of nausea and vomiting were determined intraoperatively and postoperatively for up to 24 hours. Nausea scores were collected on a scale from 0 to 10 at three time points during surgery, and at 0, 6, and 24 hours post surgery; any score greater than 0 was considered nausea. Vomiting scores were binary variables, collected during surgery and at 3 time points post surgery. Each of these outcome variables (intraoperative nausea / vomiting, postoperative nausea/ vomiting) was compared for the two treatment groups using a chi-square test of general association.

Results: Two patients were excluded due to protocol violations. Of the remaining 48 patients, 28 were in the active group and 20 in the placebo group. The two groups were similar in age, weight, height, parity, race, ASA class, history of PONV or motion sickness, smoking status, ephedrine use and need for iv fentanyl for the treatment of intraoperative pain. Intraoperatively, there was no difference between the two groups in the incidence of nausea and vomiting, or the need for ondansetron for the treatment of nausea or vomiting. Postoperatively, there was no difference between the 2 groups in the incidence of vomiting, or the need for rescue antiemetics. The incidence of nausea in the active group (17 %) was significantly less than the placebo group (48 %, $p=0.03$).

Discussion: The use of acupoint electrical stimulation was effective for reducing the incidence of postoperative nausea in patients undergoing CS under SAB with neuraxial opiates.

SOAP A92

URINARY CATHETERIZATION REQUIREMENT DURING LABOR: CAREGIVER BELIEFS AND PRACTICES

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Introduction: During pregnancy, physiologic and structural changes increase women's susceptibility to urosepsis. Bladder catheterization is often employed during the peripartum period, which may contribute to an increased risk of urosepsis. (1) Urinary retention and diminished bladder tone have been attributed both to the labor process itself as well as the use of labor analgesia. (2) Our previous research indicated a 72.7% catheterization rate in women who received labor epidural analgesia versus a catheterization rate of 18.4% in women without epidurals. (3) Caregiver practices and beliefs may influence the incidence of bladder catheterizations performed in the peripartum period. This study investigated this issue.

Methods: After IRB approval, an 8 item (multiple-choice, fill in the blanks, ranked-order) voluntary and anonymous question survey was offered to all labor and delivery caregivers to fill out. These were then placed in a private collection vehicle, tallied, and analyzed.

Results: 33 surveys returned in total to date, some with incomplete questions (Q). Answers (A)

Q1. Do patients require straight catheterization prior to epidural placement? A1- 73% -No, 27% - yes

Q2. Do you offer patients an opportunity to void prior to epidural placement? A2. 30%- always, 42% -sometimes, 28% - upon patient request (various reasons indicated)

Q3. What determines when you straight catheterize a patient?

A3. 1st - palpation of bladder, 2nd - patient urgency to void, but unable, 3rd - prior to 2nd stage labor

Q4. For a laboring patient with epidural analgesia, which is more time consuming? A4. 69% to place a bedpan, 31% to perform straight catheterization

Q5. Do you routinely have a patient attempt to void spontaneously prior to performing a straight catheterization? A5. 67% No, 33% Yes

Q6. During an 8-hour shift approximately how many times do you catheterize a patient with a labor epidural? A6. 0-1x 0.3%, 1-2x 58%, 2-3x 41.7%

Q7. Do you think patients are able to void on their own if they have epidural analgesia? A7. 93%-sometimes, 3%- never (various reasons given)

Q8. Rank the most common reasons for bladder straight catheterization in a woman with a labor epidural? A8. 1st - Bladder distension, 2nd - Epidural anesthesia, 3rd - patient comfort

Conclusions: Previous studies have investigated the ability of parturients to void while receiving labor epidural analgesia with conflicting results. (4), (5) This caregiver survey indicated that although most thought that voiding was sometimes possible with epidural analgesia, that the opportunity was not always offered.

References:

- Schwartz M, Am J Obstet Gynecol 1999; 181: 547-53
- Leighton B, Am J Obstet Gynecol 2002; 186: S69-77
- Dalby P, Chong E, Anesthesiology (SOAP Supp) 2003, A90: 44
- Campbell D, Anesth Anal 2000; 90: 1384-9
- Liang C, Int Obstet Anes 2002; 11: 164-9

POSTER REVIEW 2

SOAP A93
THE CESAREAN DECISION TO INCISION INTERVAL AND NEONATAL OUTCOME

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Introduction: ACOG and other international professional organizations recommend that hospitals have the capability to start a Cesarean delivery with 30-min of the decision to operate--the so-called "30-min rule." A Cesarean decision to incision interval (DII) was achieved in only 52% and 63% of emergency Cesarean deliveries and neonatal outcome was worse when the DII was < 30 min in several small studies. The purpose of this study is to evaluate the DII and decision to delivery interval (DDI) for a large number of Cesarean deliveries at a large teaching hospital, and correlate the intervals with neonatal outcome.

Methods: This retrospective study was IRB approved and included all non-scheduled Cesarean deliveries. Institutional databases were queried to obtain the following data for a 21-month period: decision to perform a Cesarean delivery time; OR-arrival, incision and delivery times; primary indication for CS; umbilical artery pH, Apgar scores, and NICU admission. If the decision time was missing, the median decision to OR-arrival interval for the indication for Cesarean was added to the OR-arrival to incision/delivery interval to estimate the DII or DDI. Data were analyzed using the χ^2 and the Mann Whitney-U tests. A $P < 0.05$ was considered significant.

Results: 2178 non-scheduled Cesarean deliveries were evaluated. The overall median (range) for DII and DDI were 41 (2-708) and 53 (5-714) min. The overall general anesthesia rate was 5%. 1445 parturients had arrest of dilation, descent or non-reassuring fetal heart rate as the primary indication for Cesarean delivery. DII, DDI and neonatal outcomes are shown in the table. There were no differences in NICU admission or need for intubation for DII \leq 30 min compared to DII > 30 min for these indications.

Discussion: The Cesarean DII for failure of cervical dilation or descent was > 30 min for most women and this did not adversely affect neonatal outcome compared to neonates with DII < 30 min. The 30-min rule should be revisited.

References: 1) J Reprod Med 1997;42:347-52. 2) J Am Coll Surg 1994;179:151-5.

	DII (min)	Indication for Cesarean delivery		
		Arrest of dilation	Arrest of Descent	Non-reassuring FHR
DII (min)		42 (14-249)	41 (14-249)	29 (2-177)
DDI (min)		54 (22-293)	53 (24-264)	39 (5-187)
Number (%)	≤ 30	43 (6.5)	22 (6.9)	226 (52.3)
	>30	651 (93.5)	297 (93.1)	206 (47.7)
APGAR	≤ 30	8 (2-9)	8 (2-9)	7 (0-9)
	>30	8 (0-9)	8 (1-9)	8 (1-9)†
1min APGAR	≤ 30	9 (4-9)	9 (7-9)	9 (1-9)
	>30	9 (0-10)	9 (3-9)	9 (3-9)
Cord pH _{art}	≤ 30	7.26 (7.03-7.36)	7.24 (7.0-7.31)	7.19 (6.83-7.39)
	>30	7.27 (6.94-7.39)	7.26 (6.87-7.38)	7.24 (6.89-7.48)†
Cord pH _{ven}	≤ 30	7.32 (7.1-7.39)	7.28 (7.12-7.37)	7.24 (6.88-7.45)
	>30	7.33 (7.02-7.44)	7.32 (7.1-7.44)†	7.30 (6.89-7.50)†

DII = decision to incision interval, DDI = decision to delivery interval.

Data presented as median (range).

† = different from ≤ 30 min DII within indication for Cesarean delivery.

SOAP A94
SUPPLEMENTAL OXYGEN DURING REGIONAL ANESTHESIA FOR CESAREAN DELIVERY

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Introduction: Studies of fetal oxygenation during general (1) and epidural anesthesia (2) for C/S have shown that increasing maternal FiO₂ increases fetal blood O₂ content slightly; such studies have been used to justify routine O₂ administration during elective C/S to optimize neonatal outcome. These studies provided supplemental O₂ at higher FiO₂'s than generally used clinically; the purpose of this study was to determine the effect of supplemental O₂ (as commonly used clinically) on maternal and fetal oxygenation during elective C/S under regional anesthesia.

Methods: 24 parturients at >38 weeks EGA presenting for elective C/S gave written informed consent and were randomized to one of 3 groups: NC received supplemental O₂ at 2 l/min via nasal cannula immediately after induction (n=9); FM received O₂ at 10 l/min via simple face mask after induction (n=9); and RA breathed room air throughout the study (n=6). All parturients received spinal anesthesia with hyperbaric bupivacaine 12-13 mg, fentanyl 15mg, and morphine 150mg. Maternal SaO₂ was recorded prior to induction and at delivery. Maternal arterial, umbilical venous, and umbilical arterial blood samples were obtained immediately after delivery and analyzed for pH, pO₂, pCO₂, -HCO₃, and base deficit. Data was analyzed with one-way ANOVA, and post-hoc comparisons where appropriate.

Results: There was no difference among groups in age, weight, gravidity or parity; group RA was significantly taller than groups NC or FM (means, RA-68" vs. NC-66" and FM-63", pRA, NC; and NC>RA, pRA, NC; NC>RA, p<0.05). There was no difference among groups in the umbilical venous or arterial variables measured (pO₂, pCO₂, pH, -HCO₃, base deficit, p=ns).

Discussion: Recent reports speculate that supplemental maternal O₂ during C/S may increase free radical formation with detrimental neonatal effects (3). While high FiO₂ (>.47) may increase fetal blood O₂ content, the commonly used clinical O₂ supplementation regimens studied here have no effect on umbilical pO₂. While both regimens significantly improved maternal oxygenation, there appears to be no justification for their routine use for fetal indications during regional anesthesia for C/S.

References:

1. Can Anaesth Soc J 18:587; 1971.
2. Anesth Analg 61:576; 1982.
3. Br J Anaesth 88:18; 2002.

POSTER REVIEW 2

SOAP A95

EFFECT OF ANESTHESIA FOR CESAREAN SECTION ON NEONATAL ACID-BASE STATUS

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Introduction: Spinal is the most widely used method of anesthesia for cesarean section in the west,¹ and is generally considered both more practical and safer than other techniques for the mother. Less attention has been paid to its effects on the newborn, although it is often assumed that because its maternal hemodynamic effects need not be adverse, it must be acceptable from the baby's viewpoint. Although Apgar score is known to be depressed by general anesthesia, this is a short-lived effect, while umbilical artery (UA) acid-base status provides a better index of fetal welfare.

Method: Databases were searched for studies, both randomized and not, comparing neonatal acid-base data with different types of anesthesia for cesarean section. Three-way comparison of the effect of anesthesia: spinal-general (S-G), spinal-epidural (S-E) and epidural-general (E-G), on UA pH and base deficit values were conducted by random-effect meta-analysis.

Results: 19 studies were found reporting mean and SE or SD for UA pH, 14 of which included base excess (referred to here as deficit, to avoid negatives). Base deficit values were significantly worse for spinal than for general or epidural anesthesia (table: *P<0.01). Results for the six of the studies that were randomized were similar, but did not reach significance.

Conclusion: As UA pH is influenced by maternal respiration, base deficit, although derived, is a better index of fetal metabolic acidosis. Recent meta-analysis has shown that the use of ephedrine (as in the majority of studies included here) is associated with more severe UA acidosis than phenylephrine.² More comparisons are needed using other vasopressors. Meanwhile, mothers can be reassured that general anesthesia does not cause more neonatal acidemia than regional anesthesia.

References

1. Thomas J, Paranjothy S. RCOG Clinical Effectiveness Support Unit. The National Sentinel Caesarean Section Audit Report. London: RCOG press, 2001.
2. Lee A, Ngan Kee WD, Gin T. A quantitative systematic review of randomized controlled trials of ephedrine versus phenylephrine for management of hypotension during spinal anesthesia for cesarean delivery. *Anesth Analg* 2002; 94: 920-926.

Table. Difference between umbilical artery acid-base values with types of anesthesia for cesarean

		Number of studies	Difference	95% CI
pH	S-G	14	-0.019	-0.040 to 0.003
	S-E	9	-0.013	-0.027 to 0.001
	E-G	9	-0.007	-0.022 to 0.007
Base deficit	S-G	7	1.109	0.434 to 1.784*
	S-E	7	0.910	0.222 to 1.598*
	E-G	6	0.269	-0.146 to 0.685

SOAP A96

INDICATIONS FOR GENERAL ANESTHESIA DURING CESAREAN SECTION

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Introduction: The purpose of this retrospective analysis is to determine trends in the utilization of general anesthesia (GA) for cesarean delivery (CS) at a large tertiary care maternity institution. We hope to determine the incidence and implications of GA for cesarean delivery. This study will update a similar 6 year survey conducted previously at our institution.¹

Methods: Following IRB approval, patients who received GA for CS during 1996-2003 were identified using a computerized hospital database. Medical records of these patients were then reviewed to determine patient demographics, indications for CS and GA, and complications relating to obstetric and anesthetic management.

Results: 313 parturients received GA for CS, representing 2.1% of all CS. Of the 106 records reviewed thus far, 54% were in labor and 77% required emergent CS. Fetal distress was the major indication (37%) for CS, followed by coagulation abnormalities (13%); of which thrombocytopenia (range 38-58,000 K/ μ L) represented 86% of cases. Four parturients underwent gravid hysterectomy. Of note, 44% of parturients had a prior regional anesthetic that was inadequate for initiation or completion of CS (Table 1). While 94% of patients had an airway class I or II, two patients with airway class II and fetal distress had a failed intubation. Mask ventilation followed by laryngeal mask airway insertion was successful in both cases. GA was continued with LMA in one case, while in the other GA was terminated and an awake fiberoptic intubation was performed.

Table 1-Distribution of failed regionals

Inadequate epidurals	20
Combined spinal epidurals with inadequate epidural	10
Failed spinals / aborted spinals due to fetal bradycardia	10
Inadequate continuous spinal catheter	1
Exceeding spinal anesthesia duration	6

Discussion: Although regional anesthesia is preferred for CS due to its increased safety margin,² GA cannot be avoided altogether and may be required for emergent CS or in the presence of coagulation abnormalities.³ The incidence of GA for CS during the 96-03 time period remained similar to the latter part of our prior survey.¹

Our report notes that existing neuraxial techniques can and do fail. The existence of a prior regional anesthetic does not guarantee that it will provide adequate anesthesia at the time of a CS. Hence it is important to evaluate epidural analgesia periodically and ensure proper functioning, particularly in those at high risk for an emergent CS.

References: 1. *Int J Obstet Anesth* 1998;7:147-52; 2. *Anesthesiology* 1997;86:277-84. 3. *Int J Obstet Anesth* 1998;7:145-6.

POSTER REVIEW 2

SOAP A97
SURVEY QUESTIONNAIRE: DIFFICULT AIRWAY MANAGEMENT DURING CESAREAN SECTION AND AVAILABILITY OF AIRWAY EQUIPMENT IN THE LABOR AND DELIVERY (L/D) SUITE

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Introduction: Difficult or failed intubation (FI) after induction of general anesthesia for cesarean section (C/S) is a major factor contributing to anesthesia-related maternal complications. Anesthesia-related fatalities (80%) occur during C/S requiring general anesthesia. It is imperative for anesthesia practitioners to: recognize a potentially difficult airway (DA), have appropriate equipment to deal with difficult/failed intubation, and have a rescue plan for FI.

Purpose: The purpose of the survey was to determine: 1) the familiarity with the American Society of Anesthesiologists (ASA) Difficult Airway Algorithm (DAA), 2) the availability of DA equipment in the L/D suite, and 3) the use of DA equipment in the L/D suite.

Methodology: A survey was sent to 200 members of the Society of Obstetric Anesthesia and Perinatology via e-mail. The first section was designed to survey the availability of DA equipment in the L/D suite and familiarity with the ASA-DAA. The second section of the survey was designed to study the management of the DA during C/S with/without fetal distress.

Results: Of the 200 members surveyed, 67 responded. Pertinent findings include: 98% of anesthesiologists in academic institutions were aware of the ASA-DAA versus 100% in private practice. Amongst the academic institutions 89% have a DA cart designated to the L/D suite versus 82% in private practice. Of those that did not have a designated DA cart, the respondents indicated that they had access to DA equipment. In response to the management of the DA: 92% in academic institutions interact early with the obstetric team versus 95% in private practice, 47% in academic institutions fill out a pre-anesthetic evaluation form on all patients in the L/D suite versus 27% in private practice. Eighty percent of respondents from academic institutions have encountered difficult/failed intubation during C/S versus 54% in private practice. The management of difficult or failed intubation during emergency C/S with or without fetal distress is shown in the figure.

Conclusion: As per the ASA practice guidelines, DA equipment is available in the majority of L/D suites in the USA. Documentation of pre-anesthesia evaluation is low in both academic and private institutions. In the management of difficult or failed intubation during emergency C/S with and without fetal distress, the most common techniques used were conventional mask ventilation and laryngeal mask airway (LMA).

SOAP A98
LITTLE MONEY, LITTLE LAW : THE IMPACT OF INTERNET PHARMACIES ON ANTENATAL CARE

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Introduction: Use of Internet pharmacies (IPs) has caused significant professional and political debate. The use of IPs has potential advantages with the ability to order during off-hours, convenience and cost savings being identified as the most common reasons why patients choose to patronize these facilities. The aim of this study was to identify potential financial benefits in using IPs to parturients who are prescribed medications during the antenatal period and to highlight some of the controversies surrounding this mode of medicine acquisition.

Methods: Using Internet search engines, costs at various outlets (local versus IPs) of brand name medications commonly prescribed in pregnancy were compared. Total costs included taxes and mailing charges. Only IP sites with appropriate technology for web information security were used.

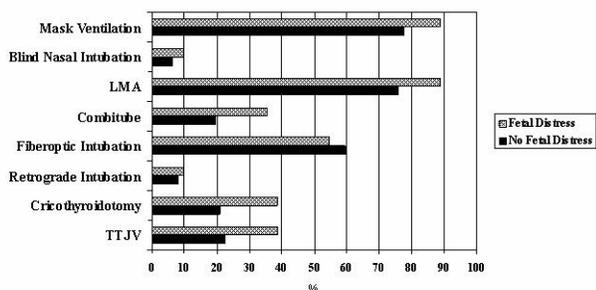
Results: Results are summarized in the Table below. Percent differences between highest and lowest cost were calculated and always found in favor of the IP source. Availability of medications was limited through IPs. Prenatal vitamins were excluded from this analysis, as they are accessible over-the-counter.

Discussion: There are marked cost savings to obtaining medications through IPs. However, unless appropriately counseled, the patient may be exposing herself and her fetus to unnecessary risk. Since 1999, USA IPs are regulated by the Food Drug and Cosmetic Act. Most IPs now get the Verified Internet Pharmacy Practice Sites seal (VIPPS) administered by the National Association of Boards of Pharmacy. However, there are numerous sites operating abroad that do not carry the VIPPS seal nor FDA approval. Medication obtained from non-FDA approved sites offer no guarantees to the patient and any litigation against defective or teratogenic medications do not have a strong foundation. More worrisome is access to prescription medication through "Cyber-Doctors", who may provide services to pregnant patients without fully considering the consequences.

Our study shows a 40-74% reduction in pharmacy costs; however, at what price? We have an obligation to both the mother and fetus. The limited scope of the regulatory bodies has resulted in the FDA encouraging health care professionals to discuss these issues with patients. Until the national debate on IPs is resolved we advocate advising patients only to use medication prescribed by their healthcare provider and obtained from FDA approved pharmacies.

Reference:
Mayo Clin Proc 79:188-194, 2004.
www.fda.gov.

Management of Difficult Airway during C/S



Comparison of IPs versus Local Pharmacy - Cost per Unit

Unit price in \$US	www.drug-store.com	www.edrug-net.com	www.afford-ablerx.com	www.wal-greens.com	Local Pharmacy	Percentage cost savings: Highest vs Lowest
Zofran 4 mg	18.59	14.30	12.75	21.9	23.58	47
Zoloft 50 mg	2.40	2.43	1.71	2.33	3.20	47
Ventolin MDI	35.99	27.00	25.08	30.99	42.47	41
Synthroid 100 mcg	0.39	0.38	0.19	0.48	0.55	65
Macrobid 100 mg	2.07	Not available	0.74	2.89	2.64	74
Prevacid 30 mg	4.06	2.66	2.40	4.26	5.39	56

POSTER REVIEW 2

SOAP A99

RETENTION OF INTUBATION SKILLS BY FULLTIME OBSTETRIC ANESTHESIOLOGISTS

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Background: The decreasing use of general anesthesia in obstetrics is reducing the number of endotracheal intubations.^{1,2} Faculty working only in obstetric anesthesia are concerned about losing airway skills.³ By testing on a simulation manikin (Airman - Laerdal Medical Corporation, Gatesville, TX) we assessed the impact of current OB anesthesia practice on maintenance of intubation skills.

Materials and Methods: Following IRB approval, general anesthesiologists (GA) (N=10), and obstetric anesthesiologists (OB) (N=8), were entered into the study. They estimated the average number of endotracheal intubations personally performed each month for the last six months. Participants were timed doing a standard endotracheal intubation, followed by a second endotracheal intubation with the manikin's tongue inflated to simulate airway edema. Intubations were observed and graded on a scale of 1 to 3 (3 being best). Data for each group were averaged, and statistical analysis was performed using the t-test with Levene's test for equality of variances, $p < .05$ considered statistically significant.

Results: The OB group averaged 1.1 +/- 1.1 (SD) intubations per month, compared with 5.1 +/- 2.7 in the GA group ($p < .001$). Average intubation times on the manikin were 17.2 +/- 4.8 (SD) seconds for the OB group and 17.2 +/- 2.7 seconds for the GA group, with average intubation facility 2.9/3 for both groups. With the tongue inflated to simulate airway edema, the average intubation times were 30.7 +/- 15.7 (SD) seconds for the OB group, and 25.5 +/- 14.3 for the GA group, with average facility 2.8/3 for both groups. Statistical analysis of intubation times and facility scores, which were nearly identical, showed $p > .04$ for all comparisons.

Discussion: Recent intubation experience in the OB group was lower than in the GA group. Neither the standard intubation times nor the more difficult tongue-inflated intubation times differed substantially between the groups, and facility scores were identical. The data do not suggest any deficiency in intubation skills. The 20% greater intubation time in the OB inflated tongue group would require a much larger number of subjects in both groups to reach statistical significance. If the small groups make the study under-powered, the OB group approaches the limit of available fulltime faculty in OB anesthesia. It is therefore unlikely that a larger study would be practical or significant. Manikin simulation testing is poorly validated, but it can be assumed that the "skill set" used to intubate high risk parturients overlaps the airway skills utilized in this simulation. Given this limitation, this study indicates that current airway experience is sufficient to maintain intubation skills above the threshold for significant loss of performance.

References: (1) *Anaesthesia* 2000;55:179-183. (2) *Anesthesiology* 2001; 94:A31. (3) B.Gutsche, 2001, personal communication.

SOAP A100

VIRTUAL PHARMACOPHORES

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Introduction: Concepts of chirality, levo / dextro rotation, and stereoisomers are difficult to visualize but necessary to explain the variation in cardiotoxicity of local anesthetic. Advances in protein crystallization and x-ray diffraction have elucidated the structure of sodium channels. It is now possible to download the 3-D structure of these channels to study their geometry. One cannot easily manipulate small molecules to study their interaction with these large proteins or take into account the forces involved in these complex reactions.

Methods: Affinity labeling and mutagenesis studies have found where the alignment of amino acids tyrosine, phenylalanine, lysine and isoleucine occur in the sodium channel to form a pocket where local anesthetics dock (pharmacophore). A virtual reality receptor could then be constructed by importing the structural coordinates in VRML format into 3DStudioMax. New techniques in computational chemistry allow the multiple calculations needed to predict drug-receptor affinity to be presented as a single force vector that enumerates the contributions of electrostatic, hydrophobic, and hydrogen bonds to the association constant.

Results: The vector was used to provide haptic response to a miniature robotic arm to best spatially orient and manipulate local anesthetic molecules into their active site. Conformational changes that occur in the larger sodium channel as a consequence of their binding can be illustrated.

Discussion: This computer simulation enables the user to understand why protein receptor sites are stereospecific and the reason for the different binding properties of local anesthetics.

References:

Molecular Pharmacology 2003; 63: 3, 499.



POSTER REVIEW 2

SOAP A101

THE INTERACTIVE PLACENTA

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Introduction: Surveys have shown that there is a poor understanding of the physiology behind placental oxygen transport which is primarily dependent on the difference between maternal and fetal oxygen partial pressure. Maternal hyperventilation can decrease uterine blood flow and increase maternal hemoglobin oxygen affinity adversely affecting oxygen transport.

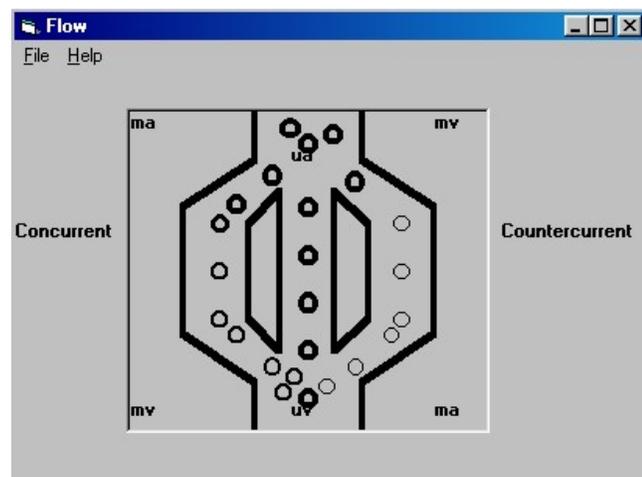
Methods: We created an animated graphical computer model that uses a system of two linear differential equations, taking into account the blood flow (Q), slope (M) of maternal and fetal hemoglobin dissociation curves, and the effect of pH and PCO₂ on P₅₀. $DPm/dx = k/QmMm(Pf-Pm)$, $dPf/dx = k/QfMf(Pm-Pf)$.

Results: As these equations are solved, fetal hemoglobin oxygen saturation is represented by color changes in RBCs as they pass through the model placental gas exchanger.

Discussion: Residents learn 1) to treat maternal hypotension before applying supplemental oxygen, 2) fetal PO₂ cannot exceed maternal mixed venous.

References:

IJOA 2000; 9: 15-19.



SOAP A102

SIMULATOR TEACHING OF OBSTETRICAL ANESTHESIA FOR MEDICAL STUDENTS

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Introduction: The purpose of this study is to examine the acquisition of knowledge by medical students completing a senior elective in anesthesiology as it relates to the performance of anesthesia for urgent cesarean delivery utilizing a patient simulator. Simulator based training may provide a more comprehensive learning environment subsequently resulting in a faster, more complete acquisition of necessary skills and mental preparation. The objective is to show that the medical students have an improved knowledge in managing an urgent cesarean delivery after participating in the OB anesthesia simulation.

Methods: The medical students are asked to complete a 0-10 point scale with "0" being no knowledge and "10" being complete knowledge, on the anesthetic management of an urgent cesarean delivery. A 30-minute power point presentation on obstetrical anesthesia is then given. Afterwards, each student engages in the care of a simulated patient with a poorly functioning labor epidural and subsequent fetal decelerations requiring an urgent cesarean delivery. All scenarios take place in the simulation center, utilizing a mock operating room and SimMan ®.

Results: The results are based on 19 fourth year medical students participating in the OB anesthesia simulation this past academic year. Before completion of the simulation, the median rating on the scale was a 2 (range = 1-6). After completion of the simulation, the median rating was a 7 (range = 4-9).

Discussion: The medical students reported that they improved their knowledge in managing an urgent cesarean delivery after learning in the simulator. However, we believe significant changes to the methods used to evaluate this teaching activity is necessary before true comparisons are available. This teaching scenario could form the basis for an examination of teaching evaluation tools and their applicability in medical student education.

References:

1. Morgan PJ, et al. Simulation Technology: A comparison of experiential and visual learning for undergraduate medical students. *Anesthesiology* 2002; 96: 10-16.
2. Gaba D, et al. A comprehensive anesthesia simulation environment: Re-creating the operating room for research and training. *Anesthesiology* 1988; 69: 387-93.
3. Bandura A and Wood R. Effect of perceived controllability and performance standards on self-regulation of complex decision making. *J Pers Soc Psychol.* 1989 May; 56(5):805-14.

POSTER REVIEW 2

SOAP A103

DEVELOPMENT OF A UNIFIED ASSESSMENT TOOL FOR MEASURING RESIDENT PERFORMANCE DURING AN OBSTETRIC ANESTHETIC SCENARIO ON A HIGH FIDELITY HUMAN PATIENT SIMULATOR

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Introduction: The ACGME has mandated that residency programs assess competency by developing tools that evaluate proficiency in specific areas. Although anesthesiologists must learn how to respond in emergencies, this competency is difficult to evaluate. Some emergencies are infrequent and do not lend themselves to rigorous evaluation. The percentage of patients having Cesarean delivery under general anesthesia (GA) has decreased. In an effort to assess competency we have developed a scenario on a human patient simulator of an emergency Cesarean delivery under GA. No standardized scoring system or assessment tool for evaluating resident performance of this procedure on the simulator exists. The purpose of this study was to develop a standard weighted scoring system using a modified Delphi technique.

Methods: A list of tasks relevant to performing an emergency cesarean delivery under GA was reviewed by 6 obstetric anesthesiologists with widespread US geographical representation and practice settings. The panelists were not aware of each other's identities. Panelists assigned each task a weighed score based on a Likert scale (1=not important to 5=extremely important). They also could suggest the addition/deletion of tasks and comment regarding their scoring decisions. The 1st round median scores, and comments were then provided to all the panelists and they were afforded the opportunity to change their weighted scores. Concordance among panelists was determined for all tasks, and for 4 general components of overall performance: preoperative assessment, anesthesia set-up/preparation, induction/intubation, and operative management. Kendall W was used to assess concordance, with a concordance of 0.75 desired for acceptance of the system.

Results: A consensus of panelists did not suggest deletion of any of the initially proposed tasks. Two tasks were added. Agreement among panelists as to the weighting of scores was greatest for tasks associated with induction and maintenance of anesthesia, and least for anesthesia set-up. A substantial increase in concordance was seen in all areas during round 2.

Discussion: Despite agreement among anesthesiologists with regards to the tasks needed to be performed during emergency Cesarean delivery, this study demonstrates that there are substantial differences in weighting of these activities. Using methods such as the modified Delphi technique, consensus guidelines for training and evaluation can and should be established for residency assessment in simulated Obstetric Anesthesia emergencies.

Component	Round 1	Round 2
Preoperative assessment	0.481	0.638
Anesthesia set-up and preparation	0.245	0.375
Induction and intubation	0.546	0.726
Operative management	0.496	0.659
Overall	0.592	0.747

Data presented as Kendall's coefficient of concordance.

SOAP A104

INCREASES IN CLOT INITIATION AND RATE OF FIBRIN FORMATION ARE RESPONSIBLE FOR AMNIOTIC FLUID-INDUCED HYPERCOAGULABILITY

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Introduction: In an accompanying abstract, we describe an *in vitro* model of disseminated intravascular coagulopathy (DIC) induced by amniotic fluid (AF) using Sonoclot® analysis. More specifically, this model represents the initial hypercoagulable state of DIC. In Sonoclot® analysis, the activated clotting time (ACT) represents the beginning of fibrin formation; the clot rate (CR) represents the rate of fibrin formation; the time to peak (TP) measures fibrinogenesis, fibrin polymerization, and platelet-fibrin interactions; and the platelet function (PF) is a measure of platelet contraction¹. The model shows dose-dependent decreases in the ACT and TP, while showing no significant changes in either CR or PF. Simplistically, the decrease in TP might be wholly ascribable to changes in the ACT. If this premise is true, then the ACT at any dose of AF minus the ACT at 0 µl AF should equal the difference between the TP at an equivalent AF dose minus the TP at 0 µl, assuming both values are expressed in the same time units.

Methods: Data analyzed in this presentation were obtained from the same 20 patients as in the accompanying abstract. Dose-response data were collected for the CR. Differences between ACT (minutes) at (x) dose of AF minus ACT at 0 µl AF were calculated for 0.625, 1.25, 2.5, 5, 10, 20, and 40 µl AF. Differences between TP (minutes) at (x) dose of AF minus TP at 0 µl AF were determined over the same dose range. The resulting dose-response curves were examined using one-way and two-way ANOVA, followed by Tukey's Multiple Comparison Test.

Results: While no significant change in CR could be demonstrated, there was a clear trend evident - with a 10% increase noted at 0.625 µl AF, and a 16% maximal increase noted by 1.25 µl AF. Examination of the difference data showed dose-dependent increases (P<0.0001) in both the ACT- and TP-differences. Moreover, the ACT-difference was markedly different than the TP-difference at all doses of AF greater than 2.5 µl AF (P<0.0001).

Discussion: TP is a complicated parameter involving fibrin formation and its interaction with platelets. One might argue that an AF-induced decrease in TP could be due to an earlier onset of fibrin formation (i.e. ACT), however, as discussed above, the demonstration of a clear separation between the ACT-difference and the TP-difference clearly rules this possibility out except at the smallest doses of AF. The lack of any AF-induced trends in PF also argues against a platelet role in increasing the TP. This implies that the rate of fibrin formation (CR) is accelerated by AF, and plays a role, along with earlier clot initiation, in increasing TP in response to AF.

References: 1. Br. J. Anaesth. 75:771-76, 1995

POSTER REVIEW 2

SOAP A105

A NOVEL IN VITRO MODEL OF AMNIOTIC FLUID-INDUCED HYPERCOAGULABILITY

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Introduction: Amniotic fluid embolism (AFE) is a protean clinical entity characterized by the abrupt onset of respiratory distress, hemodynamic compromise, and/or seizure activity during labor and delivery. AFE is a relatively rare disease (1:8000 to 1:80,000), but carries a mortality rate of 60% to 86%.^{1,2} Disseminated intravascular coagulopathy (DIC) is often a presenting syndrome. A full understanding of AFE-induced changes in coagulation is lacking due both to the rarity of the disease *in vivo*, and to systematic problems with earlier *in vitro* models of this phenomenon. We report our development of a model of AFE-induced changes in coagulation using the Sonoclot® Analyzer.

Methods: Following IRB approval and informed consent, 20 parturients undergoing elective section were enrolled in this study. A 5 ml aliquot of blood was obtained in a citrated Vacutainer® (3.2% sodium citrate) prior to skin incision, and a 5 ml aliquot of amniotic fluid (AF) was obtained by needle amniotomy after uterine incision and placed in a plain Vacutainer®. Serial dilutions of AF were prepared using preservative-free normal saline such that 40 µl of test solution contained the following doses of AF: 0, 0.625, 1.25, 2.5, 5, 10, 20, and 40 µl. A 340 µl aliquot of citrated blood was added to a Sonoclot® cuvette containing 40 µl AF test solution and 20 µl of 250 mM CaCl₂, and the following Sonoclot® parameters were measured: activated clotting time (ACT), clot rate (CR), time to peak (TP), and platelet function (PF). Dose-response relationships were examined using one-way ANOVA followed by Tukey's Multiple Comparison Test. A P<0.05 was considered significant.

Results: Both ACT and TP markedly decreased as increasing doses of AF were tested (P<0.0001). ACT proved to be especially sensitive to the presence of AF, with as little as 1.25 µl causing a 20% decrease (P<0.01) and 40 µl causing a 50% drop in this parameter (P<0.001). TP was somewhat less sensitive to the presence of AF with a 26% decrease noted at 10 µl AF (P<0.01) and a 42% decrease occurring with 40 µl AF (P<0.001). No significant changes occurred in either CR or PF.

Discussion: A highly sensitive model of AF-induced coagulation abnormalities has been developed using the Sonoclot® Analyzer. Strong dose-dependent effects of AF upon both ACT and TP were demonstrated, and probably represent the *in vitro* correlate of the DIC noted *in vivo* with AFE. Using this model, we have been able to detect the effects of smaller quantities of AF than have earlier models based on thromboelastography.^{3,4} Further characterization of this model is ongoing.

References: 1. Anaesthesia 34:20-32, 1979; 2. Am. J. Obstet. Gynecol. 172:1158-69, 1995; 3. Anesth. Analg. 90:333-6, 2000; 4. Anesthesiology 94:A45, 2001.

SOAP A106

INTRODUCTION OF AUTOMATED ANESTHESIA RECORD KEEPING (HARDWIRED AND WIRELESS) ON A LABOR AND DELIVERY UNIT

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Introduction: Computerized anesthesia information systems (AIMS) are increasingly used in anesthesia care. These systems offer many advantages over manual records including improved legibility, automatic data entry from dedicated physiologic monitors, and population of a database. We went live with Saturn on our labor and delivery suite in October 2003. Our use of Saturn has involved transitioning the product to a wireless technology. The change from paper record keeping to Saturn required significant adaptation by the users. The aim of this survey was to assess the response of the anesthesia team to the new computerized system.

Methods: A survey was distributed to all users of the computerized record-keeping system: 9 faculty members, 1 CRNA, and 4 senior residents.

Results:

The results of the survey are summarized in the table:

Compared to paper charting, electronic charting: (n=14)	strongly agree	agree	neutral	disagree	strongly disagree
is more difficult	4	7	0	2	1
has become easier as I use it more	3	8	1	1	1
is an improvement for operating room (OR) cases	7	5	0	1	1
is an improvement for L&D cases	0	6	3	4	1
is easier to read and quickly obtain information	0	1	4	7	2
provides more complete documentation of pre-anesthesia status	2	4	2	5	1
provides more complete documentation of anesthesia care	1	9	1	2	1
more accurately reflects physiologic data for OR cases	5	7	1	0	1
is adequate for medico-legal purposes	1	5	5	3	0
is more legible	5	8	0	0	1
represents an overall improvement in the obstetric anesthesia record	2	9	1	0	2
is a better source for a database	6	5	2	0	1
is easy to review and extract clinically useful information	1	9	3	0	1
If changes are not made to Saturn, I believe we should return to a paper record.	1	0	3	8	2
The time required for Saturn charting makes the system unsatisfactory.	1	4	4	4	1
Server and connection problems make me concerned about the future of Saturn.	0	2	0	9	3

Discussion: Our experience proves that wireless computer technology can be used with AIMS. Survey respondents agreed that Saturn is more time consuming and difficult to use than paper charting. Interestingly, despite these issues, the survey showed that the advantages of Saturn outweigh the disadvantages. In particular, Saturn provides a more complete and legible record and a database to support administration, QI, and research activities. With improved software and technology, user satisfaction will increase. As the use of AIMS spreads to other labor and delivery suites, the ability to combine databases to build large sets of patient data will enable us to answer clinical questions.

POSTER REVIEW 2

SOAP A107
PHYSICIANS ARE LEAST LIKELY TO APPLY EMERGENCY PROTOCOLS ON A LABOR WARD ACCURATELY

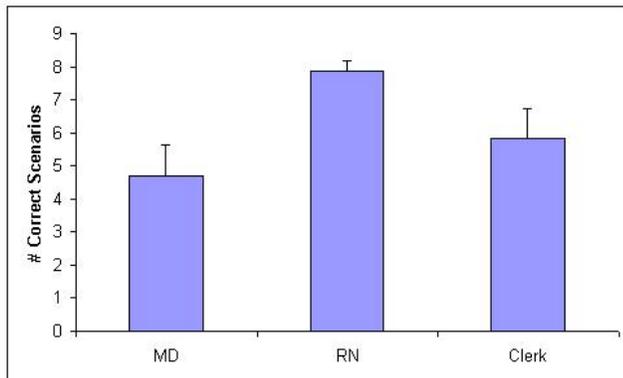
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Background: In any medical facility, the ability to activate the emergency response team (ERT) is vital for optimal patient care. On our Labor and Delivery Ward (3,000 deliveries per year), access to the ERT depends upon the ability of all staff members, at all levels, to assess critical situations and to activate the ERT appropriately. To ensure this capability, we conducted a survey to assess the breadth of knowledge amongst our staff of our ERT activation protocols.

Methods: We surveyed staff members of our labor unit. The group included OB physicians (n=15), delivery nurses (n=37), and unit clerks (n=12). The survey consisted of ten clinical scenarios. For each vignette, respondents were asked how he/she would activate the ERT (i.e. contact/request emergency assistance). The responses were scored based on existing institutional protocols.

Results: There was an unadjusted significant difference between education level and number of correct responses (p=.0002). RN's got the most right (8, +/- 2), followed by unit clerks/technicians (6, +/- 3), followed by MD's (5, +/-4). Because the three groups differed in years of experience at our institution (p=.006; MD 3.17+/- 2.22, RN 10.64+/- 10.15, unit clerks/technicians 4.83+/- 4.26), this was incorporated into the model. Analysis of covariance determined that, even when adjusting for years at our institution, the nurses continued to have a significantly higher number of correct responses (p=.002).

Conclusions: We found that the labor and delivery nurses at our institution were most likely to activate the ERT correctly. Despite this positive finding, there were significant deficiencies in the knowledge of existing protocols at all staff levels. We have implemented measures to improve these results, including initiation of an ERT Task Force to educate the entire staff on appropriate use of emergency protocols. We suspect that this lack of knowledge is not isolated to our labor ward and that other institutions may benefit from evaluating their staff.

**SOAP A108**
COMMUNICATION WITH OUR SPANISH SPEAKING PATIENTS – THEIR PERCEPTION OF THE LANGUAGE BARRIER

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Purpose: Spanish speaking patients make up 30% of the patients in our labor ward. As this population has been increasing, the ability of the medical personnel to communicate in Spanish has not. Hospital appointed translators are often available on the patients' first arrival to the labor ward but may be absent at critical portions of the patient's care. Our objective was to assess the perception of Spanish speaking patients' of their ability to communicate with medical personnel, and whether a language barrier is felt to affect their care.

Methods: 36 questions were written in Spanish and then translated into English. Two Spanish speaking translators were used to confirm accuracy. We distributed this exit survey to patients in the labor ward following anesthesia care. The English version of the survey distributed to English speaking patients served as a comparative control. Statistical analysis was performed with a Chi square test.

Results:

Question	Spanish (n=70)	English (n=32)	p value
Felt that their caregivers understood their concerns regarding their labor	62 (88%)	29(91%)	>.05
Understood what the doctors and nurses were telling them	68 (97%)	32(100%)	>.05
Felt that the doctors and nurses explained enough of what happened during their labor	68 (97%)	31(97%)	>.05
Understood the consent form they signed	67 (96%)	32(100%)	>.05
Felt that the anesthesiology team explained the anesthesia procedure adequately	65(93%)	30(94%)	>.05
During the 2 hourly monitoring assessment of laboring patients with epidurals, understood what the anesthesiologist was assessing	57(81%)	28(87%)	>.05

Table 1. Most representative questions, expressed as number (%).

Furthermore, 74% of Spanish speaking patients said that they had an interpreter present at epidural placement. Of those who didn't, 74% would have preferred to have one present. 92% felt that it is extremely important for caregivers to try to learn their language.

Conclusion: In summary, although a language barrier does exist between the Spanish speaking patients and the English speaking medical staff, the responses of the patients were similar. The small percentage of Spanish speaking patients who did not feel that they understood their English speaking physicians were mirrored by English speaking patients who did not understand our English communication either. From the data collected, a large majority of Spanish speaking patients feel that the communication between doctor and patient through translators is satisfactory and does not impact on their care. Despite this positive result however, the majority emphasized their preference that their care givers speak their language.

POSTER REVIEW 2

SOAP A109
OVERCOMING THE LANGUAGE BARRIER IN
OBSTETRIC ANESTHESIA PRACTICE: AN ANESTHESIA
CARE PROVIDER'S PERSPECTIVE

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INTRODUCTION: Spanish is the first language of a fast-growing proportion of the U.S. population. At our institution, Hispanic patients make up approximately 30-40% of the obstetric patient population. Meanwhile, the ability of obstetric anesthesia providers to communicate with these patients, has not significantly improved. Obstetric anesthesia involves caring for predominantly uneducated parturients. We thought that many anesthesia providers might feel that this set of circumstances could impact the care of the Spanish-speaking patient. Therefore, we conducted this survey to determine how obstetric anesthesia providers perceived their ability to communicate with and care for Spanish-speaking patients.

METHODS: A structured questionnaire was sent to the obstetric anesthesia providers at our institution. Forty-four participants received this survey, including ten attending physicians and thirty four residents.

RESULTS: Eighty-four percent of the obstetric anesthesia providers completed the questionnaire. Eighty-nine percent reported that they spoke little or no Spanish. Fifty-six percent reported that they attempt to use their minimal Spanish-speaking skills in the care of their patients. Most (89%) of these anesthesia providers felt that their care of Spanish-speaking patients was not equivalent to their care of English-speaking patients, while 56% felt unsatisfied with the level of communication achieved with their Hispanic patients. A translator is almost always used for obtaining a history (89%) and consent (91%) while not as frequently for a regional anesthesia procedure (43%), sensory check (18%), and general anesthesia (27%). Delays in obtaining translators were common. Many of the anesthesia providers (78%) felt that an English/Spanish pocket guide could enhance their ability to care for Spanish-speaking patients, and most (94%) would want that guide made readily available on the OB floor.

DISCUSSION: Despite an increasing Spanish-speaking patient population, most anesthesia providers at our institution do not speak Spanish well, and feel unsatisfied with their level of communication with these patients. Many felt that a medical Spanish pocket guide, tailored for OB anesthesia use, could enhance their ability to care for and communicate with Spanish-speaking patients. As a result of this survey, we developed a medical Spanish pocket guide and plan to distribute it to the OB anesthesia providers at our institution. We intend to survey the response of the care providers to the introduction of this guide after an initial trial period.

SOAP A110
GESTATION-DEPENDENT ERK PRIMING FOR LABOR
IN RAT MYOMETRIUM

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It has been previously reported that extracellular signal-regulated kinase (ERK) is activated during late pregnancy (3) and during labor (2) in the rat models. In the present study we tested the hypothesis that if ERK1/2 activation is an essential step in the onset of labor, then, the ERK1/2 subcellular distribution would reflect its function. Supporting evidence for this hypothesis came from a study in vascular smooth muscle. Alpha-adrenergic stimulation initially targets ERK to the surface membrane where it joins a signaling complex and is activated. Activated ERK is then targeted to the contractile filament where it phosphorylates caldesmon to activate the contractile filaments (1). Thus, there appear to be two phases for ERK signal processing: activation at a surface membrane-bound signaling complex, and targeting activated ERK to its substrates. ERK imaging in myometrial smooth muscle has not previously been studied. We tested the hypothesis that ERK targeting to a membrane complex primes the myometrium for labor in the rat model by ERK imaging with confocal microscopy of freshly dissociated, fully contractile myometrial cells (4). In the myometrial cells isolated from nonpregnant rats, ERK1/2 is homogeneously distributed in the cytosol, indicating the resting status. During the hypertrophy phase (at early pregnancy, day 9), ERK1/2 remains in the cytosol. In late pregnancy (day 20 or day 21), ERK1/2 translocates to the surface membrane just before the onset of labor. The gestation-dependent membrane translocation of the ERK appears to prime the myometrium in preparation for the labor contractions. Finally, when labor commences, ERK redistributes in the cytosol. We quantitated the ERK distribution by measuring confocal fluorescence intensity at the surface of the cell and the core of the cell, expressing the data as a surface/core ratio. In myometrial cells from nonpregnant and day 9 pregnant rats, the ratios for ERK1/2 are 1.26±0.06 and 1.1±0.04 respectively. In late pregnancy, the ratio increases significantly to 3.47±0.39 (p<0.0001 compared to early pregnancy). During labor, the ratio for ERK 1/2 is 1.06±0.05 (p<0.01 compared to late pregnancy), indicating of ERK redistribution. Further investigation will focus on the question whether ERK co-localizes with actin contractile filament during labor. Collectively, the ERK membrane translocation at the late pregnancy may predict for the imminent onset of labor. This research was supported by NIH grants HL31704, HL42293 and HD043054 to K.G. Morgan and NIH GM07592 and the Foundation for Anesthesia Education and Research grant to Y. Li.

1. Khalil RA & Morgan KG. *Circ Res* 76: 1101-1108, 1995.

2. Li Y & Morgan KG. *Am J Physiol Regul Integr Comp Physiol* 284: R192-199. 2003.

3. Oldenhof AD et al. *Am J Physiol Cell Physiol* 283: C1530-1539, 2002.

4. Shin HM and Morgan KG. *Circ Res* 90: 546-553. 2002.

POSTER CASE REPORTS

SOAP A111

A CASE REPORT OF BILATERAL UTERINE ARTERY EMBOLIZATION FOR HIGH FLOW UTERINE ARTERIOVENOUS FISTULA IN A TERM PARTURIENT

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Introduction: Arteriovenous fistulae (AVF) of the uterus are an uncommon, yet serious finding in the pregnant woman, increasing the risk of serious peripartum hemorrhage. There have been very few documented cases of pregnancies carried to term with a uterine AVF present. We document a case identified by ultrasound at 8 weeks gestation, carried to 36 weeks, and delivered by elective cesarean section (CS) with interventional radiology (IR) assistance.

Case report: A healthy 31 year-old parturient, gravida 2 para 1, was seen in her first trimester for a routine ultrasound when an abnormality was found in the anterior lower uterine segment. An AVF was diagnosed. Because of the possibility of interference with placental function and fetal growth based on its location, the AVF was monitored monthly by ultrasound. At 36 weeks, she presented for elective CS, understanding the high risk for intra-operative hemorrhage. A lumbar epidural was placed pre-operatively, and she was taken to the main operating room for her CS. After routine pre-medication, she was positioned with left uterine displacement. Two 14G peripheral IVs were started, and an arterial line was placed for monitoring and blood gas measurement. IR placed bilateral femoral arterial balloon occlusion catheters, and the CS proceeded. Following entry into the peritoneum, a uterine ultrasound and pelvic arteriography was performed to determine the location and extent of the AVF. Uterine incision was made, and a healthy baby was delivered rapidly and handed off to the pediatricians (Apgars 8/9). Blood loss was initially brisk, and prior to delivery of the placenta, IR performed gelfoam embolization in both uterine arteries. Hemostasis was achieved, and a repeat arteriogram demonstrated obliteration of the AVF. The placenta was delivered without further hemorrhage and the remainder of the CS was uneventful. Her postoperative hematocrit was 26 mg/dl, following 2 liters of operative blood loss with adequate fluid resuscitation. She required no blood transfusions, and remained hemodynamically stable. She was transferred to the ICU postoperatively for frequent lower extremity pulse checks. Recovery was otherwise uneventful, with a 6-week postpartum follow-up uterine ultrasound revealing no recurrence of the AVF.

Discussion: Undiagnosed AVF may cause life-threatening hemorrhage upon entering abnormal vascularity during uterine incision. Ultrasound techniques have made diagnosis easier. Treatment of AVF via IR-guided embolization is a successful way to stop bleeding, may avoid a possible emergent hysterectomy, and preserve fertility. Multiple studies have described the high success rates of uterine artery embolizations for elective and emergent AFV treatment.¹ Previous descriptions of this treatment have been used in parturients up to 34 weeks. With careful planning and preparation, antepartum diagnosis could prevent life threatening hemorrhage and fetal loss in women presenting with uterine AVF during pregnancy.

References:

1. Radiology 1999; 212:385-89.

SOAP A112

HYPERVENTILATION INDUCED TRANSIENT SPASTIC QUADRAPARESIS IN A PARTURIENT IMMEDIATELY PRIOR TO NEURAXIAL ANALGESIA REQUEST

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During conditions of extreme pain such as active labor, patients hyperventilate, overriding their involuntary brainstem respiratory center control. Here we report a case of transient spastic quadraparesis in a parturient presenting with extreme hyperventilation during active labor pain.

Case report

A 21 year old 51 kg G3P1 full term parturient, was admitted to our labor and delivery ward in active labor. Her past medical/obstetric history was unremarkable and vital signs were within normal limits. She reported previous successful labor epidural analgesia with 6 months postpartum back-pain. Following a rapid progress of labor, the patient requested epidural analgesia. The anesthesia team found the patient lying supine with arms/legs extended and both wrists in extreme flexion (carpopedal spasm), looking upwards and breathing vigorously (60-80/minute). The delivery nurse/obstetric resident described the patient undergoing sudden spastic paresis involving bilateral upper/lower extremities, 5 minutes earlier, and were unable to straighten the patient's upper extremities, with a substantially high muscle tone noted. The patient had slight voluntary control of her head/toes during the entire fifteen-minute episode. She was able to maintain conversation, but could not voluntarily move her upper or lower extremities. She also complained of dizziness, blurred vision, and numbness in her lower extremities during the event, and a five-minute prodromal paresthesia in her nose/toes 5 minutes before the event. The delivery nurse reported that the patient had been breathing at this rate for at least 30 minutes during her contractions prior to the event. Management of the patient included placing a face-mask with reservoir bag without any gas flow, to allow re-breathing of carbon dioxide, and 50 mcg of intravenous fentanyl leading to resolution over 10 minutes. The patient delivered a vigorous healthy boy 25 minutes later. A neurology consultation and laboratory tests were obtained post-delivery. Her neurological exam was normal. The majority of her laboratory investigations were normal, except a low total calcium (8.6mg/dL) and high alkaline phosphatase (207 U/L). Both patient and baby were discharged home with a normal neurological exam.

Discussion

Lamaze breathing can potentially distract patients from labor pain, reduce stress and prevent hyperventilation during labor. While a seizure/pseudo-seizure may be a possible etiology here, it is unlikely with no previous history of these and no loss-of-consciousness. The most likely cause of this event is transient hypocalcemia induced by hyperventilation-induced respiratory alkalosis. This is the first reported case of severe hyperventilation inducing spastic quadraparesis in an obstetric patient. Both awareness of this differential diagnosis and prevention of extreme hyperventilation are important management goals of the obstetric patient, especially those without prenatal education, or prior to achieving successful neuraxial and/or other means of analgesia.

POSTER CASE REPORTS

SOAP A113

EPIDURAL ANALGESIA FOR VAGINAL DELIVERY IN A PARTURIENT WITH A SPINAL CORD STIMULATOR

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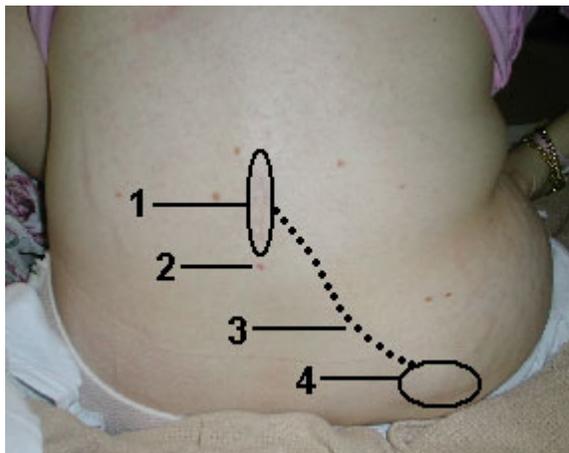
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Introduction: A 28 year old parturient presented at 30 weeks gestation for consultation regarding epidural analgesia for an anticipated vaginal delivery. This patient had a spinal cord stimulator (SCS) placed in her lumbothoracic epidural space 2 years previously for management of Complex Regional Pain Syndrome (CRPS) type I. The patient had done very well following the SCS placement and had managed to taper and discontinue all pain medications. She presented with an otherwise uneventful pregnancy and desired epidural analgesia for childbirth.

Case Report: The patient underwent a routine preadmission obstetrical anesthesia evaluation. The primary considerations in this patient were: 1) safety of the mother and fetus; 2) safety and avoidance of the implanted SCS; 3) efficacy of epidural analgesia. Discussion between the SCS implanting physician and the obstetric anesthesiologist localized the site of stimulator lead implantation and subcutaneous tunneling as well as the SCS generator. The subcutaneous site of the SCS lead insertion was right paramedian at the L1-2 interspace. The patient presented to the labor and delivery suite at 39 wks gestation in spontaneous labor. Using meticulous sterile technique, the lumbar region was prepped with betadine and draped. A 17 ga Tuohy needle was introduced at the L3-4 interspace using a midline saline LOR technique and an epidural catheter was advanced 5cm into the epidural space. After spinal and intravenous test dosing with 2% lidocaine (2ml + 5ml), analgesia was maintained with bupivacaine 0.11% and fentanyl 2mcg/ml *via* PCEA. The patient had excellent analgesia and delivered a healthy term infant without complications. Approximately one hour after delivery, the epidural catheter was removed. The patient was seen in follow-up for two days postoperatively, and six weeks later. The SCS was functioning and the mother and infant were doing well.

Conclusion: This case illustrates the potential safety and efficacy of epidural analgesia for labor and delivery in a patient with a previously placed SCS. Thorough knowledge of the location of the components of the SCS and maintenance of strict aseptic technique during the placement and maintenance of the epidural catheter minimizes risks associated with this procedure.

Image Legend: Photo taken postop day one. 1) Scar from SCS lead placement 2) Labor epidural placement site 3) Tunnel path for SCS lead 4) SCS generator and battery.



SOAP A114

ANESTHETIC MANAGEMENT OF ELECTIVE CESAREAN SECTION FOR A PARTURIENT WITH KLIPPEL-FEIL SYNDROME

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Introduction: Klippel-Feil Syndrome (KFS) is an inherited condition characterized by a short neck secondary to fusion of the cervical vertebrae. KFS is associated with other congenital anomalies affecting the cardiovascular, genitourinary, and skeletal systems. The anesthetic management of these patients can be difficult. Regional anesthesia is challenging and these patients often have difficult airways. We report a case of a patient with KFS who presented for elective cesarean section.

Case Report: The patient was a 32 year old, primigravida with KFS who presented at 39 weeks gestation for elective cesarean section secondary to breech presentation. Her past medical history was significant for cervical fusion, torticollis, severe scoliosis, a history of tethered spinal cord at L₃₋₄ (released at age of 16 years), submucosal cleft palate, partial sacral agenesis, single kidney, type I Arnold Chiari malformation, Sprengle deformities, mild aortic stenosis and a H/O imperforated anus (corrected at birth). On PE the patient was 144cm in height and weighed 69 kg. She possessed a webbed neck, Mallampati class II airway, limited neck mobility, severe torticollis and kyphosis. Because of her history and physical attributes, a general anesthetic was planned following awake intubation of the trachea with fiberoptic bronchoscopy (FOB). Following adequate patient preparation and with the patient positioned supine, several anesthesiologists attempted oral intubation of the trachea with FOB but without success. Surgery was temporarily postponed and ENT was consulted. Following re-preparation of the patient and with ENT present, the patient's airway was secured. Nasal intubation of the trachea was successful using a FOB with the patient in the sitting position. Intravenous general anesthesia was induced and a healthy, normal female was delivered with Apgar scores of 7 and 9. The patient's trachea was extubated in the OR and the patient was taken to ICU for recovery.

Discussion: The decision to proceed with general anesthesia was the correct choice. Because of previous spinal surgery, regional anesthesia would have been difficult and because of potential airway management problems, a complication during regional anesthesia could have been a disaster. The choice of awake intubation of the trachea with FOB was also correct. Failure to intubate the trachea following direct laryngoscopy in KFS patients has been reported (1). The sitting position and the nasal route for FOB provided a better angle to view the glottic opening and to minimize obstruction of the posterior pharynx by the tongue. The consultation and immediate availability of ENT colleagues is also important.

References:

(1) Anesth Analg, 92:514-6, 2001

POSTER CASE REPORTS

SOAP A115

EPIDURAL ABSCESS AFTER NEURAXIAL ANALGESIA IN A HEALTHY PARTURIENT

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Introduction: There are very few reports of epidural abscesses following labor epidural analgesia. This case report represents a healthy parturient, who had an epidural catheter placed and developed an epidural abscess requiring surgical decompression.

Case Report: A 33-year-old healthy G2P1 presented in spontaneous labor and requested epidural analgesia. She had a previous NSVD with epidural labor analgesia. The anesthesiologist wore scrubs, hat, mask and sterile gloves. The skin was prepared with 3 povidone iodine washes with time allowed for evaporative drying. A combined spinal/epidural using the needle through needle approach was performed. The pharmacy prepared infusions under sterile hood. The epidural catheter was connected to a continuous bupivacaine/fentanyl infusion. No epidural re-doses were required. The patient delivered vaginally and post-partum course was complicated by uterine atony and hemorrhage that resolved with uterine massage and methylergonovine. She did not require blood products. The epidural catheter remained in place for 6.25 hours.

Eleven days post-partum, she presented to the ED with 5-day h/o right lower back pain (VRS 10/10) radiating to her anterior thigh and was partially relieved by ibuprofen. She also described chills, right medial thigh numbness and weakness but no bowel or bladder incontinence. Her vital signs were: T=99°F, HR=108, RR=20, BP=130/83. She had right paravertebral tenderness at L5-S1. She had intact motor strength in her lower extremities except 4/5 right psoas strength and decreased sensation to pin prick over the right anteromedial thigh. She had normal gait, reflexes and rectal tone. WBC=14.6K (neut.=90%), U/A=many WBCs and positive leukocyte esterase. Lumbosacral MRI w/contrast illustrated disc extrusion at L5-S1 with enhanced granulation tissue at the right S1 nerve root. The patient was administered levofloxacin for presumed UTI. A neurosurgeon recommended urgent right L5-S1 hemilaminectomy to decompress symptomatic HNP. On exploration, purulent fluid in the axilla of the right S1 nerve root was exerting pressure on the thecal sac. Her neurologic deficits resolved after hemilaminectomy and decompression and she was discharged on post-operative day 2 with a 2-week course of IV vancomycin and levofloxacin. Blood, urine and tissue cultures were negative despite operative diagnosis of epidural abscess.

Discussion: This case report represents a rare diagnosis of an epidural abscess after labor analgesia. MRI did not aid in the detection despite 95% sensitivity and specificity in diagnosing epidural abscesses.¹ The patient's symptoms did not correlate with the herniated disk detected on MRI or abscess found during surgery. Epidural catheter associated abscesses have usually been detected posterior to the spinal cord, while this abscess was anterior.¹ The atypical presentation in a healthy patient makes this case an enigma.

References:

¹Neuroradiology 1999; 41: 904-909.

SOAP A116

DWARFISM, FACTOR V LEIDEN DEFICIENCY, ANTICOAGULATION, AND HISTORY OF DIFFICULT AIRWAY: AN OBSTETRIC ANESTHESIA CHALLENGE!

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Introduction: Dwarfism is defined as an adult height of less than 147cm. This parturient with mixed, unclassified, dwarfism may be the smallest pregnant patient reported to date.

Case Presentation: A 35 year-old G₁, P₀ patient with unclassified dwarfism, (possibly mixed achondroplastic and ateliotic), presented for evaluation at 25wks with cesarean section (C/S) scheduled for 38wks. Her pre-pregnancy weight was 35kg, current weight 40kg, and height 101cm. She had Factor V Leiden deficiency with recent deep venous thrombosis, and was receiving enoxaparin 60mg BID for anticoagulation. Past history included multiple orthopedic procedures, including C1-2 vertebral fusion, performed under GA with awake fiberoptic intubation. She was highly functional, BP 125/90, with no cardiopulmonary disease. Her head and neck were normally proportioned, with slightly decreased neck extension, Mallampati Class 2 airway, and thyromental distance of 5cm. She had extreme lumbar lordosis, barely palpable spinous processes and thoracic scoliosis. Awake direct laryngoscopy performed at 28wks with topical anesthesia revealed a grade 2 view using a short-handled Mac 3 blade. Hypertension at 30wks was treated with labetalol 100mg po BID. By 34wks she became increasingly dyspneic, requiring an electric scooter for mobility. Loratadine, nasal steroids, and albuterol were given for allergies at 36wks. Two days before the C/S, enoxaparin was discontinued and a heparin infusion started, which was continued until 6h prior to C/S. Exam included: weight 44.5kg, BP 130/90, SpO₂ 93%, peripheral edema and mild wheezing. After a 500ml hetastarch preload, epidural anesthesia was performed at L2-3 with loss of resistance at 6.5cm. Moderate difficulty was encountered threading the catheter. A negative test dose of 2ml of 2% lidocaine with epinephrine and bicarbonate was followed by 14ml of additional local anesthetic given in 2-4 ml increments with 37.5mcg fentanyl. A T4 sensory level was obtained and the C/S proceeded uneventfully. A normal 2.92kg male infant, Appgars 9/9, was delivered. No vasopressors were required. Epidural morphine, 3mg, was administered for postoperative pain and the catheter was removed. Heparin infusion and enoxaparin were resumed at 6 and 24h post-C/S, respectively. The patient recovered uneventfully and was discharged on postoperative day 5.

Conclusion: Patients with dwarfism frequently have co-existing diseases that complicate anesthetic management. The physiologic and anatomic changes of pregnancy added to their pre-existing abnormal anatomy and physiology make these patients extremely challenging. Although we were prepared for difficult intubation, our airway evaluation reassured us that emergency FOB would not have been mandatory should emergency C/S with GA have been necessary. Prior reports have suggested that dwarfs require very small volumes of epidural local anesthetics, however this clearly is not always true. This case highlights the importance of early pre-operative evaluation, a multidisciplinary team approach, and patient education regarding anesthetic options and expectations.

POSTER CASE REPORTS

SOAP A117
SUBARACHNOID HEMORRHAGES MASQUERADING AS
POST DURAL PUNCTURE HEADACHE

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Introduction: Post dural puncture headache occurs in approximately 1-4% of parturients receiving central neuraxial analgesia or anesthesia. However, not every post partum headache is due to dural puncture.

Case report: A 31 year old woman 38 weeks pregnant was admitted for urgent cesarean delivery secondary to an abnormal nonstress test (NST). On admission, the patient developed sudden onset of severe fronto-occipital headache, she attributed to extreme anxiety.

She had no significant past medical history. In the operating room, spinal anesthesia was attempted with a 27g Whitacre needle at the 4/5 lumbar interspace. Heavily bloodstained cerebral spinal fluid (CSF) returned in the spinal needle. Presuming a traumatic puncture, the anesthesiologist reattempted at the 3/4 interspace with a new 27g needle with the same result. General anesthesia was induced due to the surgical urgency and was uneventful. The APGARs were 8/8/9.

Postoperatively, the patient complained of headache. Although attributed to the dural punctures, the headache was not postural. No focal deficits were noted. Discharged home on oral analgesics, she returned the next day with intractable headache, photophobia, and phonophobia. Lumbar puncture revealed CSF with 93,500 red blood cells (RBC), 29,425 crenated RBCs, 500 white blood cells (87% neutrophils) and no organisms. Plain CT of the brain and lumbar spine were normal. Headache unrelenting, MRI performed the next day showed parietal convex sulci with increased signal consistent with subarachnoid hemorrhage. MRI angiogram revealed a 3.0 x 2.0 mm aneurysm arising at the right A1 segment of the anterior cerebral artery and the anterior communicating artery. Admitted to the ICU, the patient received dexamethasone, and nimodipine. Clipping of her aneurysm and recovery were uneventful.

Discussion: The history and findings indicate the aneurysm bled prior to cesarean delivery. Diagnosed early, the best management would have been cesarean delivery followed by aneurysm clipping under the same anesthetic.

Obstetric general anesthetic requires rapid sequence induction with application of cricoid pressure. The standard thiopentone-suxamethonium intubation sequence may cause systolic pressure increases of up to 50%. (1) carrying the risk of aneurysm re-rupture.

Alternatively, cesarean delivery under epidural anesthesia avoids laryngoscopy-associated hypertension. However, epidural injection of local anesthetic has been reported to increase the intracranial pressure (2).

The hallmark of postdural puncture headache (PDPH) is the postural nature of the headache. Headaches without a postural component should be scrutinized.

References:

(1) Colley PS, Cerebral aneurysm management: anesthetic aspects. In: Cottrell JE, Turndoff H, eds. Anesthesia and neurosurgery, St. Louis: Mosby, 1986; 410-418.

(2) Hilt H, Gramm HJ, Link J. Changes in intracranial pressure associated with extradural anesthesia. Br J of Anaesthesia 1986;58:676-680.

SOAP A118
TEMPORARY PACEMAKER AND SPINAL ANESTHESIA
FOR CESAREAN SECTION IN A PATIENT WITH
SPONTANEOUS COMPLETE HEART BLOCK DURING
PREGNANCY

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Introduction: Acquired or congenital complete heart block (CHB) is rare during pregnancy. Case reports and reviews explain the consequences of CHB for obstetric management¹, but offer little information about anesthetic implications for these patients at term. We describe spinal anesthesia (SA) for cesarean section in a patient with new onset CHB during pregnancy.

Case: A 41 y.o. woman, 5'3", 76 kg, G4P1, without prior cardiac history presented with an asymptomatic resting heart rate (HR) of 40 beats per minute on routine prenatal visit at 36 weeks gestation. EKG showed CHB with narrow-complex escape rhythm and an echocardiogram was normal. Her pregnancy was complicated by insulin-dependent gestational diabetes, and a skin condition known as Grover's disease requiring prednisone. Diagnostic tests for Lyme, autoimmune and thyroid disease were negative. Labor and delivery requires adaptation of the cardiovascular system to a physiologic rise in cardiac output. Due to the compromised physiologic HR response and its potential cardiovascular complications during labor and delivery, a temporary pacemaker was inserted in our patient before labor induction. Fetal intolerance of Pitocin-augmented labor prompted the decision for cesarean section. Spinal administration of hyperbaric bupivacaine 12 mg and fentanyl 20 mcg resulted in a sensory level of T6. The systolic blood pressure was 112/38 (mmHg) and decreased to 90/40 with a spontaneous HR between 48 and 53 bpm. Intravenous ephedrine 15 mg raised blood pressure back to baseline and HR transiently in to 73/min.. In addition to intravenous prehydration during labor augmentation, the patient received 1200cc of crystalloids during the 70 minute uneventful procedure with an estimated 500 cc blood loss. A healthy baby - APGARs 8 and 9 at 1 and 5 minutes respectively - was delivered; the umbilical cord blood gas pH was 7.3. The patient remained asymptomatic and never required pacing. Three days after delivery, she received a permanent dual chamber demand pacemaker.

Conclusion: CHB during pregnancy is a rare but potentially serious condition. The possible inability to accommodate the cardiovascular demands of pregnancy, labor, and delivery as well as those induced by anesthesia, is a major obstetric and anesthetic concern². Cardiac pacing capability is an integral part of obstetric and anesthesia care during labor and delivery in parturients with CHB. However, asymptomatic patients may tolerate labor and cesarean section under SA without pacing support. Intravenous ephedrine provoked a transient, sinus node-independent HR increase. Sinus bradycardia and hypotension, responsive to inotropes, is not uncommon in normal parturients during cesarean section, if SA impairs sympathetic cardiac accelerator fibers. This general observation and our case suggest that HR acceleration may not be a major compensatory mechanism for hemodynamic maintenance during SA for cesarean section.

References: 1. Obstet Gynecol. 79:802-4,1992 2. Acta Anaesthesiol Sin. 35: 107-11, 1997

POSTER CASE REPORTS

SOAP A119

ABDOMINAL COMPARTMENT SYNDROME FOLLOWING COMPLETE ABRUPTION OF THE PLACENTA, FETAL DEMISE AND CONSUMPTIVE COAGULOPATHY

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Introduction: Abdominal compartment syndrome (ACS) is a rare, serious condition with different etiologies causing life threatening visceral, cardiovascular, pulmonary and renal compromise. Although described in the surgical and medical literature (1,2), to our knowledge ACS has never been reported during pregnancy. We describe diagnosis and management of one such complex case.

Case: A 24-year-old woman, G2P1, was transferred to our institution at 31 weeks gestation with placental abruption and intrauterine fetal demise. Clinically she was fatigued, hemodynamically stable, with a firm and tender abdomen. An ultrasound confirmed circumferential abruption of the placenta, a large retroplacental fluid collection and fetal demise. Admitting laboratory tests were as follows (reference ranges in parenthesis): Hgb 5.2 g/dl (11-15), platelets 66 K/ μ L (150-400), PT 16.6 sec. (10.5-12.5), APTT 60 sec. (24-33.7), INR 1.5 (0.9-1.1); fibrinogen 41 mg/dl (221-421) and D-dimer > 4 μ g/ml (0-0.6). The preferred obstetric management goal was improvement of hemostasis and oxytocin induced vaginal delivery, with surgery reserved for a failed conservative approach or its complications. Necessary blood product replacement resulted in early pulmonary edema, requiring intubation. Treatment included an 8 mg recombinant Factor VIIa bolus intravenously. Within 2.5 hours, her coagulation profile normalized, except for persistent D-dimer elevation. However, concurrently with the induction of labor over 3 hours, her peak airway pressure (PAW) increased (30 \rightarrow 52 cmH₂O) with declining tidal volumes (TV, 848 \rightarrow 389 ml), and her PaO₂ declined (365 \rightarrow 73 mmHg) despite augmenting FiO₂ (0.6 \rightarrow 1.0). The CVP changed from 10 to 40 cmH₂O, the urine output (UO) ceased even after 400mg of intravenous furosemide, and metabolic acidosis developed (pH 7.22). In addition to volume overload, the acute cardio-respiratory and renal deterioration in combination with a now rigid abdomen suggested progressive ACS, necessitating emergency decompressive cesarean section. Anesthetic intraoperative management required pressure controlled ventilation and was challenging, because of severe intraoperative physiologic perturbations following abdominal and uterine decompression and reperfusion, clinically confirming ACS (PAW 45 \rightarrow 30, TV 300 \rightarrow 700, PaO₂ 66 \rightarrow 375, PaCO₂ 56 \rightarrow 46, UO 2000 ml/hr). The patient was extubated the next day, and made an uneventful recovery.

Discussion: ACS can follow serious complications of pregnancy. Common diagnostic tests, such as intracavitary bladder, gastric, and transabdominal pressure determinations, may be unreliable in the parturient. Recognizing ACS in pregnancy is important, because it determines treatment - conservative expectant *versus* operative - and outcome, as in our case. Anesthetic management is challenging because of severe intraoperative physiologic fluctuations associated with ACS, its relief and reperfusion. Collaborative and timely obstetric, anesthesia and critical care patient management permits early clinical diagnosis and rapid life saving treatment of ACS, which otherwise carries a poor prognosis.

References: 1. Obstet Gynecol; 94: 830, 1999 2. Crit Care; 4: 23, 2000

SOAP A120

ANESTHETIC MANAGEMENT OF A 26 KG PARTURIENT WITH KUGELBERG-WELANDER SYNDROME

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Introduction: Spinal muscular atrophy type III, Kugelberg-Welander syndrome, is an autosomal recessive disorder that is one of the most common genetic causes of death and disability in childhood.¹ It is characterized by severe muscle weakness and atrophy due to degeneration of motor neurons of the spinal cord. We report a case of a parturient with progressive spinal muscular atrophy with severe respiratory compromise.

Case Report: A 24 year old wheel-chair bound parturient with Kugelberg-Welander syndrome presented at 37 weeks gestation for elective cesarean delivery. She weighed 26 Kg with severe contractures and kyphoscoliosis treated with Harrington Rods. Two prior tracheostomies were performed for respiratory failure. Her FEV1 was 13% of predicted. She had extremely limited neck extension and limited mouth opening. Her head was turned to the left due to airway obstruction with midline positioning. After consultation with a pulmonologist, otolaryngologist, perinatologist and anesthesiologist, general anesthesia with an awake intubation was planned. The patient agreed and wished to be extubated at the conclusion of surgery. An awake oral fiberoptic intubation was performed, with the patients head turned to the left. A 6 mm endotracheal tube was advanced and position confirmed with end tidal CO₂ and breath sounds. An inhalational induction was performed, ventilation was assisted then controlled and no muscle relaxants were required. After the delivery of a healthy baby, small doses of fentanyl were administered. At the conclusion of surgery, she emerged from anesthesia with spontaneous ventilation then was extubated without incident. Post operative pain was controlled with local infiltration at the incision site and intravenous fentanyl and ketorolac.

Discussion: The normal physiologic changes during pregnancy decrease pulmonary reserve while increasing carbon dioxide production and oxygen consumption. Our patient with severe muscle weakness and restrictive lung disease secondary to kyphoscoliosis was not anticipated to compensate adequately.² However, due to her atrophied abdominal musculature, her gravid uterus grew outward resting on her knees with little impingement upon her diaphragm

The increased risk for respiratory failure or failed airway management for this patient required a multidisciplinary approach. An otolaryngologist was in the operating room during induction and emergence in the event there would have been a need for an emergent tracheostomy. We avoided muscle relaxants because of the predicted increased sensitivity to nondepolarizing agents and the possible hyperkalemic response to succinylcholine.

Post delivery the decreased oxygen consumption and carbon dioxide production, along with avoidance of muscle relaxants and adequate pain control all contributed to a successful immediate extubation.

This case demonstrates that severe respiratory limitation caused by spinal muscular atrophy does not necessitate postoperative ventilatory support.

Footnotes

¹ Goetz CG, ed. Textbook of Clinical Neurology. 2nd ed. Philadelphia, PA: WB Saunders Company; 2003.

² Obstet Gynecol Clin North AM. 1988;15(2): 391-428.

POSTER CASE REPORTS

SOAP A121

SEVERE THROMBOCYTOPENIA COMPLICATING VON WILLEBRAND TYPE2B DISEASE

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Introduction: vWD is characterized by abnormal platelet aggregation, is caused by changes in vWFactor, and usually improves with pregnancy.¹ Different from the quantitative Type 1 and 3 vWD, Type 2 is associated with qualitative vWF abnormalities, and a unique subtype, 2b, releases abnormal platelet aggregating multimers, an event which consumes platelets. We present the case of a parturient with Type 2b vWD that resulted in severe thrombocytopenia during the peripartum period.

Case report: A 35 y/o Caucasian female G2P1 with a history of type 2b vWD presented at 36 weeks gestation. She had a normal spontaneous vaginal delivery at 39 weeks gestation two years previously without neuraxial analgesia and a platelet count of $20,000 \times 10^9/l$. The current pregnancy had a breech presentation, and the patient was scheduled for a cesarean delivery. Although two weeks prior to admission she had a platelet count of $46,000 \times 10^9/l$, on admission, it had decreased to $36,000 \times 10^9/l$. Humate P and platelets were given, but the repeat platelet count was $30,000 \times 10^9/l$; an additional unit of platelets was given, and the anesthetic plan was changed to a general anesthetic. No excessive bleeding was observed perioperatively, despite an intraoperative platelet count of $10,000 \times 10^9/l$. Additional Humate B was given, and progressive increases in platelet counts were observed from $20,000 \times 10^9/l$ to $31,000 \times 10^9/l$ at 24 hrs, $42,000 \times 10^9/l$ at 48 hrs, and $53,000 \times 10^9/l$ on postoperative day four.

Discussion: Subtype 2b vWD is characterized by an increased interaction between vWF and normal platelets.² A unique characteristic is that thrombocytopenia is common, and may be paradoxically exacerbated by pregnancy due to an increase in vWF activity.^{2,3} Although platelet transfusions were utilized, the treatment with FVIII plasma concentrates which retain normal high-molecular-weight vWF multimers such as Humate-P is more important in patients with Type 2b vWD.

This report emphasizes the need to give factor VIII plasma concentrates to patients with vWD type 2b. The benefit of platelet transfusions in this setting remains controversial, although there may be a benefit when used in conjunction with factor VIII plasma concentrates. Of note, serial response of the thrombocytopenia to FVIII replacement may be slow, and may have implications regarding the risk/benefit analysis for neuraxial blockade.

References: 1. Clin Obstet Gynec 1999;42:390-405; 2. Br J Haematol 1999;105:538-41; 3. Haemophilia 2003;9:137-44.

SOAP A122

LABOR ANALGESIA IN A PARTURIENT WITH PRIOR HARRINGTON ROD INSTRUMENTATION: IS CAUDAL EPIDURAL AN OPTION?

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Introduction: Administration of lumbar epidural analgesia in a parturient with previous Harrington rod instrumentation presents a unique challenge to the anesthesiologist (1). We herein present a case of a parturient with prior Harrington rod insertion who received single dose caudal epidural analgesia for labor. **Report of case:** A 37-year-old, 165 cm, 72 kg, gravida 1, para 0 otherwise healthy female with worsening preeclampsia was admitted to the Labor and Delivery suite for routine induction of labor. Her past surgical history included Harrington rod instrumentation for stabilization of a motor vehicle-related L3 vertebral fracture. The course of her pregnancy had been uneventful. Her vital signs were stable and the fetal heart rate was 150 beats/minute and reactive. Radiographic studies of her lumbar spine showed an old L3 vertebral compression fracture corrected with bilateral Harrington rods extending from the L1 vertebral lamina to the sacrum. Her labor was induced in a standard manner with intravenous oxytocin infusion. At 5-6 cm cervical dilatation the patient requested labor analgesia. Lumbar epidural placement was attempted at L5-S1 and L4/L5 vertebral interspaces, however it proved unsuccessful, and the decision was made to proceed with caudal epidural analgesia. Following identification of the sacral hiatus, the sacral area was prepped and draped in a routine manner. An 18-GA Tuohy-Schliff epidural needle was introduced, and caudal epidural space was identified with the loss of resistance to saline technique on the first attempt. A total dose of 8 ml of 0.25 % bupivacaine and 100 µg of fentanyl were injected in increments over several minutes. The patient reported excellent pain relief in approximately 10-15 minutes. Two hours later (the patient was still pain free) Cesarean section under general anesthesia was required for obstetric indications (fetal distress). A healthy male newborn with Apgar scores of 9 and 9, after one and five minutes, respectively, was delivered via an abdominal route. The patient's postpartum course was uneventful. **Discussion:** Lumbar epidural analgesia is known to be technically difficult in patients with prior Harrington rod instrumentation (1,2). These difficulties range from inability to identify the epidural space, multiple attempts before catheter insertion, vascular trauma, and/or subdural local anesthetic injection to accidental dural puncture. The authors of this report are not aware of any other reports describing administration of caudal epidural analgesia in a parturient with previous Harrington rod instrumentation. In summary, this case report provides evidence, that caudal epidural analgesia can be an effective alternative to lumbar epidural analgesia in parturients with altered anatomy secondary to prior lumbar instrumentation. **References:** 1. Can J Anaesth 1989; 36:693-6., 2. Reg Anesth 1995; 20:159-62.

POSTER CASE REPORTS

SOAP A123

EPIDURAL LABOR ANALGESIA AND POSTPARTUM LUMBOSACRAL NEUROLOGIC DEFICIT: A DILEMMA

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Introduction: Lumbosacral trunk compression (LTC) by the descending fetal head is an apparently rare, but potentially reversible cause of postpartum neurological injury. Early diagnosis during labor as well as postpartum differentiation of obstetric vs. anesthesia-related nerve deficit, are challenges when epidural labor analgesia was used. We present a case of probable lumbosacral trunk injury during labor that illustrates this dilemma.

Case: A 37 yo. woman, 5'8", 91 kg, G3P1, was admitted for post date induction of labor. She reported right (R) buttock pain during contractions. L3/4 epidural catheter placement (on first attempt) was accompanied by transient R leg paraesthesia. Despite more intense R-sided blockade after local anesthetic (LA) administration, she required repeated epidural LA boluses for an 'epidural window' of R leg pain concurrent with contractions. After 14 hours of Pitocin-augmented labor, a healthy 9 lb., 11 oz. baby was delivered. On post-partum day (PPD) 1, the patient complained of painless numbness below the R knee and difficulty lifting her R foot, requiring assistance to ambulate. A neurological consultation on PPD 7 identified mild R weakness on foot and toe dorsiflexion and foot inversion. Sensation was mildly reduced over the instep and the dorsomedial surface of the foot. Deep tendon reflexes and straight leg raising examination were normal. An electrodiagnostic examination on PPD 21 found normal R tibial and peroneal motor conduction, normal R sural nerve sensory potential, and no evidence of focal slowing or conduction block of the R common peroneal nerve at the fibular head. The R superficial peroneal sensory nerve action potential was reduced, consistent with sensory nerve fiber dysfunction, at or distal to the L5 dorsal root ganglion. Needle electromyography revealed recent denervation in two muscles supplied by different nerves, but sharing L5 segmental innervation, as well as active denervation in the R lumbosacral paraspinalis muscles. Interpreted within the clinical context, the electrodiagnostic findings were felt to be consistent with a lumbosacral trunk compression injury.

Conclusion: Fetal cephalopelvic disproportion and protracted labor is a risk factor for lumbosacral trunk injury¹. Lumbosacral trunk compression may occur in early labor. Pain as a symptom of LTC may be eliminated by epidural analgesia¹, or masquerade as an analgesic window, and present as breakthrough unilateral leg pain. The incidences of LTC and its masking by epidural analgesia are unknown, but possibly underestimated. New concerns include: 1. Early diagnosis of LTC prior to and during epidural analgesia. 2. Differential diagnosis of apparent analgesic windows. 3. Consideration and timing of cesarean section to avoid nerve injury.

References: 1. Muscle Nerve 26; 2002, 340-7

SOAP A124

ANESTHESIA FOR CESAREAN SECTION IN A PARTURIENT WITH IHSS, SICK SINUS SYNDROME AND S/P CEREBROVASCULAR ACCIDENT

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Introduction: Use of regional anesthesia(RA) in IHSS is controversial. It has been previously recommended that RA be avoided because of detrimental vasodilatory effects. We presented a case of successful management with epidural anesthesia (EA) for C/S in a parturient with IHSS, sick sinus syndrome, s/p cerebrovascular accident(CVA) and anterior placenta.

Case: A 35 y/o woman, G5P3A1, IUP 37 weeks GA, with IHSS, sick sinus syndrome, DDD pacemaker, hx of hypothyroidism and s/p CVA was presented for her 4th cesarean section. Pregnancy was complicated by anterior placenta, paroxysmal supraventricular tachyarrhythmia and CVA at 29-wks GA treated with plavix. Pre-anesthetic consult was done at 32-wks GA with her presenting with moderate SOB and 3-pillow orthopnea. 2D echo revealed LVH with outflow tract resting gradient (80mmHg) c/w IHSS. After discussion with her cardiologist, neurologist and obstetrician to optimize her status, she was continued on atenolol, sotalol, HCTZ, aciphex, B12, synthroid and plavix. In anticipation of EA for C/S, plavix was stopped for 1 week prior. On day of surgery, patient was hemodynamically stable. She had 16g-IV placed and was monitored by ECG, non-invasive blood pressure and continuous pulse-oximetry, with bedside availability of non-invasive continuous arterial pressure monitor. Patient was placed on oxygen prophylactically. She received 50cc of 25%-albumin and 500cc lactated ringers immediately before EA. An epidural catheter was inserted through a 17-g Tuohy needle at L3-L4 interspace, using loss-of-resistance technique with patient in the sitting position. The patient was then placed supine with left uterine displacement (LUD) to avoid aortocaval compression. After a negative 3-ml test-dose of 2% lidocaine through the epidural catheter, followed by lidocaine 2% in 3ml increments over 25 minutes for a total of 15ml lidocaine, a sensory anesthesia level of T4-S5 was reached. 60mcg of phenylephrine in 20mcg increments were required to maintain patients blood pressure. Intraoperative anesthesia was excellent and surgery completed uneventfully. Patient required 120mcg phenylephrine intraoperatively in 20mcg increments. Blood pressure remained stable at 110-140/60-85. Total fluid in was 1,000ml of lactated ringers and 50cc of 25% albumin. Patient also received 20 U of oxytocin. Patient delivered a male infant weighing 2097 grams with Apgars of 8/9. On POD #1, patient was brought back to the OR for I+D and closure of wound hematoma. Anesthetic for this short procedure was done with local and sedation since her epidural catheter was taken out. The rest of hospital course was uneventful.

Discussion: Regardless of anesthetic technique, LUD, immediate available cross-matched blood, alpha-agonist and vasopressors devoid of inotropic effect should be used if necessary. It is essential to have a cooperative effort between obstetrician, cardiologist, neurologist and anesthesiologist. Epidural anesthesia carefully titrated with ongoing compensation for the induced hemodynamic changes can be safely accomplished in patients with IHSS.

POSTER CASE REPORTS

SOAP A125

ANESTHETIC MANAGEMENT FOR EMERGENCY CESAREAN SECTION IN A PATIENT WITH SEVERE DOUBLE VALVULAR DISEASE AND PREECLAMPSIA: A CASE REPORT

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Introduction: We present a report of a parturient that presented at 36 weeks of gestation with severe aortic stenosis (AS) and mitral stenosis (MS), pulmonary edema and severe preeclampsia.

Case report: A 21-yr-old nulliparous patient was admitted with shortness of breath, peripheral edema and increasing BP, all suggestive of preeclampsia. Past medical history was significant for previous aortic valve replacement and mitral valve repair, an IVC filter placement and patent ductus arteriosus repair as a child. Because of her valve replacements, the patient was anticoagulated with a PTT of 69.9 sec. An echocardiogram demonstrated severe AS and MS (peak/mean gradients of 80/45 and 28/14 respectively)* and an ejection fraction of 55%. Cardiology recommended emergent mitral balloon valvuloplasty. Since the patient's condition was rapidly deteriorating, it was decided to proceed with C-section under GA with cardiology standing by. The patient was taken to the operating room and laid supine to place a pulmonary artery catheter (PAC). She could not tolerate lying down and became severely dyspnoic with oxygen saturation decreasing to 70%. Attempts to place the PAC were then abandoned. An awake fiberoptic nasal intubation was performed in the sitting position. Following anesthesia induction, a baby girl was delivered with APGARs of 8 and 9. The rest of the intraoperative course was uneventful. She was transferred to the ICU postoperatively. A PAC was placed which demonstrated a PCWP of 26 mmHg, cardiac output 3.8L/min and a cardiac index of 1.75. She was extubated on POD#1 and discharged on POD#6. No subsequent valvuloplasty was needed.

Discussion: There is an increase in the number of young women with prosthetic valves[1] of which 16% become pregnant[2], a number that is increasing[3]. Maternal heart disease is one of the most important non-obstetric causes of death during pregnancy[4] so it is a problem worth addressing. Preeclampsia itself is known to causing acute pulmonary edema[5]; however, in this case, we were led to believe that anatomic worsening of the valvular disease had taken place. In fact, the increase in total intravascular blood volume and cardiac output during pregnancy led to an increase in a "physiological" stenosis. In this patient, the superimposed preeclampsia and its associated afterload changes compounded the valvular stenosis and led to pulmonary congestion and acute decompensation. Upon delivery there was complete resolution of her cardiac issues. In conclusion, the parturient with heart disease will continue to be an imposing challenge for the anesthesiologist.

References:

- 1) ClinAnaesth,1986.4:p.247-250
- 2) JCardiothoracVascAnesth,1996.10.(4):p.516-8
- 3) EurJCardiothorSurg,2002.22(2):p.223-7
- 4) TheHeart1990;p.1465-1478
- 5) ACOG:05/97:Meeting

*Mean gradients greater than 50mmHg & 12mmHg suggest severe AS & MS respectively.

SOAP A126

CARDIOMYOPATHY OF PREGNANCY MANAGED IN THE ICU SETTING WITH SLOW INFUSION OF LUMBAR EPIDURAL ANALGESIA

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A 28 yo G4P2 parturient with cardiomyopathy of pregnancy at 33 wks gestation is induced for delivery. Three months after her previous delivery she was diagnosed with post-partum cardiomyopathy and pulmonary edema with an ejection fraction of 25%. At that time she was advised not to get pregnant again. At 22 wks of this gestation she had to be admitted to the coronary ICU for an episode of Ventricular Tachycardia which was converted medically at that time. An Echocardiogram revealed (3+) MR, hypokinesis and an EF of 25-30%. She had been monitored on the antepartum service since admission. When fetal lung maturity was confirmed the obstetricians decided to deliver the baby to optimize maternal outcome. She was transferred to the ICU for induction. PE revealed a Class III Airway, BP 114/58, P80-90, RR24, O2 Sat 97% on room air. Lungs Blunted breath sounds at the bases, Heart S1 and S2 with no murmurs or gallops, Ext trace edema. She had been maintained on Lopressor, KCL and Demedex since admission. FHR's were 130-140 with good variability. A CVP was placed via the right internal jugular and an A-line in the left radial artery. An epidural catheter was placed for labor and delivery analgesia. A subarachnoid test dose of 2cc of 2% lidocaine was negative. The epidural was then dosed with a slow infusion of 0.11% bupivacaine over an hour until the patient became comfortable (14cc total). An infusion of 0.11% bupivacaine at 10cc/hr was used for maintenance. The initial CVP was 13 mmhg and was maintained in the ranges of 6-12 mmhg. Her pulse stayed in the 80-90 range. The epidural was replaced once during labor because of a one-sided block. Her block level ranged from T-10 to T-7. Small boluses of phenylephrine 20 mcg were given to maintain BP when the CVP fell. The patient delivered a female infant with outlet forceps, without incident. Apgar scores were 6 and 9 at 1 and 5 minutes respectively for the newborn.

Discussion: Cardiomyopathy of pregnancy presents as signs and symptoms of ventricular failure, along with echocardiographic evidence of ventricular failure and decreased ejection fraction. This disorder carries a high maternal risk. This case demonstrates that close monitoring of these patients with a CVP and A-line in an ICU setting along with the judicious dosing of a lumbar epidural with a slow infusion to comfort during labor and a passive second stage can lead to a successful outcome.

References

1. Pearson et al. Paripartum Cardiomyopathy: National Heart Lung, and Blood Institute and Office of Rare Diseases (NIH) workshop recommendations and review. JAMA. 2000;283:1183-8
2. Bell EA. Why mother die in the southeastern United States. Anesthesiology. 2003;98 Supp 1:A15

POSTER CASE REPORTS

SOAP A127

EPIDURAL ANAESTHESIA FOR MINOR THORACIC SURGERY IN EARLY PREGNANCY

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Introduction: We endeavour to demonstrate that minor thoracic surgery during early pregnancy can safely be accomplished with the use of epidural anaesthesia alone. This technique has the benefit of alleviating the maternal concerns of teratogenicity perceived to be associated with general anaesthesia.

Methods: We present a case report of a thirty-one year old lady, in early pregnancy, referred with a right sided pneumococcal pneumonia. This was complicated by empyema that was unresponsive to conservative management, which included drainage and aspiration under radiological control. The patient was clinically deteriorating and we had evidence on ultrasound of a multi-loculated empyema cavity. The thoracic surgeons elected to perform a rib resection and drainage of empyema. The patient of six weeks gestation had grave concerns regarding the teratogenic effects of all general anaesthetic agents, despite lengthy conversations to reassure her of the minimal risks. She implored upon us for a trial of thoracic epidural anaesthesia and accepted the risks involved and the fact that a general anaesthetic may be commenced, if required in our opinion. A thoracic epidural catheter was placed between the level of vertebrae 9 and 10. Incremental boluses of 2% Xylocaine (AstraZeneca) with 1:200 000 Epinephrine was titrated until surgical anaesthesia was established bilaterally with a sensory segmental blockade from lumbar vertebrae 2 to thoracic vertebrae 2.

Results: The patient was presented to the surgeons awake in a full left lateral position, breathing oxygen through an ordinary facemask. A segment of the seventh rib was excised and the chest entered to facilitate the drainage of multiple thick-wall loculi. The patient developed a pneumothorax once the lung was cleared from all the fibrin strands and loculi. Her oxygen saturation briefly deteriorated, but the surgeons covered and occluded the incision while we encouraged the patient to increase her respiratory tidal volume. These actions reinflated her lung and her oxygen saturation returned to normal levels. The patient tolerated the procedure well and reported no discomfort. An intercostal drain was inserted intra-operatively and remained in situ for three days. The patient made a remarkable recovery and was discharged four days post-operatively. Her pregnancy was further uneventful and she gave birth to a healthy baby.

Discussion: The lack of conclusive evidence concerning the teratogenicity associated with general anaesthetic agents, fuels the fears of pregnant women receiving a general anaesthetic in early pregnancy. Epidural anaesthesia has been used safely and effectively for numerous cardiothoracic surgical procedures to reduce morbidity associated with general anaesthesia. We feel that it is feasible to offer a regional technique to motivated pregnant women undergoing cardiothoracic procedures to alleviate their concerns regarding teratogenicity.

SOAP A128

ONDANSETRON-INDUCED MULTIFOCAL ENCEPHALOPATHY WITH EXTRAPYRAMIDAL SYMPTOMS DURING CESAREAN SECTION

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Introduction: Pyramidal and extrapyramidal reactions may occur in patients following the administration of phenothiazines and metoclopramide, the latter from a direct inhibition of dopaminergic receptors within the chemoreceptor trigger zone within the medulla. The hallmark of disorders of the basal ganglia (extrapyramidal reactions) is involuntary movement resulting in either an excess or poverty of movement, with changes in muscle tone and in posture. Ondansetron, a 5-HT₃ (serotonin) antagonist, is not known to have dopamine receptor antagonism, and carries no label asserting any risk of extrapyramidal symptoms. There are a few case reports documenting seizures, extrapyramidal reactions, and psychiatric disturbances secondary to ondansetron, however, no such cases exist within the obstetric literature. We report a case of ondansetron-induced neurologic symptoms in a patient undergoing Cesarean section.

Case Report: A healthy 37 y.o. G2P1 @ 40 weeks gestation was scheduled for repeat C-section following a failed trial of labor with arrest of cervical dilatation. She received 30cc of 2% lidocaine, and a T5 bilateral sensory anesthetic level was achieved. 15 minutes post-delivery she complained of severe nausea, and received 10mg metoclopramide and 4mg IV ondansetron. 30 minutes later she became confused, and exhibited purposeless dystonic movements of her arms, eye deviation-lateral, upwards and saccadic, and facial grimacing. A dystonic reaction to metoclopramide was suspected and she was given 50 mg IV of diphenhydramine with no immediate improvement. Midazolam 2mg IV was given, and her dystonic symptoms improved within a few minutes. All symptoms resolved completely within 1 hour. Overnight, her hematocrit fell to 15, and she was transfused 3U packed red blood cells. CT scan revealed a large intraperitoneal hemorrhage, and she underwent re-exploration under general anesthesia. 4mg IV Ondansetron was given prior to extubation following an uneventful surgery. Upon awakening she was noted to have generalized jerking, tonic-clonic movements of her limbs, and was unable to follow commands. 2mg midazolam IV was administered with improvement of her symptoms. A neurological consultation was obtained. Both EEG and head CT scan were unremarkable.

Discussion: Due to the increased use of ondansetron to treat PONV in parturients during and after C-section, it is expected that the number of cases of adverse reactions will similarly increase. It is unknown whether the administration of 2 anti-nausea drugs (metoclopramide and ondansetron) carries an additive risk of neurologic side effects. Though the neurochemical etiology is poorly understood, seizures, pyramidal and extrapyramidal reactions do occur, albeit rarely, following the administration of ondansetron. Successful attenuation of ondansetron-induced pyramidal and extrapyramidal symptoms may be partially achieved with the administration of intravenous benzodiazepines, as the response to diphenhydramine is poor.

1. Ritter MJ et al. Ondansetron-Induced Multifocal Encephalopathy. Mayo Clin Proc 2003;78:1150-1152

POSTER CASE REPORTS

SOAP A129

IATROGENIC ABSORPTIVE HYPERCALCEMIA IN A PREGNANT WOMAN AND HER TWINS

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We report a case of a 37-year-old multiparous woman who was delivered of 32-week twins via cesarean section for non-reassuring FHR pattern under spinal anesthesia. The twins were admitted to the NICU where laboratory investigation revealed that both babies were hypercalcemic (12 and 13 mg/dl) and in acute renal failure (creatinine 2.5 mg/dl). Hence, blood from the mother was sent for analysis and she was also found to be hypercalcemic (12.6 mg/dl) and in ARF (creatinine 2.5 mg/dl). Serum calcium showed minimal change during forced saline and diuretic therapy. However the patient developed chest pain, bradycardia and pulmonary edema with elevation in serum troponin levels (1.8 ng/ml). The cardiologist excluded the diagnosis of myocardial infarction. Subsequently, when a detailed history was obtained, the patient admitted that during the last 3-4 months of pregnancy she was taking 10-15 tablets of Tums (500 mg calcium carbonate tablets) for dyspepsia along with the prescribed multivitamins that contain Vitamin D. The hypercalcemia and renal failure resolved 72 and 96 hours after discontinuing her multivitamin and Tums. Subsequently, it was reported that the serum PTH (1 pcg/ml) and 1,25 dihydroxy-Vitamin D3 (11 pcg/ml) levels were low and 25 hydroxy-Vitamin D3 level (22 ng/ml) was within normal limits. These findings are consistent with a diagnosis of absorptive hypercalcemia secondary to excessive calcium ingestion in the presence of Vitamin D. Although this patient did fine under anesthesia, acute hypercalcemia has been known to cause increased morbidity by involving cardiovascular, cerebral, neurologic, gastrointestinal and renal systems. A detailed history of drug use, especially non-prescription medications should be mandatory.

SOAP A130

INADVERTENT INTRATHECAL INJECTION OF LABETALOL IN A PATIENT UNDERGOING POST-PARTUM TUBAL LIGATION

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One of the constant risks of intrathecal catheters is the possibility of inadvertent injection of toxins. These may either be direct neurotoxins or materials which produce damage through a secondary mechanism such as extreme pH or osmolality. We present a case in which a patient undergoing a post-partum tubal ligation with a continuous intrathecal catheter inadvertently received 15 mg of Labetalol (Bedford Laboratories) in a volume of three mls through the spinal catheter. Although the patient suffered no adverse effects, this is the first reported case of intrathecal Labetalol injection.

CASE REPORT

A morbidly obese 23-year-old G2P1 at 41 weeks gestation was induced secondary to impending post dates and history of macrosomia. During attempted epidural placement unintentional dural puncture occurred. A 20 gauge closed tip Braun epidural catheter was threaded 4 cm intrathecally for pain relief during labor. The patient had an uncomplicated vaginal delivery and was scheduled to undergo post-partum tubal ligation (PPTL) twelve hours later. Anesthesia for the PPTL was accomplished with two doses of 1 ml hyperbaric bupivacaine 0.75% in dextrose given ten minutes apart which produced a T4 block to temperature and excellent operative conditions. Twenty minutes into the procedure the patient developed moderate hypertension with blood pressures ranging from 140/90 to 155/100 and was given 20 mg of labetalol hydrochloride intravenously. Ten minutes later with systolic pressures still in the 140's, 15 mg of labetalol (5mg/mL) intended for intravenous administration, was accidentally injected into the intrathecal catheter. The attending anesthesiologist was immediately notified and he subsequently notified both the patient and her obstetric attending. Blood pressure remained stable. The patient's block dissipated in the usual fashion over several hours and repeated neurological examinations revealed no abnormalities. The patient had no complaints and remained without complaint on two and four week phone follow-up.

DISCUSSION

Labetalol is an adrenergic receptor-blocking agent that has both selective alpha-1 and non-selective beta-adrenergic blocking actions. It is commonly used in obstetrics in the treatment of pre-eclampsia. The formulation for intravenous injection is isotonic with a pH ranging from 3 to 4. Each ml of solution contains 5 mg of labetalol hydrochloride, 45 mg of anhydrous dextrose, 0.1 mg of edatate disodium, 0.8 mg of methylparaben and 0.1 mg of propylparaben as preservatives. The safety of these additives has been discussed in previous publications. The fact that our patient experienced no complications after intrathecal Labetalol administration suggests that intrathecal Labetalol itself is non-toxic when administered in doses of 15 mg or less.

POSTER CASE REPORTS

**SOAP A131
MANAGEMENT OF A PARTURIENT WITH A FONTAN
CIRCULATION**

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Introduction: More patients with repaired congenital heart disease are becoming pregnant. We present the management of a patient who has undergone a Fontan procedure.

Case Report: A 22 yo G2P1 presented for repeat c/s for worsening cardiac symptoms at 35 0/7 weeks IUP. The patient was born with [S,D,D]-transposition of the great arteries with tricuspid atresia, pulmonary atresia, a large secundum ASD and dextrocardia. She underwent a Blalock-Taussing shunt during infancy and a modified Fontan procedure at 7 yo. Echo in 6/2002 demonstrated moderately depressed LV function and mild mitral regurgitation.

Upon examination, the patient was morbidly obese with a height of 56 inches and weight of 99 kg. Airway exam demonstrated a Mallampati class III airway with no neck. Vital signs were stable with a RA Sat of 93%.

After aspiration prophylaxis, an epidural catheter was placed. Placement of a RIJ catheter and radial arterial line followed. We dosed the epidural with 2% lidocaine and bicarbonate by 5 mL increments every 5 minutes, giving a total of 20 mL, achieving T6 level of anesthesia. Patient remained stable throughout dosing and duration of the c/s. Patient's initial CVP prior to epidural dosing was 22 and remained between 15-17 during surgery. EBL was 900 mL. Patient received 2800 mL of crystalloid and 500 mL of hetastarch.

Discussion: The Fontan procedure is performed in patients with congenital tricuspid atresia. The procedure connects the right atrium with the pulmonary artery resulting in a single functioning ventricle and no functioning right ventricle. The pulmonary circulation is dependent on adequate systemic venous return and low pulmonary vascular resistance for passive flow.¹ The Fontan circulation is negatively impacted by ventricular dysfunction, mitral regurgitation, pulmonary hypertension and volume depletion.

When choosing anesthesia, one must remember that anything that increases PVR will decrease pulmonary blood flow. Regional anesthesia is preferred. Laryngoscopy and intubation results in an increase in PVR. Positive pressure ventilation can increase intrathoracic pressure and decrease pulmonary venous return. The single ventricle is more sensitive to the myocardial depressant effects of volatile anesthetics and may result in hypotension.²

Because of her cardiac status and potential for difficult intubation, we chose epidural anesthesia to minimize changes in PVR and systemic ventricular function and to avoid intubation. Because a decrease in SVR can result in a decrease in preload and pulmonary blood flow, we placed a CVP catheter to monitor fluid management. With her altered anatomy, we did not place a PA catheter. We dosed the epidural catheter incrementally to avoid rapid decreases in SVR. The patient did not receive any sedation, as resulting hypoxia and hypercapnia could increase PVR.

References:

1. *Br J Anaesth* 1994; 73: 252-255.
2. *Anesth Analg* 1994;78: 1190-2.

**SOAP A132
PARASPINAL MUSCLE ABSCESS AFTER AN EPIDURAL
CATHETER PLACEMENT**

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Introduction: Paraspinal and psoas muscle abscesses are unusual complications of epidural catheter placements.

Case Report: This was a 20-year-old G3 P3004 who presented for twin vaginal delivery and requested an epidural anesthetic. Her past medical history was a vaginal delivery four years ago with an epidural catheter placed without complications.

This current case consisted of an epidural catheter placed with difficulty at the L3-4 level with the patient in the sitting position. The back was prepped and draped in a sterile fashion with providone iodine. No paresthesias, blood or CSF were noted during placement. The patient subsequently delivered twins with the assistance of forceps. The catheter was left for 48 hours secondary to a periurethral laceration. When the catheter was pulled, the patient complained of right-sided low back pain without any other signs or symptoms. The following day the patient was discharged home without any complaints.

On the second day after discharge, the patient was readmitted with increased back pain, a stiff neck, headache, photophobia, a fever of 39.2 C and leukocytosis. Physical exam showed tenderness to palpation to her entire right side of the back at the level of the epidural site. There were no sensory or motor deficits. Frank pus from the epidural site was not noted. She was admitted with the presumptive diagnosis of meningitis and antibiotics were started. Neurology was consulted and attempted to perform a lumbar puncture which was aborted after multiple unsuccessful attempts and paresthesias. Three days after readmission, frank pus was noted draining from the epidural site. MRI showed no epidural or spinal abscess, but there was increased intensity at the right paraspinal muscles with extension into the right psoas muscle at the level of the epidural site. Infectious disease was consulted when the patient showed no signs of improvement after the initial course of antibiotics. Over the next few days, the patient had intermittent fevers. Another MRI was performed that showed an abscess in the right psoas muscle with significant inflammatory changes in the paraspinal muscles. The pus from the epidural site subsided as did the leukocytosis, fevers and back pain. Culture of the pus grew *Staphylococcus aureus* sensitive to meropenem. On day thirteen, an MRI was repeated and found to be unchanged.

The patient was discharged with a PICC line and was continued on meropenem for two weeks. Although not returning for a follow-up MRI, it is assumed that she completely recovered without sequelae.

Conclusion: Psoas and paraspinal muscle abscesses as a result of a lumbar epidural catheter placement are rare complications, as are epidural abscesses. We have found no other reported cases in the literature of a psoas or paraspinal muscle abscess from a labor epidural catheter placement.

POSTER CASE REPORTS

SOAP A133

LABOR EPIDURAL PLACEMENT IN A WOMEN WITH A SPINAL CORD STIMULATOR

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Introduction: Spinal cord stimulators (SCS) are being used increasingly for the treatment of chronic pain.

Case Report: A 37 year-old female in active labor, G1P0 at term, with history of cervical SCS placement, presented for epidural analgesia for labor pain management. The patient had received the SCS some thirty months prior as treatment for chronic regional pain syndrome I. Her pain was in the right upper extremity and it started as a complication of PICC line placement when she was being treated for an abdominal infection. The woman had previously failed multiple conservative treatments, including stellate ganglion blocks and multiple medication regimens. Symptoms had included chronic pain out of proportion to the injury with allodynia, burning paresthesias, and a clenched fist with loss of active finger extension. Other medical history included irritable bowel syndrome, fibromyalgia, and major depression. The patient was taking no medications, and laboratory values were within normal limits, with the exception of a physiologic anemia of pregnancy.

The SCS electrodes entered the C7-T1 interspace, and their end was in the epidural space at the C3 level. The electrodes were fixed to a cervical spinous process, crossed the midline high in the back, and then went down the left side of her back parallel to her spine to the generator, which was in her buttock region.

Physical exam revealed a thin parturient (57kg), but was otherwise unremarkable. The electrode cable could be felt high on the left side of her back, but not in her lumbar region.

After consultation with both the anesthesia pain service and orthopedic surgery, it was felt safe and reasonable to proceed with labor epidural anesthesia. The procedure took place with the patient sitting, using a standard reusable 17g Tuohy needle, with easy placement of a 19g reinforced epidural catheter left 4cm in the space. Subsequent analgesia was acceptable, and the patient also observed about 20 min after receiving the epidural medication (10cc of 0.125% bupivacaine with 50mcg fentanyl and 1:600,000 epinephrine) that suddenly she could move her right hand easier and that it felt warm. She compared that feeling to what she felt after receiving a stellate ganglion block. Her labor and deliver proceeded uneventfully. The SCS continued to function well throughout the entire process. She noticed that the feeling in her right hand returned to baseline after the delivery.

Discussion: Chronic pain syndromes are being treated in increasing frequency in young women of childbearing age. Our familiarity with the technical aspects of SCS therapy will enable these women to enjoy the benefits of epidural analgesia for their labor.

SOAP A134

MATERNAL AND FETAL AUTONOMIC RESPONSE TO EPIDURAL ANALGESIA BY ANALYSIS OF HEART RATE AND BLOOD PRESSURE VARIABILITY: A CASE OF SEVERE FETAL BRADYCARDIA POST-EPIDURAL

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INTRODUCTION: Epidural analgesia for labor can compromise the balance of the autonomic nervous system and result in hemodynamic instability and/or fetal distress. Analysis of heart rate and blood pressure variability can be used as markers of parasympathetic and sympathetic activity respectively. We present what we believe to be the first analysis of variance of maternal heart rate (HRV) and blood pressure (BPV), and of fetal heart rate (FHRV) before and after epidural analgesia, and during severe fetal bradycardia.

METHODS: A 34 year old, G1P0, 39 weeks gestation presented in labor and was recruited for our study. Baseline measurements of continuous non-invasive blood pressure, heart rate, respiratory rate and fetal heart rate were obtained. At 4 cm dilation the patient asked to receive an epidural. After a standard epidural technique was performed, 4 ml of 0.25% bupivacaine were given into the needle, and 10 ml of 0.125% bupivacaine was injected into the catheter. The patient was then placed in left lateral decubitus. Soon after, FHR dropped from a baseline of 135 beats/min to 63 beats/min. Stimulation measures were initiated and the bradycardia resolved. Analysis of HRV, BPV, and FHRV were performed by wavelet transform at five levels before and after the epidural. High frequency power (HFP) of HRV (parasympathetic tone) was calculated as the sum of levels 2, 4, and 8, and total power of BPV was calculated as the sum of all levels (2 to 32, sympathetic tone).

RESULTS: Baseline maternal blood pressure was 90/55 mmHg and heart rate was 88 beats/min. Both parameters remained stable post-epidural. Pre-epidural FHR was 135 beats/min and decreased to 86, 70 and 63 beats/min at 2, 3 and 4 min respectively post-epidural. Maternal HFP of HRV increased post epidural to a maximum of 593% baseline at 7 min (increased parasympathetic). Total power of BPV increased after 5 minutes post-epidural to a maximum of 915% baseline at 8 min (increased sympathetic). HFP of FHRV decreased for the first 2 min post epidural to a minimum of 21% baseline, and then increased sharply to a maximum of 4486% baseline at 3.5 min (decreased parasympathetic and bradycardia).

CONCLUSIONS: Fetal heart rate decreased within 4 minutes post epidural while there were modest changes in the autonomic parameters of the mother suggesting that, in this case of fetal distress, the bradycardia was likely unrelated to the autonomic consequences of epidural analgesia. Furthermore, the decrease in HFP of FHRV starting at 0.5 min post-epidural suggests that fetal distress had already started while the epidural was performed. We conclude that it is possible to follow autonomic changes throughout epidural analgesia in the mother and in the fetus, and to interpret the results to gain information concerning maternal and/or fetal distress.

POSTER CASE REPORTS

SOAP A135

INTUBATING LARYNGEAL MASK AIRWAY (ILMA): A LIFE SAVING RESCUE DEVICE FOLLOWING FAILED TRACHEAL INTUBATION DURING CESAREAN SECTION (CS)

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Failed tracheal intubation (FTI) is well documented in the obstetric population with an incidence of 1:280. Emergency airway management after FTI in obstetrics is challenging for the anesthesia practitioner. The laryngeal mask airway is a recognized part of the American Society of Anesthesiologists Difficult Airway Algorithm. The ILMA as a rescue device is shown to be useful in emergency and elective surgery of non-pregnant patients and in the emergency room following FTI with rigid laryngoscope.

Case: A 30 y.o., 30 6/7 weeks gestation, following two witnessed seizures, presented with BP 160/90 mmHg, severe headache, blurry vision and epigastric pain. At **22:45**, during a third eclamptic seizure anesthesiologist team was paged stat. On arrival we noted a morbidly obese, cyanotic, post-ictal female. Oxygen administration via Ambu bag with cricoid pressure (CP) improved color. The fetal heart tones by Doppler and the ultrasound exam confirmed fetal bradycardia and agonal rhythm. Decision was made for a stat CS. Airway exam revealed a class IV airway, lacerated tongue, bloody oral cavity, short thick neck, submental fat pad and marked periorbital and facial edema. A difficult airway (DA) was anticipated. En route to the operating room (OR) a general/ENT surgeon was paged stat to the OR. At **22:57**, in the OR patient was awake, combative and uncooperative during preoxygenation. The DA cart and ILMA were available and ready prior to induction. At **22:58**, following rapid-sequence induction with CP, laryngoscopy revealed gross laryngeal edema, grade III laryngoscopic view with the tip of epiglottis being visualized. Tracheal intubation attempts with #7 and #6 tracheal tubes (TT) were unsuccessful. At **23:00**, oxygen saturation declined to 56%, immediately an ILMA #4 was placed successfully on the first attempt. Bilateral chest movements and ETCO₂ were noted. At **23:00:30**, oxygen saturation increased to 99%-100%. The obstetrician was asked to proceed, and was notified of unprotected airway and advised not to apply fundal pressure or to exteriorize the uterus. Maintenance of anesthesia included oxygen 100% and sevoflurane. CP was maintained and manual ventilation instituted. At **23:01**, a male infant was delivered. Apgar scores were 6 @ 1 min and 7 @ 5 min with normal umbilical cord gases with mild hypercarbia. Following delivery, a silicone #7 TT was passed easily through ILMA. Remainder of surgery was uneventful. Thirty-six hours postoperatively, patient was extubated and discharged on the fifth postoperative day, with neurological, pulmonary and cardiovascular systems intact.

Discussion: Oxygenation and prevention of aspiration after FTI during CS are major priorities. This case report demonstrates the importance of having a plan of action that adapts to the obstetric emergency situation after FTI. Rapid intervention with ILMA averted maternal and fetal catastrophes and resulted in positive outcome for mother and baby.

SOAP A136

ANESTHETIC CONSIDERATIONS IN A PARTURIENT WITH POSTURAL ORTHOSTATIC TACHYCARDIA SYNDROME (POTS)

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We report the anesthetic management of a patient with POTS who underwent successful labor and vaginal delivery. An 18 y.o. WF G2P1 at 36 IUP presented in active labor. She had a history of POTS with extreme fluctuations in blood pressure that had resulted in near cardiac arrest during her first delivery. A right radial arterial line was placed which showed extreme blood pressure fluctuations ranging from 104/52 to 184/102 with each beat despite no changes in patient position or valsalva maneuvers. Blood pressures stabilized and ranged from 124/68 to 135/79 following a bolus of 1500 cc of Lactated Ringers solution. An epidural catheter was placed at L3-L4 and the test dose (3cc of 1.5% lidocaine with epinephrine 15 mcg) was negative for intrathecal or intravascular placement. 10 cc of 0.125% bupivacaine with fentanyl 50 mcg was administered via the epidural catheter in 2.5 ml aliquots over 20 minutes to establish a T 9-10 level of analgesia followed by a continuous infusion of 0.1% bupivacaine with fentanyl 2mcg/cc at 14 cc/ hour. Maternal vital signs and fetal heart rate were continuously monitored and remained unchanged. Patient had a pain-free labor and delivery was performed via vacuum-assisted forceps to diminish valsalva maneuvers. POTS is a type of chronic orthostatic intolerance seen more commonly in female patients between ages of 15-50 years. Neurophysiologic testing aids in the diagnosis (Table 1).¹ Symptoms include light-headedness, visual blurring, palpitations and peripheral weakness. Patients may also exhibit features of other orthostatic intolerance disease such as mitral valve prolapse.² POTS ranges in severity from Grade 0 (normal orthostatic tolerance) to Grade 4 (persistent orthostatic intolerance, inability to stand > 1 min). Pathophysiologic origins are still being investigated, but research suggests: impaired efferent cardio-vagal function, β -adrenergic hypersensitivity, sinus node dysfunction, brainstem dysregulation and excessive venous pooling.¹ This appears to be the first reported case in obstetric anesthesia. A diagnosis of POTS in the parturient warrants special attention due to potential for severe blood pressure fluctuations during labor, epidural and delivery process. In this patient, aggressive hydration, optimal and controlled pain management, beat-to-beat monitoring of blood pressure and minimization of valsalva maneuvers by assisted vaginal delivery provided a safe and effective method of peripartum management.

TABLE 1**Diagnostic Criteria for POTS**

Heart rate increment 30 bpm within 5 minutes of standing or tilt-up
Heart rate 120 bpm within 5 minutes of standing or tilt-up
Orthostatic symptoms consistently develop
(exclude secondary causes: hypovolemia, recent illness, prolonged recumbency)

¹Mayo Clin Proc 1998; 73(12):1141-1150

²Neurology 1995;45(4,suppl 5):S19-S25

POSTER CASE REPORTS

SOAP A137

PLANNED CESAREAN DELIVERY IN A PATIENT WITH PLACENTA ACCRETA IN THE INTERVENTIONAL RADIOLOGY SUITE

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Introduction: Pre-cesarean uterine artery balloon placement and subsequent inflation to control hemorrhage during gravid hysterectomy for placenta accreta is currently being used. Postpartum embolotherapy is used to control postpartum hemorrhage following uterine atony or uterine bleeding secondary to fibroids or placenta accreta to avoid hysterectomy and preserve future fertility. We describe a patient with placenta accreta who underwent cesarean delivery as well as uterine artery embolization in the interventional radiology suite. We believe this to be the first case of cesarean delivery in interventional radiology (IR).

Case Report: A 36 yr old G3P2 presented for her third elective repeat cesarean delivery. She had a history of placenta previa in her previous pregnancy as well as a surgical myomectomy for uterine fibroids. She was 5 '3" and 140 lb. Her past medical history was unremarkable. The obstetrician's assessment was that the patient would likely require a gravid hysterectomy. Therefore initial plans involved placement of uterine artery balloons and probable gravid hysterectomy with balloons inflated to reduce interim hemorrhage. However, as the due date neared, the patient was insistent in preserving her uterus. Hence, a multidisciplinary team concluded that we should attempt to perform cesarean delivery after placement of uterine artery balloons in the IR suite. This would enable the obstetrician to assess the success of embolization before uterine closure.

After i.v and arterial line placement, epidural anesthesia was established at L3-4 interspace. 12 cc of 2% lidocaine epidurally was used to facilitate placement of bilateral ureteral stents. The patient was subsequently transferred to interventional radiology and bilateral internal uterine artery balloons were inserted via the femoral sheaths and were left deflated. Epidural anesthesia level was then increased to T-4 level to facilitate cesarean delivery. After the delivery of a healthy male, the placenta was delivered manually that showed focal area of accreta to the anterior lower uterine segment. Multiple fibroids were also noted. There was brisk bleeding from lower uterine segment. Uterine artery balloons were inflated to decrease the bleeding and embolization was performed bilaterally using a Gelfoam preparation. Inspection of the uterus after embolization was notable for considerable reduction in bleeding. The uterus was closed securing good hemostasis. The patient made an uneventful recovery. The approximate blood loss was about 1L and postoperative hematocrit was 24 (from 34). The patient received a unit of red cells and 500ml of hetastarch in addition to 4L crystalloids.

Discussion Our IR rooms are designed to meet the infection control and air circulation standards found in an operating room. Anesthesia machine with monitors, level I rapid infusor, neonatal resuscitation equipment were transported to the IR. Adequate prior planning resulted in the patient retaining her uterus which otherwise would likely have been a gravid hysterectomy.

SOAP A138

VON WILLEBRAND'S DISEASE AND PREGNANCY IS NOT A CONTRAINDICATION TO REGIONAL ANESTHESIA/ANALGESIA

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INTRODUCTION: Three types of von Willebrand's disease (vWD) have been identified and can be distinguished using laboratory determinations of Factor VIII activity and function, vWF antigen (quantitative assay) and vW ristocetin factor (qualitative assay). Due to the significant delays (weeks to months) reporting of these laboratory assays (many of which have previously only been available in highly specialized centers), parturients presenting with vWD have historically been assumed to be at significant risk for ante- and postpartum hemorrhage (1). Consequently, parturients with vWD are assumed to have the same coagulopathy status as in the non-pregnant state culminating in an assumption that they have an absolute contraindication for regional anesthesia and routinely subjected to prophylactic treatments of DDAVP and Haemate P. Advances in the laboratory assays and rapidity of reporting, as well as a much better appreciation of the impact on the physiologic changes of pregnancy on coagulation factors (2,3) such as Factor VIII and vWF (Ag), have consequently dramatically changed our approach to anesthetic and obstetrical management.

METHODS: We present the serial results of laboratory investigations of a parturient with Type 1 vWD during her recent pregnancy. Results from her previous pregnancy, during which the results of an antenatal DDAVP challenge test were not available prior to the uneventful delivery during which DDAVP was administered, are also presented.

RESULTS: Coagulation factors are considered to be deficit and place patients at risk for bleeding if they fall below a level of 0.5 (old units <50%). The Factor results presented in Table 1 are presented in the new SI units.

CONCLUSIONS: Parturients with vWD Type 1 require hematology and anesthetic consultation early in the pregnancy to assess coagulation factors. We suggest that serial coagulation factor analysis as well as routine coagulation screening tests be performed to reassure the healthcare team that these women are at no greater risk of antenatal or postpartum hemorrhage than the general parturient population. Parturients with Type 1 vWD do not present a contraindication to regional anesthesia or analgesia.

REFERENCES: 1. Hematology/Oncology Clin NA 14(5): 2000; 2. Sem Anesth, Periop Medicine and Pain: 76 (Vol 19, No.3) 149-56, 2000; 3. Best Pract Res Clin Hematol 14(2): 381-99, 2001

Table 1

	08/04/ 1998	08/04/ 1998	08/12/ 2003	29/12/ 2003	13/01/ 2004
	Pre- DDAVP	Post- DDAVP			
Factor VIII	1.86	2.88	2.78	2.91	2.55
vW Ag	2.46	3.27	2.85	2.72	>3.00
vWF Functional/ Ristocet	(N/A)	(N/A)	3.04	3.56	(N/A)
INR	1.0	(N/A)	1.0	1.0	1.0
PTT	24	(N/A)	27	27	26

POSTER CASE REPORTS

SOAP A139

CONTINUOUS SPINAL ANAESTHESIA (CSA) FOR ELECTIVE CAESAREAN SECTION IN A PATIENT WITH PSEUDOXANTHOMA ELASTICUM (PXE)

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Introduction:

We report the first successful use of CSA in a parturient with PXE, a rare, multisystemic, hereditary disorder characterised by degeneration and calcification of elastic tissue [1]. It primarily affects all small and medium sized arteries which pre-disposes patients to catastrophic GI-bleeding, ruptured aneurysms, hypertension, myocardial infarctions and dysrhythmias [2].

Methods:

An adopted 31-year-old primigravida presented at 32 weeks gestation at the obstetric anaesthetic clinic after an ophthalmic test revealed angioid streaks on both retinae, a diagnostic feature of PXE. She had no history of bleeding during this pregnancy and did not complain of any cardiac symptoms. Cardiac investigations showed a negative stress ECG using the modified Bruce protocol and a transthoracic echocardiogram demonstrated good left ventricular function and mild aortic regurgitation.

At 38 weeks the patient was admitted to the obstetric unit fully fasted and orally pre-medicated with 10mg metoclopramide and 150mg ranitidine. Antibiotic prophylaxis of ampicillin 1g and gentamicin 120mg was also administered intravenously.

Once a 14G venflon was sited and intravenous crystalloid fluid commenced the patient was placed in the sitting position. Using an aseptic technique, a 22G pencil point spinal needle was inserted at the L3-L4 interspace. A 28G micro-catheter stiffened with an inner Teflon coated guide wire was threaded in a cephalad direction to 16 cms at the skin. The guide wire, overlying introducer and spinal needle were removed. The catheter was withdrawn to leave 5cms intrathecally. The end of the catheter was threaded through an adapter and a 0.2 micrometre filter was attached.

A glass 1ml syringe was used to inject an initial 1.5mls 0.5% hyperbaric bupivacaine with 0.3mg diamorphine followed by a further 0.5ml hyperbaric bupivacaine, five minutes later. A sensory block to ice was achieved to the level of T4 and the patient was unable to genuflex bilaterally.

Results:

Throughout the C/S, her blood pressure ranged from 95/50 to 120/70 and her heart rate from 70-115 bpm.

The patient required a total of 300mcg phenylephrine and 3 litres of Hartmanns solution.

A live baby girl was delivered with Apgar scores of 9 and 10 at 1 and 5 minutes respectively. Umbilical cord gases recorded an arterial pH 7.326 and a venous pH 7.371.

Two days post-operatively the patient was cardiovascularly stable, mobilising well, and did not exhibit any neurological sequelae associated with CSA.

Discussion:

Despite previous controversy surrounding the use of CSA, in our case it proved to be a safe and haemodynamically stable method to use, with no neurological sequelae.

Will CSA become part of the obstetric anaesthetic armamentarium in 21st century?

References:

1. British Journal of Obstetrics and Gynaecology 1984; 91: 1049-50
2. Clinical Experimental Obstetrics and Gynaecology 2000; 27: 215-7

SOAP A140

THIRD TRIMESTER OF PREGNANCY COMPLICATED BY METASTATIC CHORIOCARCINOMA

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Introduction: Choriocarcinoma occurs with a frequency of one in sixteen thousand gestations.¹ We present the anesthetic management of a parturient with metastatic choriocarcinoma.

Case Report: A 30-year-old G₂P₁ at 29³/₇ weeks gestation presented with a diagnosis of metastatic choriocarcinoma and respiratory insufficiency. She reported two weeks of flu-like symptoms and right upper quadrant pain. Ultrasound of the gallbladder was consistent with gallstones. She underwent laparoscopic cholecystectomy. The surgeon noted hemorrhagic liver nodules. Metastases were found in the breast after ultrasound and subsequent quadrantectomy. The patient was then transferred to our facility. Admitting labs included: Hgb 8.6; Platelets 65,000. Chest CT showed multiple pulmonary metastases, right pleural effusion and left lower lobe congestion. Abdominal CT showed liver metastases. Thoracentesis was consistent with pulmonary hemorrhage. After multidisciplinary discussions, and based on the extent of the disease, it was determined that delivery, initiation of chemotherapy and supportive care was the best treatment plan.

Based on coagulopathy and respiratory status, general anesthesia was chosen for C-section, including aspiration prophylaxis, standard monitors, left uterine displacement and rapid sequence induction using thiopental and succinylcholine. She was intubated with a 6.5 endotracheal tube. Arterial line and IJ catheter were placed. The anesthetic was maintained with oxygen, isoflurane and rocuronium. Time from skin incision to delivery was 4 minutes. Apgar scores were 7 at both 1 and 5 minutes. After closure of the abdominal incision, a right chest tube was placed to evacuate the hemothorax. Estimated blood loss was 2000 mL. Six units packed RBC and 10-pack of platelets were transfused intraoperatively. The patient received 4900 mL crystalloid. Hgb post-op was 10.7, Platelets 55,000. The patient remained intubated and was transported to the MICU in stable condition. After 47 days, the patient was transferred to rehab medicine and made a complete recovery.

Discussion: Choriocarcinoma is a highly malignant epithelial tumor that can arise from any trophoblastic tissue. Treatment of gestational trophoblastic neoplasms depends upon the type of disease, the desire of the patient to preserve fertility, and risk for drug resistance. Combination chemotherapy regimens are used for women with newly diagnosed high risk gestational trophoblastic neoplasms. A study of 272 women with high risk disease treated with EMA-CO reported a complete remission rate of 78% and 5-year survival rate of 86%.² Patients with liver metastases have a survival rate of 30%.³

Delivery of the fetus allows chemotherapy to be initiated as soon as possible. Hysterectomy was not performed based on the patient's wishes and the normal uterus and placenta noted at the time of surgery. Careful planning based on effective interdisciplinary communication led to an uneventful perioperative course.

References: 1. *Adv Cancer Res* 1978; 27:89 2. *J Clin Oncol* 1997; 15:2636 3. *Br J Obstet Gynaecol* 1997; 104:105

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Vasudevan, A.	SOAP A45, A73		
Wade, L.	SOAP A103		
Wali, A.	SOAP A97		
Walker, M. T.	SOAP A74		
Walsh, M.	SOAP A4		

SOAP MEMBERSHIP APPLICATION

Mail to: SOAP • 2 Summit Park Drive, Suite 140, Cleveland, Ohio 44131
Phone: 216-447-7863 • Credit card orders can be faxed to: 216-642-1127
Email: soaphq@soap.org • Web: www.soap.org

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- Online Membership Database
- Accepted Abstracts published in *Anesthesiology*

Professional Profile:

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Last First M.I. Professional Degree

Mailing Address: _____

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* ASA Members receive Anesthesiology. Non-ASA members of SOAP may subscribe for a discounted price of \$125 (Domestic rate is \$163, International rate is \$225).



Society for Obstetric Anesthesia and Perinatology

Future Meetings

SOAP 37th Annual Meeting
Desert Springs
A JW Marriott Resort and Spa
Palm Desert, California
May 5-8, 2005

SOAP 38th Annual Meeting
Fontainebleau Hilton Resort
Miami Beach, Florida
April 19-23, 2006

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