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O01. Fetal effects of combined spinal-epidural (CSE) vs. epidural labour analgesia: a prospective, randomised study

N. Patel, R. Fernando, S. Robson,* M. Columb, G. Lyons
*Department of Anaesthesia, Royal Free Hospital, London and *Fetal Medicine, Royal Victoria Infirmary, Newcastle, UK*

Introduction: Fetal heart rate (FHR) abnormalities have been associated with intrathecal analgesia more frequently than epidural analgesia for labour.[1] Our aim was to determine if there was a difference in cardiotocograph (CTG) patterns, Apgar scores and umbilical cord acid-base status following initiation of labour analgesia via the intrathecal or epidural route.

Method: After ethics approval, 115 healthy women at 2–6 cm cervical dilatation requesting regional analgesia were recruited to this prospective, double-blind study and randomised into 2 groups: *epidural* group received 0.1% bupivacaine 20 mL + fentanyl 2 μg/mL; *CSE* group received intrathecal bupivacaine 2.5 mg + fentanyl 5 μg. The CTG was recorded for 30 min before the injection and for 60 min after. Baseline FHR, variability, number of accelerations per hour and number of decelerations were recorded. Traces were categorised as *pathological*, *suspicious* or *normal* according to NICE guidelines.[2] Mode of delivery, Apgar score, umbilical artery (UA) pH and base excess (BE) were recorded. Data were analysed by intention-to-treat and included repeated measures analysis of variance, χ^2 and McNemar tests.

Results: Patient data, obstetric characteristics, mode of delivery, Apgar scores and umbilical cord gases were similar between groups. A total of 113 CTGs were analysed. There were no differences in CTG variables between groups. However within groups, there was a significant increase in the total number of pathological and suspicious CTGs ($P < 0.05$) and a reduction in acceleration rate ($P < 0.01$) after injection.

Outcome measure	Epidural (n = 53)		CSE (n = 62)	
	Before	After	Before	After
Baseline FHR (bpm)	134 (8)	135 (10)	135 (9)	136 (9)
Variability (bpm)	10 (3.5)	9.7 (3.7)	9.6 (2.6)	9.9 (3.1)
*Accelerations (n/h)	11 {0.8}	8.4 {0.8}	12 {0.8}	9.9 {0.8}
Decelerations (n)	4	16	9	14
Pathological CTG (n)	0	4	1	3
*Suspicious CTG (n)	0	7	1	5
Apgar 1 and 5 min	9[9,9]; 10[10,10]		9[9,9]; 10[10,10]	
UA pH	7.25 {0.01}		7.23 {0.01}	
UA BE (mmol/L)	−8.22 {0.76}		−7.87 {0.73}	

Data are number, mean (*SD*)/{SEM}, or median [IQR]. *$P < 0.05$.

Conclusion: No significant difference was found in CTG variables, Apgar scores or umbilical cord acid-base status between women who received initial intrathecal or epidural labour analgesia.

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O02. Suprasternal Doppler estimation of cardiac output: standard versus sequential combined spinal epidural anaesthesia for caesarean section

J. K. Bray, R. Fernando, N. Patel, M. O. Columb
Department of Anaesthesia, Royal Free Hospital, London, UK

Introduction: Sequential combined spinal epidural (Seq CSE) anaesthesia using a lower intrathecal dose may provide better cardiovascular stability compared to a standard dose (Std CSE),[1] especially for high-risk women requiring caesarean section. The aim of our study was to compare cardiac output using suprasternal Doppler in women undergoing caesarean section under either Std CSE or Seq CSE anaesthesia.

Method: Following ethics approval, 40 healthy women at term scheduled for elective caesarean section under regional anaesthesia were recruited and randomised to two groups. Baseline recordings of heart rate (HR), blood pressure (BP), linear and volumetric Doppler indices were made in the left lateral tilt position before and after intravenous fluid preloading. All CSE procedures were performed in the sitting position. All women received intrathecal fentanyl 15 μg with either hyperbaric bupivacaine 10 mg (Std CSE) or bupivacaine 5 mg (Seq CSE). An additional 10 mL of epidural bupivacaine 0.5% w/v was given at 15 min to the Seq CSE group if predefined sensory targets were not met. The Std CSE group received epidural supplementation at 20 min for the same criteria. BP, HR, cardiac output (CO), minute distance (MD), stroke distance (SDist), stroke volume (SV), peak velocity (PV) and corrected flow time (FTc) were measured at 5-min intervals after intrathecal injection and before surgery. Ephedrine 6 mg was given for 20% reductions in BP. Statistical analyses included repeated measures analysis of variance (RMANOVA) and covariance (ANCOVA) of extreme measures.

Results: Patient data, ephedrine use, HR, BP and CO were similar in groups. Fluid preload increased all Doppler indices (RMANOVA $P < 0.005$). SDist and SV were lower following Seq CSE (ANCOVA $P < 0.05$), with serial measures showing greater within-subject variability (variance ratio test $P < 0.05$).

Group	MD (cm)	CO (L/min)	SDist* (cm)	SV* (ml)	PV (cm/s)	FTc (ms)
Std CSE (n = 20)	1404.18 (217.44)	5.26 (1.04)	17.51 (2.73)	63.94 (10.76)	96.33 (7.61)	361.69 (41.11)
Seq CSE (n = 20)	1408.30 (217.41)	4.86 (1.37)	16.41 (4.54)	55.39 (16.78)	92.89 (16.20)	356.85 (41.11)

Data are mean (*SD*) for lowest recorded measure; *$P < 0.05$.

Conclusion: SDist and SV changes following sequential CSE for caesarean section suggest no overall improvement in cardiovascular stability compared with standard CSE.

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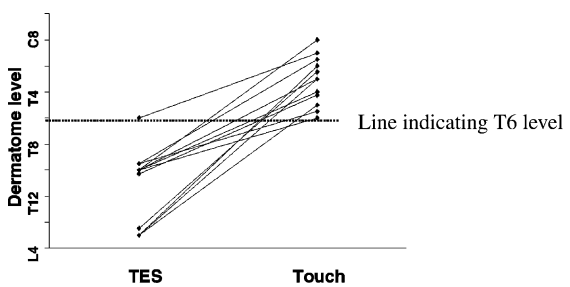
O03. A comparison of transcutaneous electrical stimulation (TES) with touch sensation to assess spinal block for caesarean section

S. A. H. Zaidi, I. F. Russell
Department of Anaesthesia, Castle Hill Hospital, Cottingham, Hull, UK

Introduction: The current recommended level of block for caesarean section under spinal anaesthesia is touch sensation blocked to T5. Some do not accept touch is a suitable modality since it cannot predict appreciation of TES stimulation.[1] However, TES as a surrogate stimulus for surgery under spinal anaesthesia has only been assumed – it has never been tested. We set out to test this assumption.

Method: After ethics approval, the levels of block to pinprick and touch (Neurotip) and TES of 12 women having spinal anaesthesia (0.5% heavy bupivacaine 2.5–3 mL plus diamorphine 100 μg/mL) for elective caesarean section were recorded at 2, 5, 10, 15 and 20 min and then every 10 min until the end of surgery. TES was assessed using a peripheral nerve stimulator connected via an electronic multiplexer to 5 pairs of ECG electrodes. These were placed in close pairs at the L3, T10, T6, T2 and C5 dermatomes. At 1-s intervals a 1-s burst of 10 mA at 50 Hz was applied to each electrode pair in turn. All testing was performed moving in a cranial direction from the groin.

Results: As in previous studies, no correlation was found between touch and TES appreciation. However, neither was any relationship between TES levels and pain-free surgery observed. The levels of block to TES paired with their associated levels of block to touch during closure are shown in the figure.



The TES levels at delivery also ranged from L2 to T6 while the block to touch always included T6 and above.

Conclusion: The level of block to TES during pain-free caesarean section ranges from L2 to T2. Appreciation of TES stimuli at 10 mA and 50 Hz cannot be used to predict a pain-free caesarean section.

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O04. A comparison of lateral, sitting and Oxford positions for CSE anaesthesia for elective caesarean section

M. W. M. Rucklidge,*,† M. J. Paech,* J. Lain,* S. Evans*, S. M. Yentis†
*Departments of Anaesthesia, *King Edward Memorial Hospital, Perth, Australia and †Chelsea & Westminster Hospital, London, UK*

Introduction: Studies investigating the influence of maternal position on CSE anaesthesia for caesarean section have produced conflicting results.[1,2] We conducted a randomised study comparing three positions for induction of CSE anaesthesia.

Method: Following ethical approval, 100 healthy women presenting for elective caesarean section were studied. After a 10-mL/kg crystalloid preload, parturients were randomised to the left lateral (group L), Oxford (group O) or sitting (group S) position before spinal anaesthesia with 0.5% heavy bupivacaine 2.5 mL + fentanyl 10 μg using a CSE technique. Parturients in group L were then turned to right lateral, group O turned to right Oxford and group S to supine left wedged positions until ready for surgery. Maternal blood pressure was recorded regularly and ephedrine administered according to strict protocol. Time to achieve surgical anaesthesia (loss of light touch to T5 bilaterally) and highest sensory level were recorded. Statistical analysis included Kruskal Wallis and Fishers Exact tests with α 0.05 and β 0.9.

Results: Data were available from 96 women

	Lateral (n = 29)	Oxford (n = 32)	Sitting (n = 35)	P
Pre-incision ephedrine (mg)	21(12–30) [6–48]	18(7.5–24) [6–48]	12(6–21) [6–42]	0.044
Total ephedrine (mg)	30(18–30) [6–66]	21(18–30) [6–54]	18(11–23) [6–38]	0.055
Time to T5 (min)	9(6–3) [4–30]	15.5(9–22) [4–34]	14(9–18) [6–36]	0.004
Needed top-up to reach T5 (n)	1 (3)	7 (22)	1 (3)	0.012

Values are median (interquartile range [range]) or number (%).

There were no significant differences in blood pressure or neonatal outcome.

Conclusion: Surgical anaesthesia for elective caesarean section is most quickly achieved after CSE anaesthesia in the lateral position; although ephedrine requirements before re-positioning for surgery may be less in the sitting position. The Oxford position does not appear to confer any additional advantages.

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O05. The effect of intrathecal diamorphine on block height in elective caesarean section

S. Saxena, A. Robinson, R. C. Wilson, M. O. Columb, G. Lyons
Department of Obstetric Anaesthesia, St. James's University Hospital, Leeds, UK

Aims: Opiate analgesics are commonly added to intrathecal bupivacaine to improve patient comfort during caesarean delivery (CS). The addition of diamorphine to bupivacaine in spinal anaesthesia may reduce the dose of the latter needed for an effective dermatomal block height.[1] The aim of this study was evaluate the impact of intrathecal diamorphine on block height, by comparing the doses of bupivacaine required to achieve a T5 block, with and without intrathecal diamorphine, using sequential allocation.

Methods: Women scheduled for elective CS, ASA grades I–II, with a single healthy fetus, height range 150–180 cm and weight 50–120 kg, were randomised into two groups. Group A were assigned to spinal anaesthesia with bupivacaine alone. Group B received intrathecal bupivacaine with diamorphine 400 μg using a syringe-blinding technique. The doses of intrathecal bupivacaine were calculated according to the up and down dosing technique. The starting dose of bupivacaine used in both groups was 13 mg. When block height reached T5, the dose of bupivacaine was considered effective, and a decrement of 0.5 mg of bupivacaine was given to the next woman. Failure to reach T5 meant an increase in dose for the next woman, and an epidural bolus to achieve a comfortable block. Doses given were analysed using the Dixon and Massey up and down formula.[2] Using data from a previous study, group size was set at 40.

Results: The two groups were comparable in terms of subject characteristics. The mean (95% CI) doses for the two groups were 10 (9.68–10.52) mg for group A and 9.5 (9.02–9.97) mg for group B (NS).

Conclusions: The addition of diamorphine to intrathecal bupivacaine does not affect the height of the block achieved by this local anaesthetic agent in elective CS with spinal anaesthesia.

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O06. A comparison of fentanyl and diamorphine as adjuncts in spinal anaesthesia for caesarean section

S. Lane, U. Misra, Z. Arfeen, P. Evans, Q. Smith
Department of Anaesthesia, Sunderland Royal Hospital, UK

Introduction: Intrathecal diamorphine is commonly used to provide analgesia after caesarean section. Studies have shown that it is equally[1] if not more effective[2] than morphine in equivalent doses. However, morphine does not provide any intra-operative coverage, and is often used in conjunction with fentanyl. Diamorphine could possibly be used to provide both intra-operative and postoperative analgesia whilst avoiding excess pruritus and hypotension.

Method: In a randomised, double-blinded trial, 99 patients presenting for elective caesarean section were studied. Each patient was given either fentanyl 15 μg (F), diamorphine 0.25 mg (D), or both (FD) in addition to heavy 0.5% bupivacaine. Discomfort, nausea, pruritus, ephedrine use and time taken to establish block were recorded intra-operatively, and discomfort, morphine PCA use, nausea and pruritus postoperatively.

Results: Analysis of variance revealed the following. There were no differences in intra-operative discomfort, time to achieve block or intra-operative ephedrine use between the groups. There was no difference in postoperative PCA use between te groups D and FD, but PCA use was significantly greater in group F. Postoperative pruritus was significantly more prevalent in group FD than in the other groups.

Conclusion: The results show that diamorphine provides the same intra-operative benefit as fentanyl, with no increase in time to achieve adequate block. We have also demonstrated that diamorphine provides the same postoperative analgesia as fentanyl and diamorphine combined, but with less pruritus.

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O07. Prophylactic oral ephedrine: effect on hypotension after subarachnoid block for caesarean section – a double-blind, controlled, randomised trial

E. Bright, H. Brownlow, R. Gande, H. Underhill, H. Wise, P. Swayne
Salisbury District Hospital, Wiltshire, UK

Introduction: Maternal hypotension remains the most frequent complication of spinal anaesthesia for caesarean section. This can have adverse consequences for both mother and baby. Ephedrine is the vasoconstrictor most commonly used in obstetric practice in the UK. The oral route of administration offers potential advantages; peak plasma levels are lower so reducing the possibility of maternal tachycardia and hypertension. Orally administered ephedrine (30 mg) has been successfully used to reduce the incidence of hypotension following spinal anaesthesia in a trial involving 200 women undergoing lower abdominal surgery.[1]

Methods: After ethics committee approval, 40 women were randomised to two groups by sealed sequential envelopes. Each participant received an identical capsule that was either placebo or contained ephedrine 30 mg. This was taken by mouth one hour before institution of the spinal anaesthetic. All participants then received Hartmann's solution 15 mL/kg before subarachnoid injection of 0.5% heavy bupivicaine 2.5 mL and diamorphine 0.25 mg, using a 25-gauge pencilpoint needle with the patient in the sitting position on the operation table. On completion of the injection, the patient was positioned supine and left-tilted by 15°. Patients were given bolus injections of rescue ephedrine 6 mg on each occasion their systolic blood pressure was less than 80% of that recorded before the spinal injection. The patient was asked to report feelings of nausea using a visual analogue scale. Apgar scores were recorded 1 and 5 min after birth as were umbilical venous pH values. Statistical analysis was performed using the Mann-Whitney test.

Results: There was no significant difference between groups in amount of intravenous rescue ephedrine received, total amount of fluid administered intraoperatively or visual analogue scores for nausea. Apgar scores at 1 and 5 min did not differ between the groups but there was a difference in the umbilical vein pH values. Neonates of mothers in the ephedrine group had a median umbilical vein pH of 7.33, which was lower than that of the neonates of mothers in the placebo group, their median pH being 7.37 ($P = 0.0209$).

Conclusion: Prophylactic oral ephedrine administered to mothers before subarachnoid block for caesarean section is not recommended.

Reference

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O08. A randomised double-blind trial of Kapanol (sustained release morphine) versus placebo for analgesia following elective caesarean section

T. Skinner, T. Parris-Piper, F. Storr, J. Hill
Department of Anaesthesia, National Women's Hospital, Auckland, NZ

Introduction: There is currently considerable diversity in the management of pain following caesarean section. Opiate drugs such as morphine are often given via intravenous, intramuscular, spinal or epidural routes and can be combined with regular paracetamol and non-steroidal anti-inflammatory drugs. Kapanol capsules are a modified release formulation providing more consistent plasma levels of morphine than oral morphine tablets, allowing them to be given once or twice daily.[1] They have been used extensively in Australasia for control of postoperative and chronic pain. We aimed to evaluate the efficacy of Kapanol when used in the first 24 h following elective caesarean section.

Method: Ethics committee approval was obtained for the study, which recruited 60 patients divided into two groups. ASA I and II patients undergoing elective caesarean section were given standard non-opioid combined spinal-epidural (CSE) anaesthesia. Immediately after the operation, group K received Kapanol 40 mg and group P an identical placebo, as selected by a block randomisation in this double-blind technique. Twelve hours later group K received a further 20-mg dose of Kapanol and group P another placebo. Both groups received pethidine via a patient controlled epidural analgesia (PCEA) pump along with regular paracetamol and diclofenac. Pain was recorded at 4, 8 and 24 h, using visual analogue scores. Pethidine consumption was recorded hourly with totals at 24 h.

Results: The groups were demographically similar with 4 withdrawals in each group following randomisation. Contrary to expectation, there was not a statistically significant reduction in PCEA pethidine consumption in the first 24 h after operation associated with the use of Kapanol. There were no significant differences in pain scores between the two groups. There was, however, a statistically significant increase in sedation in the Kapanol group across 24 h (sedation score >1/4: group P; $n = 13$, group K; $n = 2$, $P = 0.002$) although no patient felt excessively sedated.

Conclusion: Kapanol confers no analgesic benefit when given to patients using PCEA pethidine in the first 24 h after caesarean section. Further study is required to evaluate the benefit of Kapanol in the transition from epidural to oral analgesia, more than 24 h after surgery.

Reference

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O09. Depot Synacthen for the treatment of post-dural puncture headache

M. Rucklidge,*,† S. Yentis,* M. Paech,† J. Lain,† S. Yeo,* R. Fernando,‡ P. N. Robinson,§ D. N. Lucas,* M. Albin¶

*Departments of Anaesthesia, *Chelsea & Westminster Hospital, London, UK, †King Edward Memorial Hospital, Perth, Australia, ‡Royal Free Hospital, London, UK, §Northwick Park Hospital, Harrow, UK and ¶Lewisham Hospital, London, UK*

Introduction: Adrenocorticotrophic hormone (ACTH) and its synthetic analogue Synacthen have been reported to be effective treatments for post dural puncture headache (PDPH), although evidence of efficacy remains anecdotal.[1,2] We conducted a double-blind randomised study investigating the effectiveness of Synacthen for the treatment of PDPH.

Methods: After ethical approval and written informed consent, 18 women with PDPH within 72 h of documented dural puncture were randomised to receive depot Synacthen 1 mg or saline 1 mL i.m. Severity of PDPH was measured using a 10-cm visual analogue scale (VAS) after sitting upright for 1 min, before and at intervals for 48 h after injection. Data were analysed using the Mann-Whitney rank-sum or Fisher's exact tests, with $P < 0.05$ taken as statistically significant.

Results: The groups were similar for age, weight, height, parity, gestation and onset of PDPH. There was no difference in the severity of PDPH (Figure) or requirement for epidural blood patch (6/9 (67%) following Synacthen and 7/9 (78%) after saline).

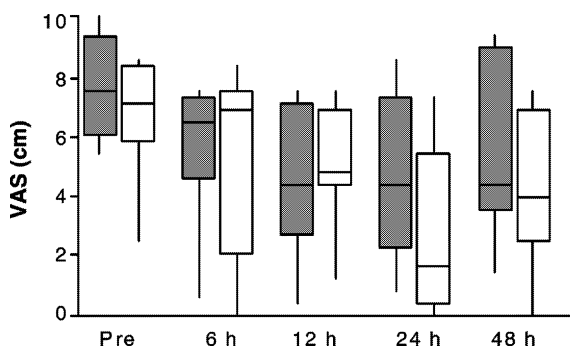

Figure: Severity of PDPH after saline (shaded) and Synacthen (clear). $P > 0.05$. Data are median, interquartile range and range.

Conclusion: This study does not support the use of Synacthen 1 mg i.m. for parturients with PDPH. The number of subjects involved is small, however, and we are unable to comment whether a different dose or method of administration may be beneficial.

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O10. Combined spinal-epidural (CSE) vs. epidural labour analgesia: does initial intrathecal analgesia reduce subsequent epidural bupivacaine requirements?

N. Patel, R. Fernando, M. O. Columb, J. K. Bray, V. Sodhi, G. R. Lyons

Department of Anaesthesia, Royal Free Hospital, London, UK

Introduction: It has been suggested that intrathecal analgesia via the CSE technique during the first stage of labour may reduce subsequent epidural bupivacaine requirements. Our aim was to estimate the minimum local analgesic concentration (MLAC) or median effective concentration (EC50) of epidural bupivacaine[1] following an initial intrathecal or epidural injection.

Method: After ethics approval, 115 women requesting epidural analgesia at 2–6 cm cervical dilatation were recruited into this prospective, double-blind study and randomised to 2 groups: the *epidural* group received 0.1% bupivacaine 20 mL + fentanyl 2 μg/mL as first injection (1st inj); *CSE* group – received intrathecal bupivacaine 2.5 mg + fentanyl 5 μg. Analgesia was assessed using a 100-mm visual analogue pain score (VAPS). Only women with effective analgesia (VAPS $\leqslant$10 mm at 30 min) were included. When further analgesia was requested, bupivacaine 20 mL was given (2nd inj). The concentration was determined by the response of the previous subject in that group. An effective dose (VAPS $\leqslant$10 mm 30 min after 2nd inj) directed a 0.01% decrement whereas an ineffective dose directed a 0.01% increment for the next subject. Duration of analgesia, VAPS and sensory block height at 0, 15 and 30 min were assessed for both injections. The MLAC of epidural bupivacaine for the 2nd inj was estimated using the Dixon and Massey formula. Repeated measures analysis of variance was used, with $P < 0.05$ significant.

Results: Eighty women completed the study. Patient data, obstetric characteristics and VAPS at each time point were similar in the two groups. MLAC estimates showed that bupivacaine requirements were increased by a factor of 1.38 in the CSE group (95% CI 0.95–2.06, $P = 0.078$). Compared to the epidural group, block height was significantly lower after the 1st inj ($P = 0.02$) and before the 2nd inj ($P < 0.001$) in the CSE group.

Group	*MLAC % (95% CI)	†Duration 1st inj, min mean (*SD*)	Max block height to pinprick: median (IQR)	
			‡Post 1st inj	†Pre 2nd inj
Epidural ($n = 40$)	0.034 (0.02, 0.05)	111 (38)	T6 (T8, T4)	T9 (T11, T7)
CSE ($n = 40$)	0.047 (0.04, 0.05)	86 (21)	T8 (T10, T6)	L1 (L4, T10)

*Unpaired *t* test $P = 0.078$; †$P < 0.001$; ‡$P = 0.02$.

Conclusion: Initial intrathecal analgesia did not reduce subsequent epidural bupivacaine requirements. The 38% increase in MLAC with CSE may be due to the greater degree of analgesic block height regression.

Reference

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O11. Sevoflurane as an inhalational analgesic in labour: a pilot study

S. Yeo, S. M. Yentis, C. Brennan, A. Holdcroft, A. Stewart
Magill Department of Anaesthesia, Chelsea & Westminster Hospital, London, UK

Introduction: Inhalational anaesthetic agents such as isoflurane[1] and enflurane[2] have been used for pain relief in labour but maternal intolerance and side effects have limited their effectiveness for routine use. Sevoflurane is rapidly acting and pleasant to breathe, but has not been studied for use in labour. The aim of this study was to determine the optimum sevoflurane concentration for use as an inhalational analgesic in labour.

Methods: After local research ethics committee approval and informed written consent, 22 parturients were recruited antenatally. Once in established labour and requesting inhalational analgesia, they self-administered sevoflurane via a mouthpiece using a Penlon OMV draw-over vaporiser with continuous monitoring of inspired and expired gases throughout 10 consecutive contractions. The inspired concentration of sevoflurane (F_ISevo), initially at 0%, was increased by 0.2% for each contraction to a maximum of 1.4%, and decreased if excessive sedation occurred (inability to complete the measurement scores). Maternal pulse, BP and SpO_2 and fetal CTG were monitored continuously. Between contractions, mothers were asked to score their previous contraction using a visual analogue scale (VAS) of 0-100 mm for pain relief and sedation.

Results: All but one woman completed the study. Both pain relief and sedation scores increased between F_ISevo 0.4% and 1.2% (Table). There was no increase in pain relief score beyond F_ISevo 0.8%. No adverse events were observed apart from excessive sedation in four women (19%) at 1.2%. None experienced excessive sedation at 1.0% or 0.8%.

Table: Median (IQR) [range] VAS scores (mm)

F_ISevo	0.4%	1.2%
Pain relief	44 (43–56) [4-93]	74 (72–78) [50–80]
Sedation	55 (43–56) [0–98]	71 (71–73) [33–97]

Conclusions: We conclude that the optimum F_ISevo for pain relief in labour is 0.8%. This will provide the best balance between pain relief and sedation, thus allowing a safety margin from excessive sedation and any cumulative effects which may occur during prolonged use.

Acknowledgements: Midwives M. Good, M. Hunter and F. Walkinshaw for their enthusiasm in recruiting women. S. Yeo was supported by an OAA Research Fellowship.

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O12. Effect of P6 acupressure on nausea and vomiting during labour

S. A. H. Zaidi, Z. Rafique, I. F. Russell
Department of Anaesthesia, Castle Hill Hospital, Cottingham, Hull, UK

Introduction: Nausea and vomiting represent a significant problem for the majority of women during labour and routine anti-emetics are commonly prescribed. Acupressure at P6 (Neiguan point) is a non-invasive, non-pharmacological method to prevent this common complaint. It has been shown to reduce nausea and vomiting after opioid administration, regional and general anaesthesia and during pregnancy.[1] This technique is appealing due to its apparent simplicity, ease of application, safety and cost-effectiveness. We designed this study to find out if it is effective during labour.

Method: After ethics approval for this randomised double blind study, 80 patients were recruited into treatment and control groups. All patients above 18 years presenting for normal delivery were included and women with prior knowledge or experience of using acupressure or acupuncture were excluded. Patients were not given routine anti-emetics. The wrist bands were positioned correctly in the treatment group and incorrectly in the control group. Nausea and vomiting were assessed two hourly using 100-mm visual analogue (VAS) and verbal rating scales (VRS). The number of episodes of active vomiting and rescue drugs used to treat it were also recorded. The wrist bands were removed two hours after the delivery.

Results: Although there was a difference at VAS score at 2, 4 and 8 h after the application of acupressure bands between the groups, this difference was not found to be statistically significant. Fourteen patients had a history of motion sickness out of which 10 were in the treatment group. 20% of patients required rescue anti-emetic in the control group and 5% in the treatment group ($P = 0.05$).

		Control group $n = 40$	Treatment group $n = 40$	P
Mean age (years)		28.5	29.1	0.6
Mean weight (kg)		78.48	76.23	0.4
Mean VAS (mm)	0 h	3.7	6.03	0.46
(nausea and vomiting)	2 h	13.48	5.66	0.09
	4 h	10.57	6.91	0.4
	8 h	27.00	10.00	0.1
	12 h	12.85	8.00	0.5
H/O motion sickness		4 (10%)	10 (25%)	
Required rescue drug		8 (20%)	2 (5%)	0.05

Conclusion: The incidence of nausea and vomiting was less in the treatment group than the control group as shown in the previous studies but the difference was not statistically significant.

Reference

1. O'Brien B, Relyea M J. Efficacy of P6 acupressure in the treatment of nausea and vomiting during pregnancy. Am J Obstet Gynecol 1996; 174: 708–715.

O13. Labour and anaesthetic outcome in obese parturients: a prospective audit

R. Sivasankar, A. Seghal, S. Harries, R. E. Collis
Department of Anaesthetics, University Hospital of Wales, Cardiff, UK

Introduction: Obesity (BMI >30 $kg \cdot m^{-2}$) is a significant in western societies and it is increasingly recognised that pregnancy in the obese is associated with high obstetric intervention rates and a poorer outcome[1] compared to the non-obese.

Methods: The BMIs of all women coming to the antenatal clinic were recorded, and 120 whose booking BMI values were over 30 $kg \cdot m^{-2}$ were followed until delivery with recordings of labour outcome and anaesthetic interventions.

Results: From April to September 2002, 1130 mothers booked at the University of Wales, Cardiff, for their antenatal care. Of these, 211 had a booking BMI > 30 $kg \cdot m^{-2}$ (18.7%).

BMI ($kg \cdot m^{-2}$)	Induction rate	Caesarean section rate
Overall population	23.6%	26.6%
30–40	36.7%	36.3%
>40	33.3%	44.4%

The caesarean section rate in primipara with a BMI of 30–40 $kg \cdot m^{-2}$ was 46.9% which increased to 50% in women with a BMI > 40 and in multipara with a BMI 30–40 the caesarean section rate was 36.6% increasing to 42.4% in women with BMI > 40. Eighty-four obese women received anaesthesia (70%), compared with 34% in the whole population. The anaesthetics received by the women were: epidural 46, CSE 18, spinal 19 and general 1. There were several difficulties siting regional blocks but there were no major complications and the majority worked well for labour and delivery. There were three stillbirths and three admissions to the special baby care unit for preterm delivery in the obese group.

Conclusion: Obesity is a major problem in our population. Our audit confirms the work of others that pregnancy and delivery in the obese parturient require a higher than normal rate of obstetric intervention. Despite some technical problems, our audit additionally demonstrates that with early, timely anaesthetic involvement it was possible to perform almost all operative deliveries using a regional technique, thus reducing the risks of general anaesthesia in this high-risk population.

Reference

1. Bongain A, Isnard V, Gillet J-V. Obesity in obstetrics and gynaecology. Eur J Obstet Gynecol Reprod Biol 1998; 77: 217–228.

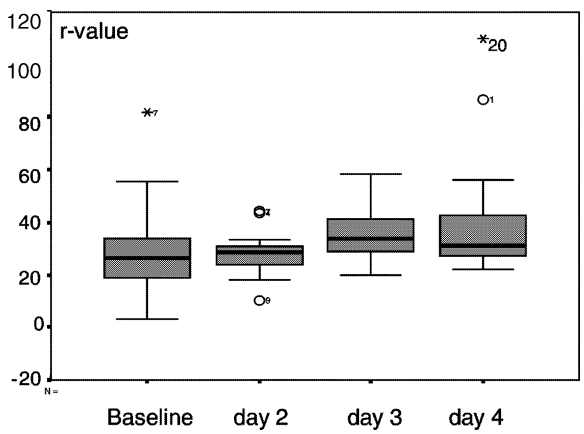
O14. Thromboelastography (TEG®) changes in the post-partum period

H. Grogan, H. Gorton, M. Vucevic
Leeds General Infirmary, Leeds, UK

Introduction: Pregnancy is associated with a hypercoaguable state and the TEG® reflects this.[1] These changes begin in the first trimester and return to normal in the post-partum period over a variable period of time.[2] Very little data has been collected on the trends and timing of these changes either using conventional laboratory tests or TEG® analysis. We report the post-partum TEG® changes that occurred in 20 women undergoing elective caesarean section from the day of their operation until 72 h post-partum.

Methods: ASA 1 women presenting at term for elective caesarean section were recruited. Serial TEG® analyses were performed. Samples were taken pre-operatively (baseline) and on a daily basis until the patient went home. 0.36 mL of blood was taken via a 22G cannula in the ante-cubital fossa and fresh whole blood was analysed by TEG® within 4 min of venepuncture.
r and k (mm), α angle (degree), maximum amplitude (MA in mm) and patient characteristics were recorded.

Results: The box plot below shows the trend of the 2.5, 25, 50, 75, and 97.5 centiles in r value over 72 h after caesarean section. There was significant difference when comparing the baseline value to days three and four (Kruskall–Wallis P <0.007).



Conclusion: This series illustrates that although the women remain hypercoaguable during this time period there is some suggestion of a change towards non-pregnancy values on days three and four.

References

1. Hawthorne L. Haematological disorders in pregnancy. In: Russell I F, Lyons G (eds). Clinical Problems in Obstetric Anaesthesia. London: Chapman and Hall Medical, 1997: 67–85.
2. Sharma S K, Philip J, Wiley J. Thromboelastographic changes in healthy parturients and post-partum women. Anesth Analg 1997; 85: 94–98.

O15. A national survey of external cephalic version (ECV) for breech presentation in the 3rd trimester

A. Swami, M. C. Mushambi, M. Habiba, C. Archdeacon
Departments of Anaesthesia, Obstetrics and Gynaecology, Leicester Royal Infirmary, UK

Introduction: The incidence of breech presentation at term is 3–4%. A recent study has shown that vaginal breech delivery is associated with increased perinatal mortality (1.3%) and neonatal morbidity (3.8%) compared to 0.3% and 1.4% respectively in planned caesarean section[1] (CS). Following these results, it is now considered safer to deliver all term breech babies by CS. Where appropriate, ECV should be offered to women with breech presentation in order to reduce the CS rate. Immediate success rate for ECV on average is 58%[2] with final cephalic presentation at birth of 48%.[3] We carried out a survey of the use of ECV for breech presentation in obstetric units throughout the UK.

Methods: An Obstetric Anaesthetists' Association (OAA) approved questionnaire was sent to all lead obstetric anaesthetic clinicians in the UK in April–July 2001. Questions asked included which units were doing ECVs, how the service was organised, success and complications rates and what analgesia patients received.

Results: Of the 261 forms sent out, 183 (70%) were returned. One hundred and fifty seven units (88%) carried out ECVs. Of these, 99 units (63%) had an organised ECV service. Ninety-nine units (63%) had obstetrics guidelines for ECV compared to only 12 units (8%) that had anaesthetic guidelines. In 102 units (65%), ECVs were carried out on the delivery suite or in theatre. Only 65 units (41%) kept patients fasted and 40 (25%) secured i.v. access before ECV. Antacid prophylaxis was administered in 30 units (19%). Forty units (25%) always informed the anaesthetist about ECVs. Six units (4%) used regional analgesia and 21 (13%) inhalation agents. Forty units (25%) always used tocolysis. Overall success rate for ECV was low with only 17 units (11%) having more than 50% success but 80 (51%) did not know the success rate. In 72 units (46%) less than 5% of women needed emergency CS within 24 h.

Conclusion: The audit showed that a large number of units offer ECV but the standards of the service vary. Anaesthetic input into ECVs is minimal.

References

1. Hannah M E, Hannah W J, Hewson S A et al. Planned caesarean section versus planned vaginal birth for breech presentation at term: a randomised multicentre trial. Term Breech Trial Collaborative Group. Lancet 2000; 356: 1375–1383.
2. American College of Obstetricians & Gynaecologists. Clinical management guidelines for obstetrician – gynaecologists. External Cephalic Version. ACOG Practice Bulletin. Feb 2000; 13: 1–7.
3. Mushambi M C. External cephalic version: new interest and old concerns (Editorial). International Journal of Obstetric Anesthesia 2001; 10: 263–266.

O16. Staffing for obstetric anaesthesia: current UK practice

J. Thompson, V. Hariharan, F. Umerah, C. Grange
Nuffield Department of Anaesthesia, Oxford, UK

Introduction: Increased obstetric workload has necessitated reevaluation of obstetric services in the UK. Guidelines[1] produced by the Association of Anaesthetists and the Obstetric Anaesthetists Association (OAA) recommend a duty anaesthetist be available 24 h per day and that at least one consultant session be allocated for every 500 deliveries. The aim of our study was to investigate current obstetric anaesthetic cover in UK hospitals.

Method and Results: Following OAA approval 246 questionnaires were sent to the lead obstetric anaesthetist at each hospital in the UK. Initial response rate was 70% (22% tertiary referral, 78% secondary referral hospital). All units had an anaesthetist available 24 h per day. Units ranged from 150 deliveries/year without dedicated consultant sessions (i.e., without other anaesthetic commitments) to those units with 6300 deliveries per year with several tiers of trainees and 20 consultant daytime sessions per week. In 79% of units dedicated obstetric anaesthetic trainees covered during the day, in addition to support from various numbers of allocated consultant sessions per week (Table).

Consultant sessions/week	% Units	Deliveries/year (range)
0	5	150–1300
0.5–3.5	12	250–2500
4–6.5	23	900–4000
7–9.5	19	1750–5000
10–13	34	2000–5800
15–20	7	3500–6300

A dedicated trainee provided cover at night in 62% of units. Although none of the units had resident obstetric anaesthetic consultants on call at night, a specific obstetric anaesthetic group provided consultant cover in 10.4% of units (on call rotas ranged from 1 in 5 to 1 in 10). 10.9% of units had future plans in progress for developing a specific consultant obstetric on call rota.

Discussion: With increasing numbers of high-risk pregnancies and obstetric intervention, consultant anaesthetic presence remains an essential component in maintaining good standards of care. Although all units had an available anaesthetist 24 h per day only 76% of units complied with the minimum standards of one consultant session per 500 deliveries.

Reference

1. Guidelines for obstetric anaesthetic services AAGBI and OAA working party 1998.

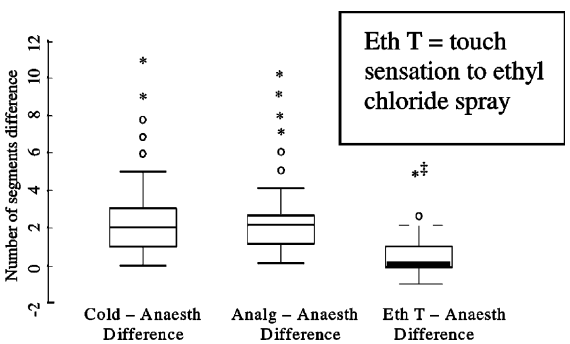
O17. A comparison of pinprick, cold and touch levels during spinal anaesthesia for caesarean section

I. F. Russell
Hull Royal Infirmary, Hull, HU3 2JZ, UK

Introduction: Although touch is believed to be a better predictor of efficacy of neuraxial block many use cold or pinprick as these levels are believed to be closely related to touch (2 and 4 segments difference).[1] The literature abounds, however, with studies in which many women require intra-operative supplements despite "adequate" levels of block to pinprick or cold. Data collected by the author have been analysed to compare the levels of block assessed by cold, pinprick and touch.

Methods: Data were collected from 102 women undergoing caesarean section with spinal anaesthesia (2–3 mL of 0.5% bupivacaine plus diamorphine 100 $\mu g \cdot mL^{-1}$). Levels of block were assessed routinely with cold and touch (ethyl chloride), sharp pinprick (Neurotip) and touch (Neurotip) at 2, 5, 10, 15, 20, 30 min and again at the end of surgery. Ethical approval was obtained for analysis and publication of these data. Two-minute data were not used in the analysis.

Results: The differences between the level of block to touch (anaesthesia) and that to pinprick (analgesia), cold and ethyl chloride spray-touch are shown in the figure [median, quartiles, range, outliers (o) and extremes (*)]. The latter two are defined as lying 1.5–3 and >3 box-lengths from the edge of the box. One point marked ‡ appears to be an original data transcription error.



Four women required analgesic intervention. All four had levels of block to cold and pinprick above T4 with complete motor block of the legs and touch levels assessed as below T6.

Conclusion: The data demonstrate that the level of block to cold or pinprick cannot be used to predicted the level of block to touch. A pinprick or cold level above T4 with complete motor block of the legs could not predict the need for further analgesia. No woman with a block to touch (either modality) which included T6 required intervention.

Reference

1. Brull S J, Greene N M. Time-courses of zones of differential sensory blockade during spinal anesthesia with hyperbaric tetracaine or bupivacaine. Anesth Analg 1989; 69: 342–347.

O18. Accidental subdural injection during obstetric epidural block, it's commoner than you think! Epidurogram evidence

C. B. Collier
Department of Anaesthesia, Royal Hospital for Women, Sydney, Australia

Introduction: The unintentional subdural injection of local anaesthetics intended for the subarachnoid space is a well-known cause of failed spinal blocks. Accidental subdural injection of such solutions during attempted epidural block, although considered rare, is known to produce extensive and occasionally life-threatening blocks.[1] Recent epidurogram evidence suggests that accidental subdural injection may also be a cause of failed or inadequate epidural block.

Method: This study formed part of an on-going investigation, using epidurograms,[2] into the cause of unsatisfactory epidural blocks at caesarean section. Following ethics committee approval, all mothers whose blocks had been inadequate or atypical, and whose catheters were still in place, were invited to undergo epidural contrast injection and radiographic screening, between 24 and 48 h postpartum. The contrast used was Iopamiro 300 in a dose of up to 10 mL, with AP and lateral X-rays being taken.

Results: Forty mothers have been investigated, over a 10-year period, the epidurograms of three, unexpectedly, revealing posterior subdural spread of contrast. These blocks had been inserted by experienced obstetric anaesthetists, reporting a single pass, uncomplicated insertion in each case. The clinical picture was similar in all three, featuring the slow onset of surgical anaesthesia, and requiring additional doses of local anaesthetic (2% lignocaine with adrenaline). Total doses of 35–40 mL were administered over a 40–50 min period, and the surgery was pain-free. Satisfactory postoperative pain relief was provided by midwife-administered intermittent boluses of pethidine 50 mg in 10 mL, although the analgesia was reported to be slow in onset (30–40 min). Back or nerve root pain was reported during top-ups in all three patients and all developed transient numbness in one or more dermatomal areas with most of the top-up doses.

Conclusion: It appears as if local anaesthetic injection into the *posterior* subdural space results in slow and restricted spread of blocks, whereas *anterior* subdural injection is well known as being associated with exaggerated spread of blocks. The true incidence of accidental subdural block may be higher than the usually accepted figure of 0.8%.[1]

References

1. Collier C B. Accidental subdural block: Four more cases and a radiographic review. Anaesth Intensive Care 1992; 20: 215–232.
2. Collier C B. An Atlas of Epidurograms, Sydney: Harwood Academic, 1998.

O19. A randomised trial comparing general with spinal anaesthesia for caesarean section in preeclamptics with a non-reassuring fetal heart trace

R. Dyer, I. Els, J. Farbas, L. Schoeman, G. Torr, M. James
Department of Anaesthesia, University of Cape Town, Cape Town, South Africa

Introduction: There are no randomised studies on neonatal outcome following spinal versus general anaesthesia for caesarean section in preeclamptics with a non-reassuring fetal heart trace. This study examined both markers of neonatal hypoxia and maternal haemodynamics.

Methods: Seventy patients were randomised to general (group G, $n = 35$) or spinal anaesthesia (group S, $n = 35$). After a crystalloid preload, group G received thiopentone, magnesium sulphate and suxamethonium i.v. before intubation, followed by nitrous oxide 50% in oxygen, isoflurane 0.75–1.5% and morphine after delivery. The target end-tidal PCO_2 was 4–4.5 kPa. Group S received 0.5% hyperbaric bupivacaine 1.8 mL plus fentanyl 10 μg at the L3/4 interspace. Heart rate and blood pressure were measured at specific time-points. Hypotension was treated with ephedrine. A maternal arterial and a neonatal umbilical arterial (UA) blood gas sample were taken at delivery. Resuscitation requirements were recorded.

Results: Both groups were haemodynamically stable. Group S patients required more ephedrine (13.7 vs. 2.7 mg). Maternal $PaCO_2$ was lower in group S (3.85 vs. 4.32 kPa). One-minute Apgar scores were lower in group G. Median neonatal UA pH was lower (7.20 vs. 7.23), and mean base deficit greater (7.13 vs. 4.68 mmol/L) in group S. Within- and between-group analysis showed that if maternal diastolic blood pressure on admission was >110 mmHg, neonatal UA base deficit was greater in group S. There was no difference in the number of patients with Apgar scores <7 at 1 or 5 min or UA pH < 7.2, or in the requirements for resuscitation.

Conclusions: In patients with severe preeclampsia, spinal anaesthesia for caesarean section was associated with a greater mean neonatal umbilical arterial base deficit. The clinical significance remains to be established. Maternal haemodynamic stability was similar and acceptable with either anaesthetic technique. The choice of anaesthetic technique should not be based on concerns relating to neonatal acidosis.

O20. Six year audit of high regional blocks in obstetric anaesthesia

M. Dresner, A. Brennan, J. Freeman
Leeds General Infirmary, Leeds, UK

Introduction: The OAA's National Obstetric Anaesthesia Database (NOAD) project surveyed high regional blocks during 2002. Our unit had none to contribute in this time frame, but we wanted to investigate our practice since data collection began, six years ago. This single unit audit may provide a useful benchmark to be compared with NOAD's findings.

Methods: For the purpose of this study a high block was defined as one which necessitated respiratory support with bag and mask, or intubation and ventilation. Data collected between April 1997 and January 2003 were retrieved from audit databases.

Results: The results table shows the number of high blocks against the total number of procedures performed. Spinal after epidural refers to a single shot spinal anaesthetic given to a woman with an epidural in situ.

Technique	High blocks	Incidence
Epidural analgesia	1/6796	0.01%
CSE analgesia	0/2296	0%
Spinal anaesthesia	0/3784	0%
CSE anaesthesia	0/222	0%
Topped up epi/CSE	1/995	0.1%
Spinal after epidural	5/342	1.46%

Discussion: Each case of high block warrants detailed discussion beyond the scope of an abstract. The two cases caused by epidural analgesia and a topped up CSE involved unrecognised intrathecal catheterisation managed in violation of unit protocols. Spinal anaesthesia after epidural analgesia poses the greatest risk of high block. No predictors for this complication, such as previous epidural doses or spinal drug dose, could be identified. This appears to be a sporadic complication that requires explanation at consent and appropriate safety precautions. It is of interest to note that the use of this technique in our unit increased in the light of five cases of litigation for pain during topped up epidural anaesthesia. The superior performance of spinal anaesthesia in this role has been documented in an earlier abstract.[1] Despite the resultant complications, no lasting morbidity has been caused to mothers or babies and no complaint or litigation has ensued.

Reference

1. Cole P, Dresner M, Stockwell J, Freeman J. Anaesthesia for emergency caesarean section in women already receiving epidural analgesia. International Journal of Obstetric Anesthesia 2001; 10: 215.

O21. An integrated pathway of care (IPOC) in obstetric anaesthesia

P. E. Shannon, J. Collins
Department of Anaesthesia and Critical Care, Doncaster Royal Infirmary, Doncaster, UK

Introduction: The integrated pathway of care (IPOC) in obstetric anaesthesia aims to provide a coherent approach to improving the care given to the pregnant woman. It describes a targeted, step-by-step management plan for the referral of women from the community to specialist anaesthetic services and back again, placing the emphasis on information, choice and safety. The impetus for this approach has come from two areas. Firstly, anaesthetists have appreciated the need to provide good, high-quality information on anaesthetic-related issues to all pregnant women, and to identify high-risk women earlier and more consistently.[1] Secondly, there has been the development of midwifery-led care such that the majority of pregnant women may never be assessed by a doctor.[2]

Method: Over a 12-month period, 147 women screened by their community midwife using a simple questionnaire were referred to the Obstetric Anaesthesia Service (OAS). This represented about 5% of all deliveries (approximately 3500 per annum). A consultant from the OAS reviewed the referrals and instigated further investigation as necessary.

Results: We found that 58 of the referrals (40%) required no further action. These were considered relatively trivial, such as mild well-controlled asthma or known allergy. Eighty-nine women (60%) were telephoned, allowing further information to be collected plus discussion, explanation and reassurance as appropriate. Of these, 9 (10%) required a further face-to-face consultation with or without subsequent on-going management. No one needed to be seen urgently (within 24 h). Overall therefore, only 9 women (6%) needed to be physically seen by an anaesthetist.

Conclusion: We consider that we have:

- improved the effectiveness of the OAS by providing direct access for women to a high-quality service;
- eliminated the reliance on medical obstetric referral;
- created a new awareness of the value of the OAS to community midwives;
- improved the chances of identifying anaesthetic high-risk women.

We hope to establish the IPOC in electronic form soon.

References

1. Association of Anaesthetists of Great Britain and Ireland and Obstetric Anaesthetists' Association. Guidelines for Obstetric Anaesthesia Services. London, 1998
2. Cumberledge Report. Changing Childbirth: Report of the Expert Maternity Group. London: HMSO, 1993

O22. Spontaneous vaginal delivery and ambulation after "mobile" epidural analgesia in labour

The Comparative Obstetric Mobile Epidural Trial (C.O.M.E.T.) Study Group, Birmingham University Departments of Public Health & Epidemiology & Anaesthesia, Leicester Royal Infirmary Departments of Anaesthesia & Obstetrics, St Thomas' Hospital, Kings' College London, UK

Introduction: We recently demonstrated that combined spinal epidural (CSE) and low dose infusion (LDI) epidural techniques, for analgesia in labour, are associated with a reduced instrumental vaginal delivery rate, relative to traditional epidurals.[1] It is unclear whether this increase in spontaneous vaginal delivery rate results from factors associated with maternal ambulation in labour per se or the enhanced perineal sensation afforded by "mobile" epidural analgesia, assisting active and passive expulsion of the fetus. We have undertaken a secondary analysis of the association between walking in labour with a mobile epidural in situ and subsequent delivery mode.

Method: From a total of 1054 nulliparous women recruited to the *C.O.M.E.T.* study, 701 women were randomised in labour to receive CSE or LDI, each using a low-dose mixture of 0.1% bupivacaine with fentanyl 2 μg/mL. A modified Bromage score of lower limb power was recorded at 30 min after epidural insertion and hourly thereafter, until delivery. A record was made each hour of whether women had remained in bed, stood out of bed or walked. Those women who stood out of bed or walked, at any time in labour, were labelled "ambulatory," those who remained in bed throughout labour were labelled "sedentary." Subgroup analysis of ambulatory and sedentary women was performed for delivery mode.

Results: A similar proportion of women in each "mobile" epidural group were ambulatory during labour: CSE (37.9%) and LDI (36.6%). There was no difference in the incidence of spontaneous vaginal delivery, instrumental vaginal delivery or caesarean section between ambulatory and sedentary groups.

	Ambulatory $n = 261$		Sedentary $n = 440$	
Delivery mode	CSE	LDI	CSE	LDI
	$n = 133$	$n = 128$	$n = 218$	$n = 222$
Spontaneous vaginal	61 (46%)	54 (42%)	89 (41%)	96 (43%)
Instrumental[†]	36 (27%)	37 (29%)	66 (30%)	61 (28%)
Caesarean section	36 (27%)	37 (29%)	63 (29%)	65 (29%)

[†]Includes forceps and ventouse delivery.

Conclusion: Within the limitations of subgroup analysis, there was no association between ambulation after "mobile" epidural analgesia and delivery mode.

Reference

1. Comparative Obstetric Mobile Epidural Trial (COMET) Study Group UK: Effect of low-dose mobile versus traditional epidural techniques on mode of delivery. Lancet 2001; 358: 19–23.