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ANALGESIA AFTER CESAREAN SECTION: DOES THE PRE-EMPTIVE EFFECT OF EPIDURAL DIAMORPHINE AFFECT OUTCOME?

Mok, M.U.; Thompson, J.; Vanarase, M.; Grange, C. Nuffield Department of Anaesthetics, Oxford Radcliffe Hospitals NHS Trust, Oxford, United Kingdom Good analgesia post cesarean section (C/S) remains paramount. Effects of pre-emptive analgesia are controversial(1,2). Our ongoing study compares patients receiving pre-emptive epidural diamorphine intra-operatively (group 1) with those who received it post-operatively at patient request (group 2). 21 ASA I-II women undergoing C/S were anesthetized using a standard combined spinal-epidural technique with intrathecal heavy bupivacaine (0.5%, 2.5ml) and fentanyl (12.5mcg). Group 1 (10 patients) were given their first dose of 2.5mg epidural diamorphine at the end of the surgery and received additional doses in the recovery room (RR) at maternal request. Group 2 (11 patients) were given their first and subsequent doses of 2.5mg epidural diamorphine in the RR at maternal request. All patients also received regular simple analgesics. Pain, pruritus, nausea and vomiting were each recorded using a scoring system of 0-3 (0 = no symptom, 3 = severe symptom) at 1, 2, 4, 8, 12, 24 hours post surgery and overall 24 hour score. Time of first epidural diamorphine in RR and dosage of other analgesia used were also noted. The demographics of the 2 groups were similar. (Please see table for the summary of results) It appears that giving pre-emptive epidural diamorphine at the end of surgery combined with regional technique may provide better analgesia than administering the epidural diamorphine at patient request after the painful stimulus is perceived. The pre-emptive epidural diamorphine does not seem to increase the incidence of side effects. It is hoped that with larger sample numbers in each group, statistical significance will be achieved which will support the above findings. 1. *Anaesthesia* 1998; 53: 296 - 8 2. *British Journal of Anaesthesia* 1992; 69: 1 - 3

| | Group 1 (pre-emptive diamorphine) n=10 | Group 2 (no pre-emptive diamorphine) n=11 |
|--|--|---|
| Time interval from intrathecal injection to 1st requested epidural diamorphine in RR | 208 min | 202 min |
| Average of 24 hour overall pain score | 0.6 | 1.6 |
| Average of 24 hour overall nausea + vomiting score | 0.4 | 0.3 |
| Average of 24 hour overall pruritus score | 0.6 | 0.8 |

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EXAMINING THE INFORMATION REQUIREMENTS OF WOMEN HAVING ELECTIVE CESAREAN SECTION.

DR JULIA MÖRCH-SIDDALL, DR VALERIE BYTHELL DEPARTMENT OF ANESTHESIA, ROYAL VICTORIA INFIRMARY, NEWCASTLE UPON TYNE UK Morch-Siddall, J. Bythell, V. Anaesthesia, Royal Victoria Infirmary, Newcastle upon Tyne, United Kingdom We surveyed women having elective cesarean section (CS) pre- and post-operatively to determine where they obtained information about anesthesia, whether the information was adequate and whether it could be improved. All women scheduled for CS in a 4 month period (n=54) self-administered a questionnaire, pre- and post-partum, on the information they had acquired about anesthesia for CS. The questionnaire used graded response multiple choice questions and questions with open ended answers. Thirty completed questionnaires were returned, the average age of woman was 32 years, 20 women had no previous CS. As to why they were having CS, what type of anesthesia to choose and their involvement in those decisions the majority wanted maximum or enough information. Asked who should give the information 26 women felt the hospital doctor should rather than family doctors or midwives, 10 women felt midwives more approachable than doctors. Most women felt hospital staff had enough time to answer their questions but would have preferred alternative information formats for reinforcement e.g. booklets or videos, feeling information existed but unsure how to access it. All women saw an anesthetist pre-operatively and felt the information given clear and easy to understand but 9 women felt the risks of regional anesthesia (RA) were not fully explained. RA was chosen by 29 of the women giving reasons such as 'desire to see my baby', 'have partner there' and 'be more in control'. All women got their chosen anesthetic. Half felt frightened during the CS but felt more information would not have been anxietytic. The best things about the CS were 'no pain', 'the attentive staff' and 'speed', the worst were 'feeling sick', 'the pulling' and 'being immobile and helpless afterwards'. Four women did not feel involved when they did not get to hold the baby during suturing. When asked for any other comments about the anesthesia and analgesia all were complimentary. Mainly the women were satisfied with the information they acquired and felt it reflected their experiences. However important gaps were revealed, women wanted to know more on the risks of RA, recovery and post-CS analgesia. We have acted on this and changed what women are told pre-CS, revised our CS leaflet to include an appendix of other information sources and increased its availability. The study has changed practice, we wanted to find out what women wanted to know before CS rather than assuming we knew. It has allowed women in our care to set the information agenda.

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DOES INCREASED INTRAVENOUS HYDRATION DECREASE THE INCIDENCE OF NAUSEA/VOMITING FOLLOWING CESAREAN SECTION? *Gaiser, R.R., Dong, Y.; Cheek, T.G.; Gutsche, B.B. Anesthesiology, University of Pennsylvania, Philadelphia, PA* Nausea and vomiting represent a common occurrence after cesarean section. Multiple factors account for this nausea including surgical factors and epidurally administered opioids. In the ambulatory anesthesia, increased intravenous hydration has been shown to decrease the incidence of nausea from 30% to 10%. (1) We studied whether intravenous hydration alters the incidence of nausea following cesarean section. This study received IRB approval. Written informed consent was obtained from each patient. Study candidates included patients presenting for the first elective cesarean section of the day. One hour prior to cesarean section, all patients received a fluid preload of 20 cc/kg normal saline. Epidural anesthesia consisted of 1.5% lidocaine with epinephrine and fentanyl. Following completion of the preload, patients were begun on a maintenance rate based upon weight. Normal saline was replaced for blood loss on a 3:1 ratio. At the conclusion of surgery, duramorph 4 mg was administered epidurally. Patients were randomized by sealed envelope to one of two groups. The control group received only maintenance fluid. The experimental group received a fluid bolus of 20 cc/kg normal saline over 30 minutes and then begun on a maintenance rate. The number of episodes of nausea and vomiting were recorded over a 24 hour period. The use of rescue emetics and supplemental opioids was recorded. Statistical analysis included chi-square and t-test. Values are presented as the mean (standard deviation). A total of 10 patients have been studied to date. There was no statistical difference in maternal demographics. The only difference was in total fluids. There was no difference in the incidence of nausea/vomiting or in the need for anti-emetics or supplemental opioids. There was no difference in the incidence of nausea or vomiting following cesarean section if the patient was vigorously hydrated. There was a trend toward a greater incidence of nausea in the hydration group, although there are too few patients. This ongoing study does not support the vigorous hydration of patients to prevent nausea or vomiting. *Yogendran S, Asokumar B, Cheng DCH, Chung F. A prospective randomized double-blinded study of the effect of intravenous fluid therapy on adverse outcomes on outpatient surgery. Anesth Analg 1995; 80: 682-6.*

| | Age (yrs) | Height (cm) | Weight (kg) | EBl. (cc) | Total Fluids (cc) | Nausea (0-12 hr) | Nausea (12-24 hr) | Vomiting (0-12 hr) | Vomiting(12-24hr) |
|-----------------|------------|-------------|-------------|-----------|-------------------|------------------|-------------------|--------------------|-------------------|
| Control (n=5) | 25.6 (8.3) | 160.5 (7.2) | 87.6 (7.8) | 760 (40) | 2850 (670) | 60% | 0% | 40% | 0% |
| Hydration (n=5) | 32.8 (2.5) | 165.6 (6.6) | 88.9 (22.1) | 790 (20) | 4420 (750) | 100% | 40% | 80% | 0% |
| | | | | | p<0.05 | | | | |

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GENERAL ANESTHESIA FOR CESAREAN SECTION: CURRENT PRACTICE PATTERNS *Satya-Krishna, R.; Grange, C. Russell, R. John Radcliffe Hospital, Oxford, United Kingdom* (a) This study was aimed at investigating the incidence and factors contributing to use of general anesthesia (GA) for cesarean section (CS) in a busy university hospital in UK. (b) This retrospective study was performed to cover a period of eight months between January and August 2001. The Oxford Obstetric Anesthetic Database was used to generate a list of patients who underwent GA for CS. The following data was collected from these patients' records: grade of anesthesiologist and surgeon, degree of emergency, time of operation, decision to delivery time, conversion of regional anesthesia (RA) to GA, method of testing RA and view at laryngoscopy. (c) A total of 69 case records were analysed accounting for 86.2% of GA performed for CS during this period. This represents 2.8% of all elective and 12.3% of all emergency CS. 56.5% of cases were done out-of-hours, 31.9% after midnight. A senior anesthesiologist was present in 66.6% of in-hours and 10.3% of out-of-hours general anesthetics. Trainee anesthesiologists administered the remaining anesthetics. In 27 cases, the CS was classed a crash section, in 18 the indication was fetal distress. In 23.2% cases, GA was employed after failed RA. The failed techniques were: epidural for labour top-up in 8, combined spinal-epidural in 3, spinal in 2 and one case each of epidural block and damaged epidural catheter. In 4 cases, GA was induced after the incision was made. RA was tested most commonly with cold spray, but 56.3% of case records did not specify the mode of testing. Where a failed RA was encountered, the mean decision to delivery time was 53 minutes. Mean cord arterial pH was 7.220 when RA failed. Difficult airway was detected preoperatively in 2 patients who were managed with planned awake fibre optic intubation. In the remaining 67 patients, there was only one recorded use of a bougie to facilitate intubation for a grade II laryngoscopic view. Grade I laryngoscopic views were seen in 50 patients, grade II views in 4 patients and in the rest, there was no mention of any difficulty with the intubation process. (d) In conclusion, this study identifies the indications and factors affecting the choice of GA for CS. Although overall GA rate was well within published guidelines, failed RA made up a significant proportion. This is possibly due to the fact that junior anesthesiologists performed most blocks, working mainly out-of-hours. Failed RA prolonged delivery time but was not associated with significant fetal acidosis. The incidence of difficult airway was 4.3% with one unanticipated difficult intubation. *Russell IF. Technique of anesthesia for Cesarean section. In: Raising the standard. London: The Royal College of Anaesthetists, 2000.*

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PRURITIS ASSOCIATED WITH INTRATHECAL MORPHINE FOR CESAREAN SECTION: A COMPARISON BETWEEN 100 AND 200 MCG *Habib, A.S., Drysdale, S., Phillips-Bute, B.G., Muir, H.A. Anesthesiology, Duke University Medical Center, Durham, NC* Introduction: Intrathecal morphine provides good analgesia following cesarean section (CS), but may be associated with adverse effects. Some studies have suggested that the incidence of itching may be dose-related (1,2), however this was not confirmed by others (3). Our aim was to compare the incidence of itching needing treatment following the two commonly used doses of intrathecal morphine in our unit (100 and 200 mcg). Methods: Following IRB approval, we retrospectively reviewed the anaesthetic records of all women who had a CS under spinal anesthesia during 2001 and received intrathecal morphine. All patients in our unit are followed-up within 24 hours postpartum and asked whether they had itching that needed treatment. Treatments offered are diphenhydramine first, then nalmefene and finally naloxone if there is no response to the first two agents. We recorded the dose of intrathecal morphine used as well as the incidence of pruritis requiring treatment. Statistical analysis was done using the Chi-squared test, $p < 0.05$ was accepted as statistically significant. Results: 382 patients had CS under a spinal anesthetic. The data were incomplete in 67 patients. Of the remaining 315 patients, 100 had 100 mcg intrathecal morphine, 151 had 200 mcg and 64 had other doses. All patients also had 20 mcg intrathecal fentanyl with hyperbaric bupivacaine 0.75 % (10–12.5 mg). Patients in the 100 and 200 mcg groups were similar with respect to age, height and weight. The incidence of pruritis needing treatment was 21 % in the 100 mcg group and 31.79 % in the 200 mcg group ($p=0.06$). Conclusion: In this retrospective analysis, we found a higher incidence of pruritis requiring treatment in patients receiving 200 mcg intrathecal morphine compared to those receiving 100 mcg, however this difference did not reach statistical significance. 1. *Cordoso MM et al. Anesth Analg 1998; 86: 538-41.* 2. *Yang T et al. Can J Anaesth 1999; 46: 856-60.* 3. *Milner AR et al. Anaesthesia 1996; 51: 871-3.*

P-86

ARE ROUTINE TYPE & SCREEN ORDERS NECESSARY FOR CESAREAN SECTION? *DeBalli, P., Spahn, T., Muir, H.A. Anesthesiology, Duke University Medical Center, Durham, NC* Introduction: Cesarean section (C/S) is one of the most commonly performed operations in the United States. Major blood loss (>1 L) is commonly associated with identifiable risk factors. (1) Transfusion is rarely required during C/S. A type and screen (T&S) is frequently done before C/S and if found to be unnecessary can have a profound economic impact nationwide. Methods: A retrospective analysis of an obstetrical anesthesia database was used to identify patients who underwent C/S. Patient demographic data was collected along with indication for C/S, pre and post Hct, whether T&S was performed, risk factors (including previous C/S, antepartum hemorrhage (APH), postpartum hemorrhage, multiple gestation or polyhydramnios, macrosomia, prolonged labor on oxytocin infusion, coagulation abnormalities, pre-eclampsia and use of magnesium) and estimated blood loss at the time of surgery. Categorical variables will be analyzed using Chi-square analyses. Logistic regression analysis will be used to determine interaction between risk factors and transfusion/blood loss outcomes. Results: To date 456 records have been reviewed in this ongoing analysis. In this cohort of patients 0.66% required transfusion intraoperatively and 4.6% had a blood loss >1L. Developing trends suggest risk of transfusion and major blood loss is negligible in patients presenting for elective repeat or breech C/S. Failure to progress (FTP) after a prolonged labor associated with the use of oxytocin is the most common risk factor in the otherwise low risk laboring population. Antepartum hemorrhage carries the expected increased risk. See table 1. Discussion: Early data analysis from this ongoing study suggests that elective repeat C/S is associated with a negligible transfusion risk. Identification of factors most associated with major bleeding with other indications for C/S may also be possible. Large numbers are required to make definitive statements about ability to reduce the need for T&S, however using this methodology access to this data is possible. *Journal of Reproductive Medicine. 44(7):592-4, 1999 Jul.*

| Table 1 | Number of patients | Number of transfusions |
|---------------------|--------------------|------------------------|
| All C/S reviewed | 456 (100%) | 3 (0.66%) |
| Elective repeat C/S | 139 (30.5%) | 0 (0%) |
| FTP C/S | 117 (25.7%) | 1 (4.5%) |
| Breech C/S | 40 (8.7%) | 0 (0%) |
| APH | 17 (3.7%) | 2 (11.8%) |
| Blood loss >1L all | 21 (4.6%) | 3 (14.2%) |
| Blood loss >1L FTP | 12 (2.6%) | 1 (8.3%) |

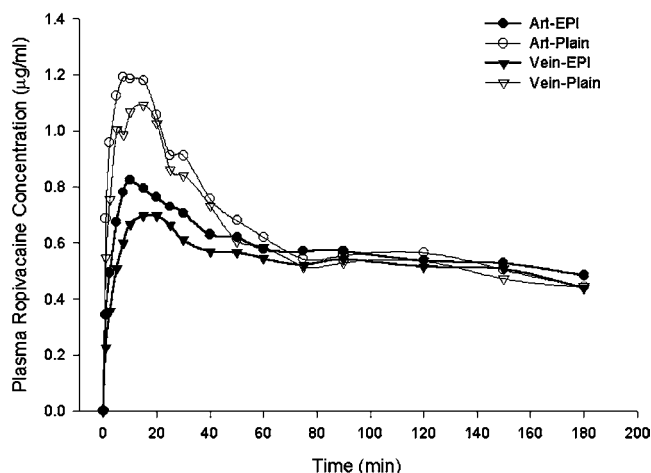
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THE EFFECT OF THE ADDITION OF EPINEPHRINE ON EARLY SYSTEMIC ABSORPTION OF EPIDURAL ROPIVACAINE IN HUMANS LEE, B.B.¹ Ngan Kee, W.D.¹ Plummer, J.L.² Wong, A.S.¹ 1. Dept of Anaesthesia & Intensive Care, The Chinese University of Hong Kong, Prince of Wales Hospital, Shatin, Hong Kong, Hong Kong; 2. Dept of Anaesthesia, Flinders Medical Centre, Flinders University of South Australia, Bedford Park, SA, Australia Little pharmacokinetic data are available on addition of epinephrine(Epi)to epidural ropivacaine(Rop)in humans. In a double-blinded study, we randomized patients having elective abdominal hysterectomy to receive 1.5 mg/kg Rop diluted in 15 ml either with (Epi group, n = 12) or without (plain group, n = 12) Epi 5 µg/ml. We measured arterial and venous plasma concentrations of Rop at intervals up to 180 min. Our results showed that arterial and venous plasma Rop concentrations were lower in the Epi group compared with the plain group in the first 60 min after drug administration (P < 0.01). Mean (+/- SD) maximum total plasma Rop concentration (Cmax) was lower in the Epi group (arterial 0.92 +/- 0.32 µg/ml and venous 0.82 +/- 0.33 µg/ml) compared with the plain group (1.31 +/- 0.39 µg/ml and 1.31 +/- 0.50 µg/ml, P = 0.01). Time to Cmax (Tmax) was not significantly different between groups (mean +/- SD arterial 16 +/- 2 min and venous 23 +/- 2 min in the Epi group, vs 9 +/- 2 min and 12 +/- 3 min, respectively, in the plain group, P = 0.08). Arterial plasma Rop concentrations were higher than venous concentrations during the first hour (P < 0.01); the arterio-venous difference decreased exponentially and the rate and magnitude of this decrease was unaffected by Epi. We conclude that addition of epinephrine 5 µg/ml to ropivacaine reduced the early systemic plasma concentrations of ropivacaine after epidural injection. This has implications for decreasing the risk of toxicity from systemic absorption of epidural ropivacaine. Hurley RJ, Feldman HS, Latka C, Arthur GR, Covino BG. The effects of epinephrine on the anesthetic and hemodynamic properties of ropivacaine and bupivacaine after epidural administration in the dog. *Reg Anesth* 1991;16:303-8

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IS 6% HETASTARCH PREFERRED OVER PROPHYLACTIC IV EPHEDRINE FOR PREVENTION OF HYPOTENSION FROM INTRATHECAL ROPIVACAINE FOR C/S? Cohen, S.; Denenberg, H. Alptekin, B.; Ginsberg, S.; Bokhari, F.; Burley, E.; Zada, Y.; Freeman, L. *Anesthesiology, UMDNJ-Robert Wood Johnson Medical School, New Brunswick, NJ* Introduction: The use of prophylactic IV ephedrine or 6% Hetastarch is effective for prevention of hypotension from spinal anesthesia for cesarean section (C/S) when compared with lactated Ringer's solution (LR) alone. This study was designed to determine which treatment is the most effective for the prevention of hypotension from combined spinal-epidural (CSE) anesthesia for C/S: IV LR, IV 6% Hetastarch, IV ephedrine or IV 6% Hetastarch with IV ephedrine. Method: Following IRB approval & informed consent 244 parturients scheduled for elective C/S with CSE were studied. In all patients, the epidural space was located at L4-5 or L3-4 interspace using epidural needle in lateral decubitus position. The epidural catheter was inserted immediately following administration of 10 mg ropivacaine with 100 µg epinephrine and 25 µg fentanyl intrathecally. The patients were randomized into 4 group: GI (n=60) received IV 2L LR prior to induction of spinal anesthesia, GII (n=66), received IV 1L LR & upon the spinal injection received IV ephedrine 30 mg for 15 min, GIII (n=57) received IV 500 ml 6% Hetastarch + 1L LR prior to spinal injection, GIV (n=61) received IV 500 ml 6% Hetastarch + 1L LR prior to spinal injection, and upon the spinal injection also received IV ephedrine 30 mg for 15 min. The cost of: 1L LR is \$0.86, 1 amp ephedrine is \$0.32, & 500 ml 6% Hetastarch is \$16.16. Immediately after the spinal induction, the patients were positioned supine with left uterine displacement. BP was measured with automatic BP device every 2 min for the duration of the surgery. Hypotension was defined as a systolic BP (SBP) <100 mm Hg & <80% of the baseline BP. Hypotension was treated with IV boluses of ephedrine 5 mg q2 min. Conclusion: IV prophylactic ephedrine is cheaper and is as effective as 6% Hetastarch for the treatment of hypotension from intrathecal ropivacaine for C/S.

Mean Plasma Concentration Profiles



| | GI | GII | GIII | GIV |
|-------------------|------------|-----------|-----------|-----------|
| Age (yrs) | 31.7±4.9 | 30.7±6.2* | 32.2±5.8 | 32.8±4.9 |
| Weight (kg) | 81.8±17.2 | 82.2±18.1 | 81.6±18.8 | 82.2±18.7 |
| Height (cm) | 160.5±22.6 | 161.3±6.4 | 160.8±6.6 | 161.3±5.8 |
| Primiparae (n)(%) | 14(23) | 13(20) | 20(35) | 11(18) |
| Efficacy (n) | | | | |
| 1(%) | 55(92) | 61(92) | 54(95) | 58(95) |
| 2(uncomfort.) | 1(2) | 3(5) | 1(2) | 2(3) |
| 3 (+sedation) | 3(5) | 2(3) | 2(4) | 1(2) |
| 4 (G/A) | 0 | 0 | 0 | 0 |
| Vomiting | 9(16) | 16(25) | 6(11) | 16(26) |
| Hypotension | 26(44)** | 10(16) | 15(27) | 13(22) |
| Hypotension Rx | 24(40)*** | 8(13) | 9(16) | 10(17) |
| Overall Satis | 9.6±1.0 | 9.8±0.6 | 9.6±0.8 | 9.6±0.9 |

*II〈:IV, p〈:0.04, **I 〉:II,III&IV, p〈:0.02, ***I〉:II,III&IV, p〈:0.001

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IN VITRO INVESTIGATION:DURAL TRAUMA PATTERNS,CSF LEAK AND EPIDURAL NEEDLE PUNCTURE *Angle, P. Kronberg, J.; Thompson, D. Anesthesia, Sunnybrook and Womens College HSC, Toronto, ON, Canada* The effect of epidural needle design,angle of puncture and bevel orientation on dural trauma patterns and CSF leak was examined.For each study phase human cadaveric dura(L1/2-L4/5)was cut into approximate 2cm square specimens and mounted on a cylindrical model of the dural sac.The model was pressurized to 15cm with artificial CSF(left lateral decubitus pressure)and dura punctured with an epidural needle according to a pre-determined randomization schedule. The pressure was then raised to 25cm(labor/semi-sitting pressure)and leak measured over 15minute intervals x4.A micromanipulator was used to ensure precise needle angle,bevel orientation and advancement at the time of puncture.Dural trauma patterns were examined using Scanning Electron Microscopy (SEM).Every comparison involved use of dura from the same cadaver.Part 1 addressed the effect of gauge/tip design using 6 epidural needles:17G Husted;17G Tuohy;18G Tuohy;18G Special Sprotte;18G Crawford;and 20G Tuohy(10 cadavers).Punctures were made at 90deg to the long axis of the dura with the bevel parallel where applicable.Part 2:The effect of needle angle(30vs90 deg)was examined for each of 2 needle types:18G Tuohy (bevel parallel,10 cadavers)and the 18G Special Sprotte needle(6 cadavers).Part 3:The effect of bevel parallel vs perpendicular bevel orientation was examined using the 18G Tuohy(10 cadavers).Statistical analysis using RMANOVA was blinded with $p < 0.05$ considered significant.We found a large(3-5 fold)statistically significant reduction in CSF leak/15 minute interval between the 20GTuohy and each of the other needles examined in Part 1(reported as mean gm \pm SD per 15minutes ;lgm=1ml;p values=comparison with the 20GTuohy):17G Husted (516 \pm 319,p=0.002) ;18G Tuohy(420 \pm 191,p=0.002);17G Tuohy(405 \pm 209,p=0.002;18G Special Sprotte(359 \pm 208,p=0.016);18G Crawford(356 \pm 121,p=0.0001); 20G Tuohy (99.5 \pm 112).Part 2:CSF leak for the 18G Tuohy at 30deg was 401 \pm 135 vs 485 \pm 215 at 90deg(p=0.31).Leak for the 18G Special Sprotte at 30deg was 408 \pm 205 vs 401 \pm 208 at 90deg(p=0.96).Leak after puncture with an 18GTuohy with a perpendicular bevel was 367 \pm 119 vs 485 \pm 216 with the bevel parallel(p=0.12).Characteristic dural trauma patterns were identified on SEM for each needle type,orientation and angle of puncture.This study suggests that a large statistically significant reduction in CSF leak occurs with the 20G Tuohy needle compared with larger epidural needles.Large reductions in leak were found with the Tuohy at a 30deg angle vs 90deg that did not reach statistical significance.Angle of puncture made no difference in leak for the Sprotte epidural needle.Large reductions in leak,not achieving statistical significance were found with a perpendicular Tuohy bevel orientation when compared to a parallel orientation.

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SODIUM NITROPRUSSIDE (SNP) INHIBITS HYPOXIC FETO-PLACENTAL VASOCONSTRICTION (HFPV) IN THE DUAL PERFUSED, SINGLE ISOLATED HUMAN PLACENTAL COTYLEDON *Downing, J.W. Ramasubramanian, R.; Minzter, B.H.; Paschall, R.L.; E, L.; Johnson, B.; Johnson, R. Anesthesiology, Vanderbilt University, Nashville, TN* Nitric oxide (NO), a potent vasodilator, plays a major role in modulating vascular resistance¹. The dual perfused, single isolated human placental cotyledon is a well-established in-vitro placental model². The model has been used to demonstrate the existence of Hypoxic Feto-Placental Vasoconstriction (HFPV) and its modulation by a variety of vasoactive agents^{3,4}. This study examines the ability of SNP, a NO donor, to counter HFPV in the human fetoplacental circulation. Six placentae were collected from healthy women with their written informed consent and IRB approval. Both the fetal and maternal sides of a single cotyledon were perfused with KRB equilibrated with air (21% oxygen) using the open (non-recirculating) model. Perfusion pressures for both circuits were measured and recorded at one minute intervals. The pH of both circuits was maintained at 7.4 by the addition of CO₂ in the gas mixture (air or nitrogen). Each placenta was allowed a 30 minute normoxic interval to rest and establish its baseline fetal arterial pressure (FAP). Thereafter, the perfusate was rendered hypoxic by substituting nitrogen for air in the gassing media. Hypoxic perfusion was continued for the 30 minutes. FAP increased due to HFPV during this episode of hypoxic equilibration. SNP (50 μ M) was then added to the fetal circuit. Thirty minutes later (total duration of hypoxia = 1 hour), the cotyledon was again exposed to the original aerated perfusate for another thirty minutes. In keeping with earlier experiments³, removing oxygen from the placental perfusate significantly increased mean (\pm sem) FAP (66.7 \pm 4.2 vs. 78.2 \pm 5.3 mmHg, p = 0.002). The addition of SNP (50 μ M) to the hypoxic preparation rapidly decreased FAP back to control levels (78.2 \pm 5.3 mmHg vs. 65.2 \pm 4.9 mmHg, p = 0.0008). FAP levels remained at baseline during the 30 minute recovery period on air. This study demonstrates that SNP reverses HFPV in the dual perfused, single isolated human placental cotyledon and suggests that NO plays a vasodilatory role in countering HFPV in the human placenta. 1) *Am J Obstet Gynecol* 1991; 164:687-692. 2) *Anesthesiology* 1995;82:459-468. 3) *Anesthesiology* 2001;V94, No A1, Apr:A51. 4) *Am J Obstet Gynecol* 1987;157:1261-66.

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SPINAL PROSTAGLANDINS MODULATE PAIN FROM UTERINE CERVICAL DISTENSION *Tong, C. Eisenach, J.C. Anesthesiology, Wake Forest University, Winston-Salem, NC* Introduction. Pain from acute uterine cervical distension (UCD) underlies the pain of labor, yet the neurophysiology and pharmacology of this visceral pain has received little attention. Spinal prostaglandins have been implicated in playing an important role in this visceral pain. As part of a series of validation studies examining acute UCD, we studied the induction by UCD of cfos expression in the thoraco-lumbar spinal cord, and the effects of spinal ketorolac on UCD evoked cfos expression and reflex contraction of abdominal wall muscles. Methods. Ovariectomized adult female rats were anesthetized and UCD induced by manual separation of two fine metal rods. This results in a reflex contraction of the abdominal wall musculature, which is quantified using the rectified, integrated EMG. Following determination of a baseline stimulus-response to UCD, animals received intrathecal ketorolac by cumulative dosing, with dose range and timing determined in preliminary experiments. Other animals were anesthetized, UCD at a near maximal force (75 g) performed, then they were peri-cardially perfused with saline and fixative, their spinal cord removed and sectioned, and spinal neuronal excitation quantified by counting the number of cells expressing the early-immediate gene protein, cfos. Data were analyzed by one- or two-way analysis of variance, with $p < 0.05$ considered significant. Results. UCD increased the number of cfos containing cells throughout the dorsal horn and deep laminar in sections from T12 to L2 compared to sham laparotomy controls. This increase in cfos expression was abolished when locally injection of lidocaine into the cervix). Intrathecal ketorolac significantly attenuated both the cfos expression in deep dorsal horn of the spinal cord and the reflex EMG response elicited by UCD. Discussion. Noxious stimulation results in cfos expression of cells in the dorsal spinal cord. The location of these cfos cells has been used as a measure of the synaptic terminals of primary afferents which were excited by the stimulus. A reduction in the number of cfos expressing cells by drug administration correlates with behavioral analgesia. These data with spinal cord cfos expression are consistent with neural tracing methods which demonstrate extensive arborization of visceral afferent terminals deep in the spinal cord, and add to previous recordings in hypogastric afferents and reflex EMG responses to validate this novel model of UCD. Ketorolac, although stated to be non-selective, is actually several hundred fold selective for cyclo-oxygenase (COX)-1 than COX-2, suggesting activation of COX-1 in the spinal cord during UCD. We propose that spinal COX-1 may be a reasonable target to examine for the treatment of labor pain. Supported in part by NIH grant GM35523 and NS41386

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USE OF NIRS TO MONITOR PLACENTA TISSUE OXYGENATION *Olufolabi, A.¹ James, A.² Coates, E.¹ El-Moalem, H.¹ Reynolds, J.¹* 1. Anesthesiology, Duke Medical Center, Durham, NC; 2. Ob/Gyn, Duke Medical Center, Durham, NC Near-infrared spectroscopy (NIRS) is a non-invasive spectrometric method of measuring tissue oxygenation that works by recording changes in the ratio of oxygenated and de-oxygenated hemoglobin in the region of interest. Such technology has allowed researchers to measure oxygenation in various adult and neonatal tissues and has led the FDA to approve NIRS for clinical use. The purpose of this preliminary investigation was to assess the potential of this technology to measure placental oxygenation. As blood in the placenta is directly associated with fetal oxygenation, NIRS might indirectly be used to monitor fetal status. Following IRB approval, written informed consent was obtained from third-trimester parturients (>30 weeks) with normal single pregnancies. Parturients with anterior placenta were identified using abdominal ultrasound. The NIRS probe was placed over their abdomen, overlying the position of the placenta. Placental tissue oxygenation was recorded for 10 minutes. During subsequent NIRS recording session, mothers were given 100% oxygen to induce changes in the placental oxygenation. The final recording session had the women back to breathing room air. Parturients with posterior lying placentas served as controls. To date, 10 women have been enrolled in the study: 7 had anterior located placentas while 3 had posterior-located placentas. In the latter group, there was no quantifiable signal following NIRS probe placement. Amongst the women with anterior placentas, strong NIRS signals were recorded from the region of interest in 6 of the participants. Inspiration of 100% oxygen, produced, on average, a 4.4% increase in placental oxygenation (range , 0.8 to 9.8). Ultrasound-directed placement of NIRS probe on the abdomen appears to provide information of placental oxygenation in term parturients. Further developments in technology is needed to confirm this preliminary finding. A non-invasive means of monitoring placental oxygenation may be beneficial in the management of fetal well-being.

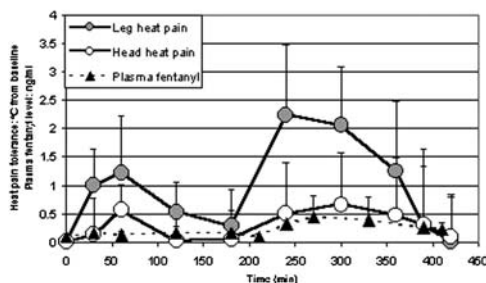
P-93

EXTRACELLULAR REGULATED KINASE-MEDIATED PHOSPHORYLATION OF MYOMETRIAL CALDESMON DURING PREGNANCY AND LABOR *Li, Y.¹ Malek, S.² Morgan, K.G.³* 1. Anesthesia and Critical Care, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA; 2. Country Day High School, Newton, MA; 3. Boston Biomedical Research Institute, Watertown, MA. Caldesmon (CaD) is a major actin associated protein, regulating contraction and relaxation of smooth muscle (1). An increased level of CaD in term pregnant human myometrium compared to nonpregnant state suggests specific regulation of this protein during gestation (2). In the present study, we used a timed-pregnant rat model to track the dynamic changes during pregnancy and labor in (I) myometrial contractility; (II) content of contractile proteins and (III) the protein levels and phosphorylation state of CaD and Extracellular Regulated Kinase (ERK). Compared to contractility in nonpregnant myometrial strips (Force 0.34 ± 0.04 g/mg in tissue dry weight, mean \pm SEM, n=8, frequency 10.85 ± 0.81 contractions/15min., n=7), although spontaneous contraction force amplitudes were significantly increased at 16 and 20-day pregnancy (1.11 ± 0.12 and 1.25 ± 0.15 g/mg respectively, n=7 and 6, $p < 0.001$), frequencies of contraction were greatly inhibited (1.12 ± 0.10 and 2.75 ± 0.94 contractions/15min. respectively, n=7 and 6, $p < 0.001$), reflecting myometrial quiescence during pregnancy. During the onset of labor, force amplitude and frequency reached the highest levels (1.12 ± 0.10 g/mg and 12.61 ± 1.51 contractions/15min. respectively, n=7 and 8). While the content of the 20kDa myosin light chain remains unchanged through pregnancy to labor, actin levels were significantly increased at 20-day pregnancy and during labor ($p < 0.001$). The protein content of CaD was increased 3–4 fold in pregnancy (n=4). A 20-fold increase in CaD phosphorylation levels was observed during labor ($p < 0.05$), compared to very minimal phospho-CaD in nonpregnant myometrium (n=4). The phospho-CaD antibody used is specific for phosphorylation at the ERK sites of CaD. Phosphorylation of CaD has been associated with increased contractility (3). ERK activation did not increase significantly during pregnancy until the onset of labor ($p < 0.01$). We conclude that the increase in CaD protein content during pregnancy may contribute to a suppression of the contractility of the pregnant myometrium by raising the threshold for contraction. On the other hand, CaD phosphorylation, perhaps through an ERK-mediated signaling pathway, is suggested to reverse the inhibition by promoting the uterus to contract during labor. This work may point to new potential targets for therapeutic intervention. 1. Horowitz et al, *Physiol Rev*, 1996; 79:967 2. Word RA et al, *J Clin Invest* 1993; 92:29 3. Gangopadhyay & Morgan, *J Appl Physiol*, 2001; 91:953

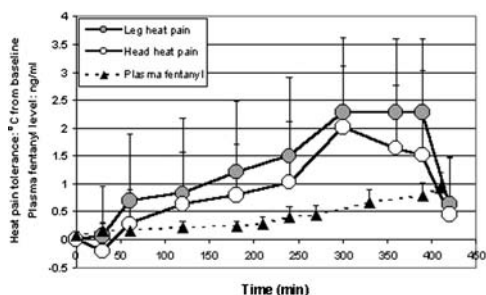
P-94

EPIDURAL BOLUS ADMINISTRATION AND CONTINUOUS EPIDURAL INFUSION OF FENTANYL DIFFER IN THEIR MECHANISM OF ACTION *Ginosar, Y. Riley, E.T.; Angst, M.S.* Department of Anesthesiology, Stanford University Medical School, Stanford, CA Controversy exists as to whether epidural fentanyl acts predominantly by a spinal or systemic mechanism. This study tested the hypothesis that the predominant mechanism of fentanyl action depends upon the mode of its administration. **Method:** 10 healthy volunteers have completed this double-blind, randomized, cross-over study. Epidural catheters were placed at L3/4. On separate study days, subjects received either an epidural fentanyl bolus regime (0.03mg followed 210 min later by 0.1mg) or an epidural fentanyl infusion regime (0.03mg/h followed 210 minutes later by 0.1mg/hr for 200 min). Using both an experimental heat pain model and an experimental electrical pain model, analgesic effects of fentanyl were assessed at the leg and face 3 times before and 30, 60, 120, 180, 240, 270, 330, 390 min after first drug administration. Finally, an analgesic assessment was made after intravenous administration of 0.4mg naloxone. Plasma fentanyl was measured at each time point. **Results:** The figure depicts the change in heat ($^{\circ}$ C) necessary to cause maximum tolerable pain as a function of time after drug administration. The graph depicting the % change in electrical current required to cause maximum tolerable pain as a function of time after drug administration was almost identical and has not been represented here for lack of space. Fentanyl bolus administration caused significant analgesic effects at the leg (*) but not the head. Fentanyl infusion caused significant analgesic effects at both the leg (*) and the head (#). No difference could be detected between the magnitude of the analgesic effect at the leg and head for epidural infusion of fentanyl. **Conclusion:** Our data suggest that epidural bolus administration of fentanyl acts predominantly at the spinal site thereby providing segmental analgesia. Conversely, epidural infusion seemed to act significantly at supraspinal sites, so providing systemic analgesia.

Heat pain tolerance and plasma fentanyl: bolus



Heat pain tolerance and plasma fentanyl: infusion



P-95

IS PERIODONTITIS ASSOCIATED WITH PRETERM LABOR, PRETERM LOW BIRTH WEIGHT, AND PREECLAMPSIA? *Vallejo, M.C.¹ Daftary, A.² Riegel, A.R.¹ Phehls, A.L.¹ Kaul, B.¹ Mandell, G.L.¹ Ramamatban, S.¹* 1. Anesthesiology, University of Pittsburgh, Pittsburgh, PA; 2. Obstetrics, University of Pittsburgh, Pittsburgh, PA Introduction: Preterm labor, preterm low birth weight, and preeclampsia is reported to be 3 to 8 times more common in women with periodontal disease. The purpose of this study is to determine if periodontitis is associated with preterm labor, preterm low birth weight, and preeclampsia. Methods: After local IRB approval, 85 preterm (≤ 37 weeks gestation, n = 15) and term (≥ 38 weeks gestation, n = 70) parturients in labor received a periodontal examination using the Periodontal Screening and Recording (PSR) system. PSR is a screening classification system endorsed by the American Dental Association. PSR scores range from code 0-4: (0 - healthy gingiva, 1- bleeding after probing, 2 - supra/sub/gingival calculus, 3 - probe depth > 3.5mm indicating mild periodontitis, 4 - probe depth > 5.5 mm indicating moderate to severe periodontitis). Results are expressed as mean \pm SD and analyzed using t-test or Chi-square. P < 0.05 is considered significant. Results: Results are expressed in the table. No differences were noted with respect to PSR scores, vaginal delivery rate, or in Apgar scores < 7 at 1 minute. The prevalence of periodontitis (PSR = 3 + 4) was higher in the preterm group (46.7% vs. 40.0%). As expected, both gestational age and birth weight were lower in the preterm group. Preeclampsia was significantly higher in the preterm group. More neonates in the preterm group had Apgar scores < 9 at 5 minutes. Conclusion: There appears to be an association between periodontitis, preterm labor, preterm low birth weight and preeclampsia. More research is needed to establish this relationship and to determine its mechanism. *JAMA 2000;283:2922.*

| | Preterm | Term | P |
|--------------------------------|----------------|----------------|------|
| Gestation (wks) | 36.0 \pm 1.0 | 39.5 \pm 1.0 | 0.00 |
| Preeclampsia (%) | 26.7 | 2.9 | 0.01 |
| PSR = 0 (%) | 26.7 | 27.1 | 0.78 |
| PSR = 3 + 4 (%) | 46.7 | 40.0 | 0.85 |
| Vag Del (%) | 86.7 | 92.9 | 0.78 |
| Apgar < 7 ; ¹ ; (%) | 13.3 | 8.6 | 0.93 |
| Apgar < 9 ; ⁵ ; (%) | 20.0 | 1.4 | 0.02 |
| Birth wt (gms) | 2778 \pm 629 | 3566 \pm 349 | 0.00 |

P-96

ASA PHYSICAL STATUS CLASSIFICATION - A PREGNANT PAUSE *Barbeito, A. Schultz, J.; Muir, H.; Dwane, P.; Olufolabi, A.; Breen, T.; Habib, A.; Millar, S.; Drysdale, S.; Spahn, T. Division of Women's Anesthesia, Duke University Medical Center, Durham, NC* In 1941, the American Society of Anesthesiologists developed a six-category classification for patients requiring anesthesia and surgery. The ASA physical status classification was then modified into five categories by Dripps et al in 1961 and remains in use today with some changes. The advantages of the ASA classification are twofold: it provides anesthesiologists with a quick summary of the physical status of a patient and it allows us to compare outcomes. The inconsistency of ratings using this classification in surgical patients has already been shown. The objective of this study was to investigate whether this disparity of opinions also exists when referring to parturients. To explore the differences of opinion, and of practice, we asked a sample of anesthesiologists to rate specific hypothetical cases in regards to ASA classification. We presented three non-obstetrical cases and three obstetrical cases. Case 1: A 34 y/o male with GERD presenting for elective laparoscopic hernia repair. Case 2: A healthy 24 y/o female who will undergo left breast biopsy. Case 3: A healthy 19 y/o male with acute appendicitis presenting for emergent appendectomy. Case 4: A healthy 24 y/o G1P0 in active labor, requesting a labor epidural. Case 5: A 22 y/o G1P0 in active labor, developing early signs of pre-eclampsia. Case 6: A healthy 25 y/o in active labor presenting for urgent cesarean section for breech presentation. We found inconsistency in the ratings using the ASA physical status classification for surgical patients. This discrepancy appears even greater in parturients. While pregnancy is considered a "normal" physiological condition by some, others realize the increased risk due to the parturients's anatomic and physiologic changes. At least two studies have shown discrepancy in rating the ASA physical status classification in non pregnant patients. We found adding a simple modifier, the fact that a patient is pregnant, trends towards more inconsistency to this already imperfect system. Ways of improving this useful classification should be sought in order to allow physicians to communicate more effectively and to better compare outcomes. *1. Saklad M: Grading of patients for surgical procedures. Anesthesiology 2:281, 1941 2. Dripps RD, Lamont A, Eckenboff JE: The role of anesthesia in surgical mortality. JAMA 178:261, 1961 3. Owens WD, Felts JA, Spitznagel EL: ASA physical status classifications: A study of consistency of ratings. Anesthesiology 49:239, 1978*

| n=49 | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 | Case 6 |
|---------|----------|-----------|----------|----------|----------|----------|
| ASA I | 11 (22%) | 49 (100%) | 34 (69%) | 19 (39%) | 0 | 17 (35%) |
| ASA II | 38 (78%) | 0 | 13 (27%) | 30 (61%) | 25 (51%) | 29 (59%) |
| ASA III | 0 | 0 | 2 (4%) | 0 | 24 (49%) | 2 (4%) |
| ASA IV | 0 | 0 | 0 | 0 | 0 | 1 (2%) |

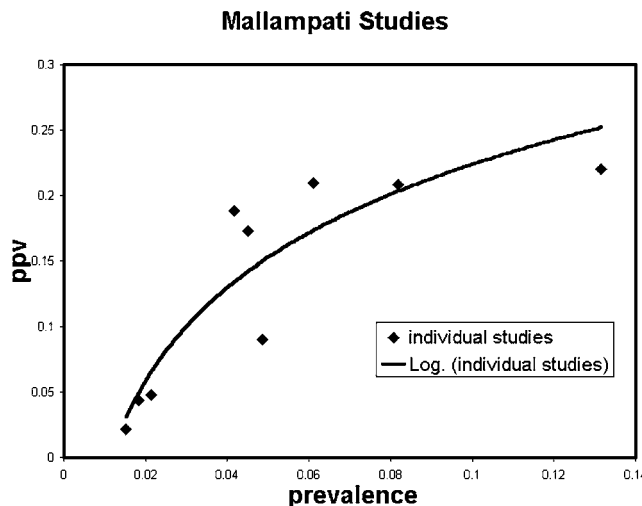
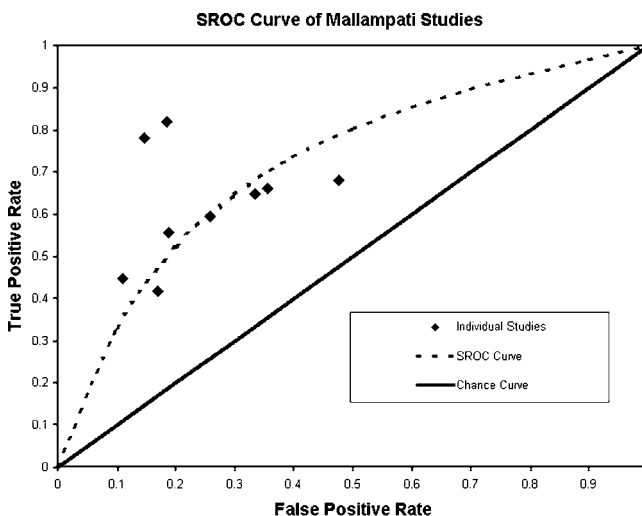
P-97

ECV FACILITATION BY ANESTHESIA FOR BREECH PRESENTATION - A QUANTITATIVE SYSTEMATIC REVIEW *Gagnon, S.¹ Turrau, L.M.² Macarthur, A.J.²* 1. Anesthesia, CHUQ, Quebec City, QC, Canada; 2. Anesthesia, Mount Sinai Hospital, Toronto, ON, Canada Recent RCT results have recommended cesarean delivery for breech presentation.¹ The only proven therapy to reduce the incidence of breech presentation is an external cephalic version.² The purpose of our study was to systematically review the literature to identify all RCT assessing the effect of any anesthetic on success of ECV attempts and pregnancy outcomes. The databases searched: MEDLINE, PUBMED, EMBASE, COCHRANE CONTROLLED TRIALS REGISTER, and WEB OF SCIENCE from 1945–2001, as well as hand searches. Selection criteria for studies were randomised/quasi-randomised trials comparing anesthesia vs no anesthesia. Primary outcome of interest was the proportion of successful versions at the end of ECV attempt. Other outcomes of interest: fetal presentation at delivery, method of delivery, fetal morbidity/mortality and maternal morbidity. Trials under consideration were evaluated by 2 reviewers according to prestated selection criteria. Results were pooled using fixed effects model for dichotomous outcomes if homogeneity demonstrated. 24 manuscripts were identified and reviewed. Of these, 21 articles were excluded due to the following reasons: 5 observational prospective studies, 16 retrospective studies. Only 3 randomised clinical studies met inclusion criteria: 2 studies compared epidural anesthesia^{3,4} to no anesthesia, while 1 study compared spinal anesthesia to no anesthesia.⁵ Other differences between the 3 studies: transverse lies, use of vaginal elevation of breech presenting part, and degree of motor block achieved. Individual study results are displayed in table. Pooling of data for the primary outcome and fetal morbidity was acceptable as findings weren't heterogeneous ($p=0.0924, 0.3667$). The pooled result proportion of immediate success at ECV attempt was a relative risk of 1.5 (95% CI 1.2–2.0). That is women receiving anesthesia for ECV attempts were 1.5 times more likely to have a successful version. Pooled results showed no increased risk in fetal morbidity with the use of anesthesia for ECV attempts (RR 1.3; 95% CI 0.6–2.9). Other secondary outcomes were heterogeneous and could not be pooled. 1. *Hannah M. Lancet 2000; 356(9239):1375–83.* 2. *Hofmeyr G. Cochrane DSR 2001;(3): CD000184.* 3. *Schorr S. Am J Obstet Gynecol 1997;117(5):1133–7.* 4. *Mancuso K. Obstet Gynecol 2000;95:648.* 5. *Dugoff L. Obstet Gynecol 1999;93:345–9.*

| | ECV Success (#) | Pres'n@Del(#ceph) | Vag. Deliv(#) |
|---------------------------|-----------------|-------------------|----------------|
| Schorr-Anesth vs Control | 24/35 vs 11/34 | 24/35 vs 10/34 | 23/35 vs 7/34 |
| Mancuso-Anesth vs Control | 32/54 vs 18/36 | 32/54 vs 19/35 | 29/54 vs 16/54 |
| Dugoff-Anesth vs Control | 22/50 vs 22/52 | 20/50 vs 26/52 | 16/50 vs 25/52 |

P-98

META ANALYSTS CHALLENGE THE PUERPERAL PREDICTIONS OF MALLAMPATI ADVOCATES *Glassenberg, R. Fredericksen, M.* *Anesthesiology, Northwestern, Chicago, IL* Introduction: The inter-observer variability of the Mallampati test is 20%, the sensitivity (TPR) varies with the false positive rate (FPR), the positive predictive value (PPV) depends on the prevalence of difficult intubation in the population. (1) What is the accuracy of the scoring system? (2) What are the TPR and PPV in a model population, where a proportion of difficult appearing airways were secured awake prior to induction of general anesthesia for C-section? Methods: A Medline search found 12 reports using the Mallampati exam. The number of patients per study range from 250 to 10,500. A meta-analytical method using a logit function converted the data to a linear system. The data were back-transformed using an exponential function, and plotted as a summary ROC curve. Mathematica was used to integrate the function to find the area under the ROC curve, the true accuracy of the test. We used an intent to treat analysis to give values for PPV for the model population. Conclusion: The accuracy of the Mallampati test is only 75%, better than if the predictions were obtained by chance. Chemical analysis to determine the presence of a disease, alpha feto protein for neural tube defects, have accuracies and sensitivities greater than 90%. Acting on the results of a test with even moderate accuracy reduces the prevalence of difficult intubation. *Littenberg, Med Decis Making 1993; 13:313–321*



P-99

EXPECTANT MANAGEMENT, POSTDURAL PUNCTURE HEADACHE AND LENGTH OF HOSPITAL STAY *Angle, P.¹ Tang, S.² Thompson, D.¹ Szalai, J.P.¹* 1. Sunnybrook and Womens College Health Science Ctr., Toronto, ON, Canada; 2. University of Toronto Medical School, Toronto, ON, Canada Prophylactic extradural patching to prevent postdural puncture headache(PDPH) has been advocated after large gauge dural puncture(DP)[1]. In many institutions, however, management is expectant. This matched case-control study examined the impact of expectant management on length of hospital stay (LOS) and emergency ward(EW) visits in parturients who developed PDPH vs those with uncomplicated epidurals. After ethics board approval, our perinatal database was used to identify ASA I-II parturients with unintentional DPs during epidural placement(1996-2001) and otherwise uncomplicated deliveries. Women with recognized DPs who developed PDPH were matched by parity, mode of delivery(spontaneous/instrumental) and date of admission (<1yr) with women who had uneventful epidural placement/delivery. Exclusion criteria for both groups included prematurity, multiple gestation, significant maternal/neonatal illness, NICU admission or post-delivery complications. All charts were independently reviewed by 2 authors to identify cases with PDPH, to exclude PDPH in controls and to confirm study eligibility. Outcomes were assessed only after patients were entered into the study. The primary outcome was LOS (hrs) from birth to patient discharge (or last recorded time). Secondary outcomes included: # of nights in hospital, # of EW visits related to PDPH, timing of EBP (pre vs post-discharge), and blood volume used. LOS and # of nights in hospital were assessed using a 2-tailed paired t-test. 26 cases and 26 controls were identified from a review of 106 charts. Firm discharge times were found for 23 cases and 23 controls. Demographics did not differ significantly between groups. LOS in hospital in PDPH cases was increased by a mean of 17 ± 23.8 (SD) hours (95% CI, 8, 26; $p=0.0012$). # of nights in hospital was increased by a mean of 0.62 nights in PDPH cases (95% CI, 0.26, 0.98, $p=0.0027$). 73% (19/26) of cases received at least 1 EBP with a mean blood volume of 18.7ml. 68% (13/19) of cases had EBPs done on the ward. 11 cases visited the EW 14 times for evaluation of PDPH with 54% receiving at least 1 EBP. In summary, expectant management of a recognized large gauge DP is associated with a significant increase in hospital LOS and a large number of EW visits for evaluation/treatment in parturients developing PDPH. Prophylactic therapy warrants further investigation. 1. *Anesth Analg* 1989; 69:522-3

P-100

INCIDENCE OF POST-DURAL PUNCTURE HEADACHE AND EPIDURAL BLOOD PATCH FOLLOWING DURAL PUNCTURE WITH EPIDURAL NEEDLE IN 15,411 OBSTETRIC PATIENTS IN A LARGE, TERTIARY CARE TEACHING HOSPITAL *Toyama, T.M.¹ Ranasinghe, J.S.² Siddiqui, M.N.³ Steadman, J.L.⁴ Lai, M.⁵* 1. Anesthesiology, University of Miami, Miami, FL; 2. Anesthesiology, University of Miami, Miami, FL; 3. Anesthesiology, University of Miami, Miami, FL; 4. Anesthesiology, University of Miami, Miami, FL; 5. Anesthesiology, University of Miami, Miami, FL Post-dural puncture headache (PDPH) following dural puncture with 17-gauge Tuohy epidural needle is a recurring morbidity in obstetric anesthesia. Reported incidences of accidental dural puncture (ADP) in teaching hospitals range from 0.6% to 4.2% (1,2,3,4,5,6). Over a three-year-period between January 1999 and December 2001, we investigated the incidences of ADP, PDPH, and efficacy of epidural blood patch (EBP) in our institution. We followed three groups of patients for the purpose of Quality Improvement. (a) Who had intentional dural puncture by epidural needle for continuous intrathecal analgesia or anesthesia. (b) Who had recognized ADP at the time of epidural or combined spinal epidural (CSE) procedure. (c) Who developed PDPH following epidural or CSE procedure, although at the time of procedure dural puncture was not recognized. During the study years, 15,411 patients had either intentional intrathecal catheter, epidural or CSE performed for labor analgesia or cesarean section. There were 16 intentional dural punctures and only one of them required EBP. There were 302 ADPs in the epidural and the CSE group combined (1.9% incidence). In the epidural group, 273 out of 9,639 sustained ADP (2.8%), while in the CSE group, 26 out of 5,753 had ADP (0.4%). Although 188 patients developed PDPH (59.1%), only 81 of them required EBP. Therefore, 56.9% of the PDPH patients (107 out of 188) responded to conservative treatment with fluid intake and oral analgesics. Eight patients had prophylactic EBP, of whom two required therapeutic EBP. It is not known how many of the patients who had prophylactic EBP, other than those two who had therapeutic EBP, would have developed PDPH. Three out of 73 patient with PDPH required second EBP for recurrent headache. Therefore the success rate of the first EBP was 95.8%. Our overall incidence of ADP (1.9%) is comparable to the previous reports. Our ADP rate of 0.4% in the CSE group is much lower than that in the epidural group (2.8%). Norris and others (3) reported similar findings. Incidence of PDPH and the success rate of EBP are comparable to the previous studies (1,3,5,6). 1) *Anesthesia* 1987; 42:1110-3. 2) *Anaesthesia* 1993; 48:247-55. 3) *Anesth Analg* 1994; 79:529-37. 4) *Int J Obstet Anes* 1997; 7:5-11. 5) *Anesth Analg* 1999; 88:352-6. 6) *Int J Obstet Anesth* 2001; 10:162-7.

P-101

A COMPARISON OF THE USE OF ATRAUMATIC SPINAL NEEDLES BETWEEN ANESTHESIOLOGY AND EMERGENCY MEDICINE TRAINING PROGRAMS *Kerimoglu, B. Birnbach, D.J.; Marengo, J.E.; Stein, D.J. Anesthesiology, St. Luke's-Roosevelt Hospital Center, Columbia University, New York, NY*

Introduction: Postdural puncture headache (PDPH) following lumbar puncture may be dramatically reduced through the use of "atraumatic" spinal needles and these needles have become standard of care in Obstetric Anesthesia. A recent study (1), however, reported that only a tiny fraction of US Neurologists are using pencil point needles. Based on the practice at our institution, our impression was that Emergency Medicine physicians are likewise continuing to use Quincke needles. Furthermore, it appeared that residents in Emergency Medicine were unfamiliar with atraumatic spinal needles. The aim of this study was to evaluate the prevalence of use of atraumatic spinal needles at residency programs in Emergency Medicine and to compare these results with the Anesthesiology programs at those hospitals. **Methods:** All 123 residency programs in Emergency Medicine in the US, as listed in the 2002 ACGME directory, were contacted. The departments of Anesthesiology at those hospitals were also contacted and asked several questions including which spinal needle was routinely used in their departments. **Results:** Of the 123 Emergency Medicine residency programs contacted, 95 (77%) have responded to date. The Anesthesiology departments in each of those hospitals have also responded. Of the 95 Emergency Medicine programs responding, not a single one reported the use of atraumatic spinal needles; Quincke needles were routinely used for all patients undergoing lumbar puncture, regardless of age, in each of these Emergency Medicine departments. Additionally, large bore Quincke needles (18 -20 gauge) were used by 67 % of these programs. All Anesthesiology departments contacted reported the routine use of atraumatic spinal needles, except in geriatric patients. **Discussion:** This study confirms previous data which suggests that while Anesthesiologists have embraced the use of atraumatic spinal needles, other subspecialties have not (1). Furthermore, these results confirm our presumption that this problem will continue, since residents in training in Emergency Medicine programs are not being introduced to atraumatic spinal needles. In order to change this situation and improve patient care, efforts must be made by Anesthesiologists to teach our colleagues who may be unaware of the advantages of these needles. Due to our training and practice, Obstetric Anesthesiologists are in an excellent position to influence their colleagues and thus lower morbidity for patients undergoing lumbar puncture outside the operating room. 1. *Headache* 2001;41:385-390

P-102

EXPANDED ANTIGEN-MATCHING FOR ERYTHROCYTE TRANSFUSION OF WOMEN WITH SICKLE CELL DISEASE DURING PREGNANCY REDUCES TRANSFUSION-RELATED ALLOIMMUNIZATION *Ramsey, P.S. Winkler, D.D.; Rouse, D.J. University of Alabama at Birmingham, Birmingham, AL*

We sought to examine the rate of alloimmunization after transfusion using an expanded antigen-matching program during pregnancy in women with sickle cell disease. For this investigation we reviewed our obstetric database to identify women with sickle cell disease (Hemoglobin SS and SC) who underwent either prophylactic or exchange transfusion of packed red blood cells (PRBCs) during pregnancy from 9/91-8/01. Reason for transfusion (prophylactic vs. indicated), type of transfusion (exchange vs. straight), transfusion reactions and alloimmunization events were recorded. Statistical analysis included the Student's t test and the Fisher exact test. For the 10 year period evaluated, complete transfusion and delivery records were obtained and reviewed for 36 patients (22 hemoglobin SS and 14 hemoglobin SC) with a total of 45 pregnancies (28 hemoglobin SS and 17 hemoglobin SC). These women received a total of 89 antepartum transfusions (mean 6.8 units PRBC per pregnancy). Of these transfusions, 27 (30%) were prophylactic while the remaining 62 (70%) were indicated for sickle cell crisis and/or low hematocrit. Fifty-eight transfusions (65%) were exchange and 31 (35%) were straight transfusions. Four (8.9%) women were alloimmunized at the time of their first prenatal visit. Three of 16 women (19%) between 1991 and 1994 became alloimmunized following indicated transfusions (1 with anti-E and 2 with anti-C) with PRBCs (mean 7.9 units PRBC per pregnancy) matched for D, Kell, Kidd, and Duffy antigens. In contrast, none of the 29 women (0%) receiving PRBC transfusions (mean 6.1 units PRBC per pregnancy) with extended matching (c, C, D, E, e, Kell, Duffy, Kidd) between 1995 and 2001 became alloimmunized during pregnancy ($p=0.03$). These findings demonstrate that expanded antigen-matching of PRBCs used for transfusion of sickle cell patients in pregnancy significantly reduces the rate of alloimmunization.

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SUPINE POSITION DURATION FOLLOWING AN EPIDURAL BLOOD PATCH *Hepner, D.L., Kodali, B.; Camann, W.; Harnett, M.; Segal, S.; Tsen, L.C. Department of Anesthesiology, Perioperative and Pain Medicine, Brigham and Women's Hospital, Harvard Medical School, Boston, MA* An epidural blood patch (EBP) is the most effective treatment for a postdural puncture headache (PDPH), with 61–75% resulting in persistent symptomatic relief. (1) Although a longer duration of the supine position after an EBP has been noted to provide better results (2 hrs1 hr30 min), (2) variations in age, gender, needle size and an unknown pregnancy status may have influenced the results and may limit the application of the results to the parturient population. Furthermore, a less effective amount of autologous blood may have been utilized (12 mL). (3) We hypothesized that the use of a more homogenous patient group and placement techniques, as well as a greater volume of autologous blood (20 mL), would eliminate differences observed due to the supine position duration. In our ongoing study, 30 postpartum women with a PDPH after an inadvertent dural puncture with a 17G Touhy needle were approached. Following consent, the patients were randomized in a double blind fashion to remain supine following a standardized, 20 mL EBP to one of three groups: 30 minutes (group 1, 10 subjects), 60 minutes (group 2, 11 subjects) or 120 minutes (group 3, 9 subjects). A visual analogue pain score (VAPS) and duration of headache was obtained in the upright position at baseline, and at 24 and 48 hours (hrs) following the EBP. Statistical analysis included an analysis of variance for parametric results, and Wilcoxon ranked tests and Man-Whitney U tests for differences in VAPS scores before and after EBP and between treatment groups. All subjects had a VAPS4 at baseline. There were no differences in the duration of the headache after the EBP (150 min in group 1, 126 min in group 2, 168 min in group 3), or in the number of subjects with a VAPS <4 after the EBP (8 in group 1, 10 in group 2, 8 in group 3), at 24 (8 in group 1, 9 in group 2, 7 in group 3), or 48 hrs (8 in group 1, 7 in group 2, 6 in group 3) post EBP. There was a difference between the VAPS at baseline and following the EBP, and at 24 and 48 hrs post EBP in all three groups ($P < 0.005$). There were no differences between groups in regards to return of headache (3 in group 1, 4 in group 2, 5 in group 3) or need for a repeat epidural blood patch (2 in group 1, 2 in group 2, 3 in group 3). To date we have demonstrated that under the present study conditions utilizing a homogenous group of recently postpartum patients, the duration of the supine position following an EBP does not influence the success of the procedure. 1. *Duffy PJ, Crosby ET. Can J Anaesth 1999;46:878-86.* 2. *Martin R, et al. Can J Anaesth 1994;41: 23-5.* 3. *Crauford JS. Anaesthesia 1980;35:513-5.*

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ANESTHESIA FOR EGG RETRIEVAL IN JAPAN: THE FIRST NATIONWIDE SURVEY *TERUI, K.¹ Taya, J.² Ishibara, O.² Takeda, S.² Kinoshita, K.³* 1. anesthesia, Saitama Medical Center, Kawagoe; 2. Obstetrics and Gynecology, Saitama Medical Center, Kawagoe, Japan; 3. Obstetrics and Gynecology, Juntendo University, Tokyo, Japan Purpose To investigate the current practice of anesthesia for egg retrieval with respect to anesthesia provider, anesthetic method, and monitoring. Methods Questionnaire was mailed to all 474 registered institutions to perform IVF-ET and GIFT under the guideline by the Japan Society of Fertility and Sterility. The survey includes anesthesia method and its agent, anesthesia provider, and monitoring. Results 312 institutions (65.8%) responded to the survey. The most frequently employed anesthesia method was iv sedation and analgesia (61%), followed by general anesthesia (41%), and regional anesthesia (19%). The most frequently used anesthetic agent was diazepam-pentazocine combination (54%), followed by ketamine-diazepam (14%). General anesthesia was provided by intravenous agents such as thiopental (48%) and ketamine (32%), while propofol was used only in 17% of the institutions. Methods of regional anesthesia include local infiltration (71%), spinal anesthesia (19%), and epidural anesthesia (10%). Anesthesia provider was found to be the same obstetrician who performs egg retrieval in 73% of the respondents. Anesthesiologists provide anesthesia care in only 11% of the institutions. Monitoring for egg retrieval seemed appropriate, 52% of the institutions utilize ECG, BP, and pulse oximetry. There were 15 institutions in which patients were hospitalized due to anesthesia related complications, such as nausea, vomiting, and anaphylaxis. Conclusion This nationwide survey in Japan revealed a variety of anesthesia method for egg retrieval. Anesthesiologists are very infrequently involved in reproductive medicine at present.

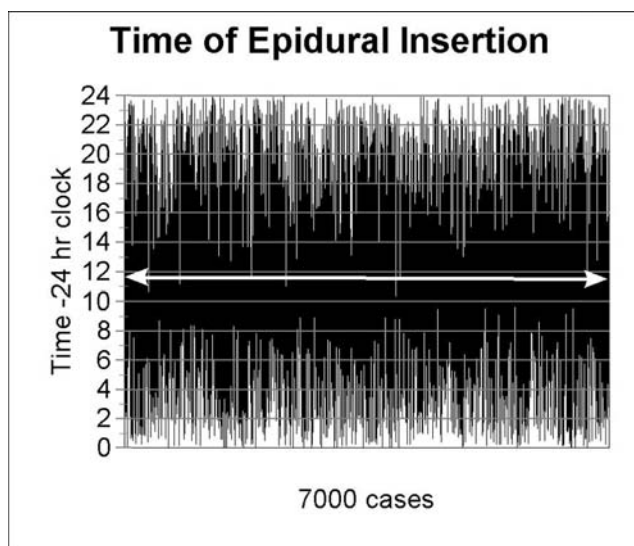
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DECREASE IN THE INCIDENCE OF POST DURAL PUNCTURE HEADACHE: LONG TERM PLUGGING OF THE DURAL HOLE WITH THE EPIDURAL CATHETER *Kuczkowski, K.M. Benumof, J.L. Anesthesiology and Reproductive Medicine, University of California, San Diego, CA*

Introduction: The incidence of epidural needle-induced post dural puncture headache (PDPH) in parturients following dural puncture with a large bore (18 GA) needle has been reported to range 76–85% (1). Although a few preventive measures have been proposed to prevent PDPH, none have been shown to work with certainty to date. **Methods:** Following inadvertent dural puncture with an 18-GA Tuohy-Schliff epidural needle seven parturients were quickly consented to continuous spinal analgesia and the dural puncture was followed by (1) injection of the CSF in the glass syringe back into the subarachnoid space through the epidural needle; (2) insertion of an epidural catheter into the subarachnoid space; (3) injection of a small amount of preservative free saline (3–5 ml) into the subarachnoid space through the catheter; (4) administration of bolus (1 ml of 0.25% isobaric solution of bupivacaine with fentanyl 10 mcg) and then continuous (0.625% bupivacaine with fentanyl 2 mcg/ml at the rate of 2 ml/hour) intrathecal labor analgesia through the intrathecal catheter; and then (5) leaving the intrathecal catheter in-situ for a total of 12–20 hours. **Results:** PDPH occurred in only one of the seven patients (14%). **Discussion:** Our findings suggest that following inadvertent dural puncture with an 18-gauge epidural needle in parturients, sequential performance of the above five maneuvers decreased the incidence of PDPH from 76–85% (1) to 14%. It is difficult to know the relative importance of the five maneuvers performed in our study in decreasing the incidence of PDPH. We postulate that the immediate insertion of the epidural catheter into the subarachnoid space (“short term plugging”) with careful attention to minimize CSF loss, and more importantly, the prolonged presence of the catheter in the subarachnoid space (“long term plugging”), seem the most likely mechanisms of prevention of continuous leakage of CSF and subsequent development of PDPH. **Conclusion:** We conclude that the combination of the above five maneuvers appears to be a promising technique in preventing PDPH. *Reg Anesth Pain Med 2001; 26: 301–305.*

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DOES THE TIME OF THE DAY AFFECT OBSTETRIC ANESTHESIA WORKLOAD? *Vogel, T.M. Ramanathan, S. Anesthesia, Magee-Womens Hospital, Pittsburgh, PA*



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COSYNTROPIN FOR THE TREATMENT OF POSTDURAL PUNCTURE HEADACHE *Helsley, S. Muir, H.; Breen, T.; DeBalli, P.; Dwane, P.; Drysdale, S.; Habib, A.; Millar, S.; Schultz, J.; Olufolabi, A. Anesthesiology, Duke University Medical Center, Durham, NC* This study investigates the effectiveness of cosyntropin in the treatment of postdural puncture headaches (PDPH). A retrospective analysis of our QI database for patients who received cosyntropin as a potential treatment for PDPH revealed six patients. Their charts were pulled for review and are presented here as a case series. All patients had dural taps with 18 or 17 gauge tuohy needles. Cosyntropin was given intravenously at a dose of approximately 7 ug/kg as this dose has been reported to be effective by others (Carter and Pasupuleti, 2000). This was given in normal saline over 4 – 8 hours. During this time the patient was instructed to maintain the supine position. Our results are shown in the table below. The present results are in agreement with existing anecdotal reports, which suggest that adrenocorticotrophic hormone (ACTH) and its analogue cosyntropin may be of benefit to patients suffering from PDPH. Most of our patients were spared the invasive intervention of an epidural blood patch (EBP) and experienced satisfactory resolution of their symptoms. Further studies are required to confirm these findings. It is possible that prophylactic use of ACTH and its analogues for PDPH in combination with other conservative intervention may significantly reduce the use of EBP and its associated risks. At present, cosyntropin is not labeled for use in the treatment of PDPH. *Carter BL, Pasupuleti R. Use of intravenous cosyntropin in the treatment of postdural puncture headache. Anesthesiology. 92(1): 272-274, 2000.*

| Pt | Treatment prior to cosyntropin | Dose of cosyntropin | Day post dural puncture | Symptom pattern | Additional treatment |
|----|--------------------------------|---------------------|-------------------------|---|-------------------------------|
| 1 | None | 6.9 ug/kg | 3 | Significant but transient improvement | EBP day 5 post dural puncture |
| 2 | None | 7.7 ug/kg | 1 | Significant, complete resolution by day 3 | None |
| 3 | EBP day 9 | 6.7 ug/kg | 10 | Moderate improvement followed by complete resolution over next 3 days | None |
| 4 | None | 7.0 ug/kg | 1 | No improvement | EBP after cosyntropin |
| 5 | None | 5.6 ug/kg | 2 | Moderate improvement; symptoms resolved over next 3 days | None |
| 6 | None | 6.7 ug/kg | 1 | Complete Resolution | None |

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AMBULATORY GYNECOLOGICAL PROCEDURES OF CERVIX AND UTERUS CAN BE DONE SAFELY WITH MINIDOSE LIDOCAINE AND FENTANYL *Steadman, J.L. Siddiqui, M.N.; Ranasinghe, J.S.; Toyama, T.; Melgen, J.; Lai, M. Anesthesiology, University of Miami, Miami, FL* We traditionally use spinal anesthesia for minor gynecologic procedures at our institution. Of short duration and principally T10-L1 pain origin, we adapted the use of labor analgesia to improve patient satisfaction and time to discharge. Quality improvement data sheets are kept for all procedures in our labor suite. The spinals for missed abortion, molar pregnancy, retained placenta, cone biopsy, dysfunctional uterine bleeding, and cerclage consist of lidocaine 5% indextrose 0.2cc (10mg) and fentanyl 25mcgs using a 27g Whitacre needle. Vital signs are recorded every 2 min for ten min and every five min thereafter. Sensory block to cold and pain are recorded at 2, 5, and 10 min. Motor block using modified Bromage scale is evaluated at 2,5, and 10 min and surgery end. Pain is assessed throughout the procedure and in the PACU using VAS scores. Other medications given in the OR or Pacu are also recorded. Anesthesia time is from spinal induction to complete recovery of spinal effects. Of 29 patients, the average sensory level was T8±4 to cold, and T10±2 to pain. Average motor block at 10 min and PACU was 1±1. 26 of 29 patients had VAS scores during surgery and in PACU of 1±1. One had 5 and two had 6. One patient with VAS 6 was converted to general anesthesia for laparotomy. The other two patient with VAS scores of 5 and 6 responded well to small aliquots of fentanyl IV. 3 patients had pruritus, two requiring treatment in the PACU. 2 patients had mild nausea; neither required treatment. Average anesthesia time is 120 min±30 min. Patient satisfaction was excellent in 28 patients and fair in one. No patients had hypotension (BP ≤20% of baseline). No patients had difficulty voiding. Minidose lidocaine and fentanyl spinal provides safe effective anesthesia for minor gynecological procedures of the cervix and uterus with virtually no motor block.