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Original Article

Combined spinal epidural vs epidural labour analgesia: does initial intrathecal analgesia reduce the subsequent minimum local analgesic concentration of epidural bupivacaine?

N. P. Patel,[1] S. L. Armstrong,[2] R. Fernando,[1] M. O. Columb,[3] J. K. Bray,[4] V. Sodhi[5] and G. R. Lyons[6]

1 Consultant Anaesthetist, 2 Research Fellow in Obstetric Anaesthesia, University College London Hospitals NHS Trust, London, UK
3 Consultant Anaesthetist, South Manchester University Hospitals NHS Trust, Wythenshawe, UK
4 Consultant Anaesthetist, St Mary's Hospital NHS Trust, Paddington, London, UK
5 Consultant Anaesthetist, Queen Charlotte's and Chelsea Hospital, London, UK
6 Emeritus Consultant Anaesthetist, St. James's University Hospital, Leeds, UK

Summary

Labour analgesia initiated using a combined spinal-epidural (CSE) technique may reduce subsequent epidural bupivacaine requirements compared with an epidural-only technique. We compared the minimum local analgesic concentrations (MLAC) of epidural bupivacaine following initial intrathecal or epidural injection. In a prospective, double-blind study, 115 women requesting epidural analgesia were randomly assigned to receive either an epidural with bupivacaine 20 mg and fentanyl 40 μg or a CSE with intrathecal bupivacaine 2.5 mg and fentanyl 5 μg. Analgesia was assessed using a visual analogue pain score. When further analgesia was requested, bupivacaine 20 ml was given, and the concentration was determined using the technique of up-down sequential allocation. The MLAC of bupivacaine in the epidural group was 0.032% wt/vol (95% CI 0.020–0.044) compared with 0.047% wt/vol (95% CI 0.042–0.052) in the CSE group. Bupivacaine requirements for the second injection were increased following intrathecal analgesia by a factor of 1.45 ($p = 0.026$) compared with epidural analgesia.

Correspondence to: Dr. R. Fernando
Email: r.fernando@btinternet.com
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Introduction

The combined spinal-epidural (CSE) technique is an established method for providing labour analgesia with advantages over standard epidural techniques such as speed of onset and better sacral analgesia [1, 2]. It has been suggested that initiating analgesia via the intrathecal route may improve the effectiveness of the epidural component. In a prospective study, Leighton et al. reported a greater dermatomal spread of epidural bupivacaine if intrathecal sufentanil had previously been administered, via a CSE technique, compared with a group receiving a standard epidural block with bupivacaine only [3]. This study examined the impact of a spinal induction dose, but did not compare it with an equivalent epidural induction dose. Both Eappen et al. [4] and Norris et al. [5], in retrospective studies, have reported that epidural catheters, inserted as part of CSE analgesia, had a higher probability of success when

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compared with an epidural-only technique. In particular, Norris et al.'s study of over 1600 parturients receiving either CSE or epidural analgesia for labour suggested that a catheter inserted as part of a CSE technique was more likely to produce bilateral sensory change and adequate analgesia [5]. It remains unclear as to whether this effect is due to more reliable placement of the epidural catheter or a greater efficacy of the epidural component of the CSE. Conversely, Collis and colleagues in 1995 reported a greater requirement of epidural top-ups following a CSE compared with an epidural. However, in that study, the CSE group received a 'low-dose' regimen, whereas the epidural group received higher concentrations of bupivacaine (0.25%) [2]. None of these studies answer the question of whether the choice of a spinal or epidural induction dose has an impact on the quality of epidural analgesia in late labour.

The primary aim of this study was to determine if initial intrathecal labour analgesia using the CSE technique reduces subsequent epidural bupivacaine requirements compared with an initial epidural bolus. We used the minimum local analgesic concentration (MLAC) model [6] to estimate the median effective concentration (or EC_{50}) of epidural bupivacaine in the first stage of labour in two groups of patients, who had previously received either an intrathecal or epidural injection of low-dose bupivacaine and fentanyl.

Methods

After hospital ethical committee approval (Royal Free Hampstead NHS Trust, London, UK) and written informed consent, parturients in labour were recruited into this prospective, randomised, double-blinded study. Women were approached and consented at three different times – in the antenatal clinic, anaesthetic antenatal education classes or on arrival on the labour ward, if they were in early labour. All women were classified as ASA physical status 1–2 and had singleton pregnancies of > 36 weeks, gestation with vertex presentation. They were in active labour between 2 and 6 cm cervical dilatation and had baseline visual analogue pain score (VAS) > 30 mm (0–100 mm scale). Women who had pre-eclampsia, received opioid medications within the previous 4 h or entered the second stage of labour before the study ended were not studied. Patients on oxytocin infusions, who had changes made to the infusion rate during the 30-min assessment period, were also not studied. Upon request for regional analgesia, the women were randomly assigned into two groups: CSE or epidural group.

Randomisation for each patient was performed with a computer generated random number table using Excel (Microsoft Corporation, Redmond, WA, USA). Parturients were randomly assigned to one of the two treatment regimens using sealed opaque envelopes that contained details of group allocation. The sequence of treatment was concealed until the interventions were assigned. Three anaesthetists were involved in the study. One anaesthetist who was not involved with the clinical care or data collection performed the randomisation procedure. The second anaesthetist performed the regional block on request according to the group allocation. A third anaesthetist, blinded to the procedure performed, assessed the regional block, and if appropriate, the patient was then entered into the second phase of the study as detailed below, with the second anaesthetist administering further boluses of local anaesthetic via colour-coded syringes. Any further assessments of regional blockade were again performed by the third anaesthetist. The patient, first anaesthetist and third anaesthetist were blinded to group assignment throughout.

All regional blocks were performed in the flexed sitting position at the L3-4 or L4-5 lumbar intervertebral space following a routine fluid preload of 500–1000 ml Hartmann's solution. The epidural space was identified using loss of resistance to saline with a 16-G Tuohy needle (SIMS Portex, Kent, UK). The CSE technique was performed using the single interspace needle-through-needle technique. The intrathecal injection was performed using a 27-G, 119-mm Whitacre spinal needle (Becton Dickenson, Franklin Lakes, NJ, USA). In both groups, an 18-G, closed-end, multiport epidural catheter (SIMS Portex) was inserted 4–5 cm into the epidural space.

There were two phases in the study. The first phase represented the randomisation of parturients to receive either the initial epidural or intrathecal dose, and is referred to as the first injection. The second phase represented the dose-finding intervention and involved varying the concentration of bupivacaine in a subse-

quent epidural injection. This is referred to as the second injection.

First injection

The epidural group received 20 ml of standard 'low-dose' mixture prepared under sterile conditions by our hospital pharmacy containing 0.1% bupivacaine and 2 $\mu g.ml^{-1}$ fentanyl; this was administered over 3 min through the epidural catheter. The CSE group received 2.5 ml of the same mixture intrathecally, containing 2.5 mg bupivacaine and 5 μg fentanyl [7]. To ensure that the entire dose was delivered intrathecally, the syringe was securely attached to the hub of the spinal needle, once cerebrospinal fluid (CSF) was seen, and CSF was aspirated at the beginning and end of the injection over 30 s. Test doses were not used.

The women were then positioned sitting at 45° with left uterine displacement and routine maternal and fetal monitoring performed. The third research anaesthetist performed the following assessments at baseline (immediately before injection), 15 and 30 min after injection:

1 100-mm VAS where 0 represented 'no pain' and 100 represented 'the worst pain possible' at the height of the contraction.
2 Maximum sensory block height (complete loss of sensation) to pinprick (Medipin®, Bushey, Hertfordshire, UK) and cold (Ethyl Chloride BP spray, Roche Products Ltd, Welwyn Garden City, Hertfordshire, UK) was recorded for the left and right sides, with the mean used for data analysis.
3 Motor block using the modified Bromage score was recorded where 1 = complete block, unable to move feet or knees; 2 = able to move feet only; 3 = just able to move knees; 4 = detectable weakness of hip flexion; and 5 = full flexion of hips and knees while supine. Right- and left-sided motor block was quantified with the mean used for data analysis.
4 Adverse effects e.g. patients were asked about the presence of pruritus, nausea or vomiting.
5 Maternal heart rate and non-invasive blood pressure (automated). Hypotension was defined as a ≥ 20% fall in systolic blood pressure from baseline values.
6 Any treatment given including use of ephedrine.
7 Duration of analgesia was recorded as time from the end of the injection to the sensation of uncomfortable contractions and request for further analgesia

Analgesia following the first injection was defined as effective if the VAS was reduced to ≤10 mm at 30 min. Only women defined as having effective analgesia from the first injection proceeded to the dose-finding phase of the study and received the second epidural injection. Patients with ineffective analgesia (VAS > 10) were not studied further and were given rescue analgesia (20 ml bupivacaine 0.1% with 2 $\mu g.ml^{-1}$ fentanyl).

Second injection

There was no prompted request from either the anaesthetist or the midwife looking after the patient. When further analgesia was requested by the patient, 20 ml bupivacaine was given (second injection) via the epidural catheter. The first woman in each group received 0.07% bupivacaine (the MLAC of bupivacaine from previous studies) [6, 8]. The concentration of bupivacaine for the next woman was determined by the response of the previous woman randomly assigned to that group, using the technique of up-down sequential allocation at a testing interval of 0.01% bupivacaine. Three outcomes were considered, which characterised this dose-finding phase. Analgesia was defined as: effective if the VAS reduced to ≤10 mm within 30 min; ineffective if the VAS was >10 mm at 30 min, but responded to rescue epidural analgesia (20 ml bupivacaine .01% with fentanyl 2 $\mu g.ml^{-1}$); and repeat if rescue epidural analgesia failed to reduce VAS to ≤ 10 mm. An effective dose directed a 0.01% decrease in concentration of bupivacaine, an ineffective dose directed a 0.01% increase and a repeat dose directed an injection of the same concentration for the next woman randomly assigned to that group. Blinding was facilitated by the use of coded syringes, containing the appropriate concentration of bupivacaine prepared by our hospital pharmacy as a single batch under sterile conditions. All syringes were stored and administered at room temperature (20 °C). All top-ups were performed using incremental injection following negative pressure aspiration. The same assessments were performed for the second injection as described above for the first injection by the same anaesthetist who had performed the initial assessments, and who was blinded to group allocation

Other data collected included maternal age, height, weight, gestation, parity, cervical dilatation, use of prostaglandins for induction of labour, use of oxytocin for augmentation, use of pethidine before regional block,

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time from first injection to delivery and mode of delivery.

At the end of the study period (defined as completion of assessments following the second injection at 30 min), women continued to receive epidural 'low-dose' mixture (10–15 ml half-hourly as required). All women received routine obstetric care throughout the study and thereafter.

Statistical analysis

Means (SD) were analysed using unpaired Student's t- or Welch's t-tests for differing variances, median (IQR (range)) by Mann–Whitney U-test and counts or proportions by Fisher's exact test. Data from evaluable patients were analysed using repeated ANOVA with Tukey–Kramer multiple comparison tests for time-based data. Kaplan–Meier analysis and log rank tests were used for durations of analgesia. The median effective concentrations were estimated from the up-down sequences by analysing up-down reversals and also using probit regression as back-up analysis, which enabled the MLAC with 95% CI to be derived. Analyses were carried out using the following software: Excel 2000 (Microsoft Corp., Redmond, VA, USA): Number Crunching Statistical System (NCSS) 2000 (NCSS Inc., Kaysville, UT, USA); and GraphPad Prism 3.02 (GraphPad Software Inc., San Diego, CA, USA). Statistical significance was defined for $p < 0.05$ (two-sided). Sample size estimates suggested that 39 patients per group would be sufficient to detect a nominal 0.02% difference (SD 0.022) [9] as significant at $p < 0.05$ with at least 80% power in this up-down study.

Results

Of the 115 women recruited, 80 eventually completed both phases of the study with 40 in each group. The CONSORT diagram for the study is shown in Fig. 1.

In the epidural group (n = 53), 13 women were not studied from analysis: eight due to ineffective analgesia from the first injection; four due to protocol violations

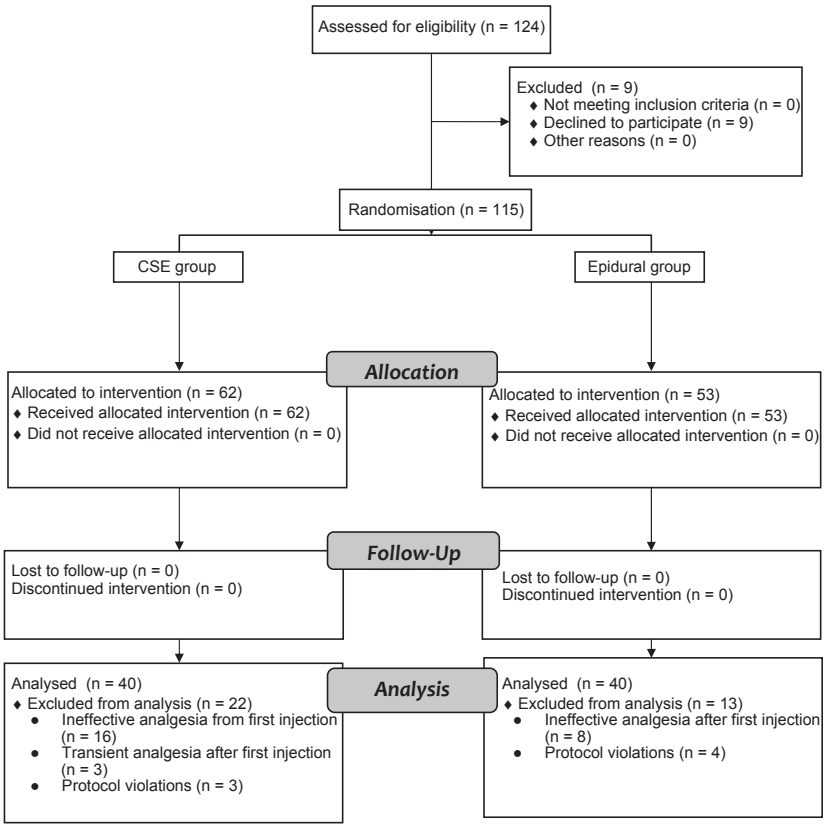

Figure 1 CONSORT recommended description of patient recruitment. CSE, combined spinal-epidural.

who were in the second stage of labour before the study ended; and one where a woman received 'low-dose' mixture instead of the study solution as the second injection. In the CSE group (n = 62), 22 women were not studied from analysis: 16 due to ineffective analgesia after the first injection; and three due to transient analgesia only from the first injection (VAS ≤ 10 at 15 min, but not at 30 min); protocol violations included one who was found to be in the second stage of labour before the study ended, one received 'low-dose' mixture instead of the study solution as the second injection; and one woman received a variable oxytocin infusion during the 30 min assessment period following the second injection, making it difficult to assess her pain scores.

Patients' characteristics and obstetric data were similar in both groups. The median (IQR [range]) cervical dilatation was 3.5 (3–4 [2–5]) cm before the first injection. There were no significant differences in mode of delivery and time to spontaneous vaginal delivery (not including instrumental delivery) from first injection in both groups.

Ineffective analgesia, as defined for the purposes of the study, after the first injection was more frequent (p = 0.08) in the CSE group, but this difference did not reach statistical significance. All occurrences of ineffective analgesia were relieved by rescue epidural analgesia except two – one delivered soon after the epidural was sited and one refused rescue analgesia with a VAS of 17 at 30 min after the first injection.

The sequences of effective and ineffective analgesia are shown in Figs 2 and 3. Each data point represents an individual woman's response to the concentration of bupivacaine that she received. There was no difference between the two groups with regard to the distribution of 'repeats' following the second injection. The MLAC of epidural bupivacaine for the second injection for both groups are summarised in Table 1. The MLAC estimates showed that bupivacaine requirements were significantly increased in the CSE group by a factor of 1.45 (95% CI 1.05–2.04; p = 0.026). The absolute difference in bupivacaine concentration was 0.015% (95% CI 0.002–0.027). Probit regression estimates are also shown in Table 1. Variability of the up-down sequences was significantly lower in the CSE group (variance ratio test p = 0.001) for the second injection requirements.

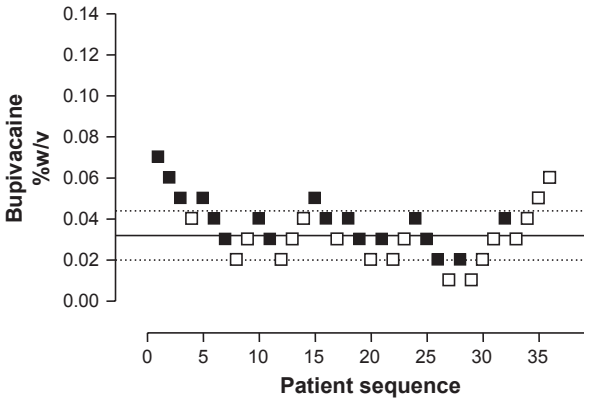

Figure 2 The minimum local analgesic concentration (MLAC) of epidural bupivacaine for the second injection as determined using the technique of up-down sequential allocation in the epidural group. The solid horizontal line represents the MLAC. Dotted horizontal lines represent 95% CI. The testing interval is 0.01% wt/vol.

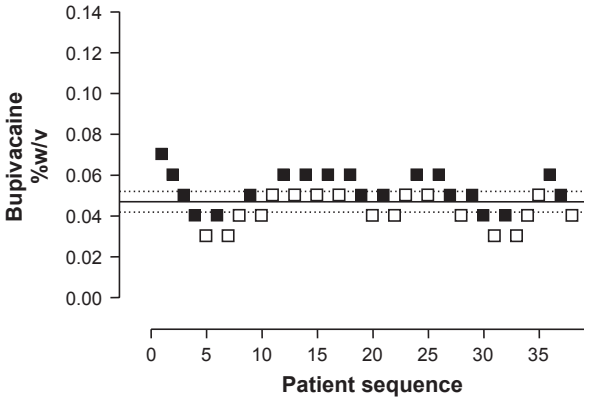

Figure 3 The minimum local analgesic concentration (MLAC) of epidural bupivacaine for the second injection as determined using the technique of up-down sequential allocation in the CSE group. The solid horizontal line represents the MLAC. Dotted horizontal lines represent 95% CI. The testing interval is 0.01%. ■ Represents effective analgesia, □ represents ineffective analgesia.

Table 1 Minimum local analgesic concentrations. Values are % (95% CI)

	Epidural (n = 36)	CSE (n = 38)
Up-down analysis	0.032 (0.020–0.044)	0.047 (0.042–0.052)
Probit	0.032 (0.026–0.041)	0.045 (0.037–0.055)

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Table 2 Visual analogue pain scores in epidural and CSE groups. Values are median (IQR [range]).

	Epidural (n = 40)	CSE (n = 40)
Baseline*	81 (66–93 [42–100])	68 (59–85 [35–100])
15 min after first injection	5 (0–15 [0–53])	0 (0–5 [0–43])
30 min after first injection	0 (0–1 [0–10])	0 (0–1 [0–10])
Before second injection	30 (25–40 [11–80])	35 (25–50 [8–70])
15 min after second injection	18 (1–37 [0–100])	15 (5–29 [0–75])
30 min after second injection	17 (3–37 [0–100])	11 (1–27 [0–86])

*p = 0.06.
CSE, combined spinal epidural.

The VAS were similar in groups at the various time points both before and after the second injection (Table 2).

There was a greater rate of fall in the percentage of women with analgesia in the CSE group with a significantly shorter median (IQR [range]) duration of 81 (72–101 [45–145]) min compared with 104 (86–134 [55–226]) min in the epidural group (Log rank p = 0.0003).

Maximum sensory block heights to pin prick and cold were significantly lower in the CSE group (Fig. 4) (p < 0.002). Pinprick block height after the first injection was significantly lower in the CSE group (median T8) compared with the epidural group (median T6) (p < 0.05). At request for the second injection, pinprick block height had regressed in both groups, but to a much greater degree in the CSE group (median L1 vs T9 in epidural group; p < 0.05). After the second injection, pinprick block height in the CSE group was still significantly lower (median T7.5 in CSE group vs T6 in epidural group; p < 0.05).

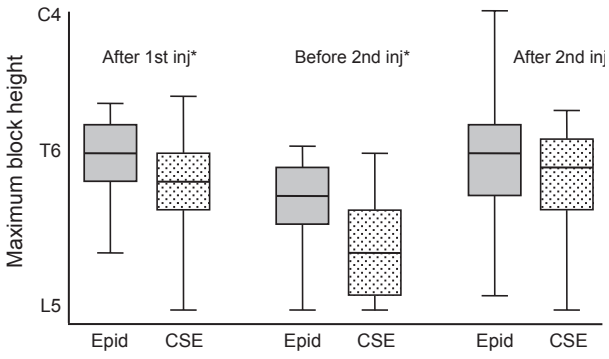

Figure 4 Maximum sensory block height to pinprick after the first injection, and before and after the second injection. Data are presented as median (horizontal bar), IQR (box) and range (whiskers). *indicates p < 0.05.

The number of women with weak hip flexion, graded as 4 on the modified Bromage score, was greater in the CSE group (5 vs 0; p = 0.055) at 15 min, but did not reach statistical significance, resolving by 30 min after first injection. The remainder had no detectable motor block. Although the number of women with pruritus was greater in the CSE group (12 vs 5), this was not significant. The incidences of adverse effects such as nausea or vomiting (2 vs 0), hypotension (5 vs 4), and ephedrine requirements (1 vs 2) were similar in both groups (epidural vs CSE, respectively).

Discussion

This study compared the minimum local analgesic concentrations (MLAC) or median effective concentrations (EC_{50}) of epidural bupivacaine for the second injection in two groups of patients who had received either initial low-dose epidural or intrathecal analgesia in labour. In contrast, previous studies have only estimated the MLAC of bupivacaine for the first epidural injection (0.07%) [6, 8].

There have been several reports in the recent literature comparing the overall effectiveness of epidural vs CSE analgesia for labour. Although there are some retrospective studies that have concluded that CSEs are more effective for labour analgesia, several prospective studies show that there is no real difference between the techniques [10–12]. Thomas et al. performed a prospective double-blinded randomised controlled trial, assessing the effects of a dural puncture with no actual intrathecal drug administration on the quality of epidural analgesia in early labour. They demonstrated no improvement in epidural analgesia quality or reduction in catheter manipulation or replacement rate when compared with a traditional epidural technique [13]. Goodman et al. randomly assigned 100 women in early labour to receive CSE or epidural analgesia and found no significant differences in the percentage of patients requiring top-ups or number of top-ups required [14]. A Cochrane review in 2007 looked at 19 randomised trials involving 2658 women. The authors concluded that

CSEs had a slightly faster onset of effective pain relief than epidurals, but with no difference in the women's overall satisfaction between the two techniques [15].

Under the conditions of this study, the MLAC of epidural bupivacaine was not reduced by the use of intrathecal analgesia, but increased by a factor of 1.45. This may suggest that in our study, CSEs may actually be less effective than an epidural first dose. Perhaps, when using an intermittent top-up technique, and, in particular, this low-dose combination, the transition from spinal to epidural analgesia may require a greater dose compared with an epidural-only technique. However, although the absolute difference in MLAC of 0.015% between the two groups was statistically different, it is not likely to be clinically significant. The answer to our primary aim appears to be that CSE analgesia, using the combination of drugs and doses described, offers no quantitative analgesic advantage over standard epidural analgesia beyond the first dose. As this study considered bupivacaine requirements for the second injection, after the first injection had regressed, we cannot extrapolate these results to the overall requirement in labour. These results do not influence the established clinical indications for a CSE technique, particularly for parturients in advanced labour needing rapid sacral analgesia.

Median analgesic duration from the intrathecal injection was significantly shorter than that of the first epidural injection (81 vs 104 min) in this study. Other studies that have used a larger dose of fentanyl (25 μg) combined with 2.5 mg bupivacaine, for the intrathecal injection have also demonstrated a similar shorter duration compared with a low-dose epidural group [16]. Collis et al. reported the median time to the first epidural top-up as 86 min in 300 women receiving a CSE technique [1]. The limited duration of analgesia of the spinal component of a CSE technique is thought to be an important consideration by some workers [17]. However, starting an epidural infusion immediately after the first injection reduces the relative importance of this consideration, and yet maintains the advantages of rapid onset of analgesia.

In our study, the CSE group demonstrated a greater degree of block height regression before the second injection (Fig. 4), despite having similar VAS to the epidural group at this time point (Table 2). This may represent either a spinal opioid analgesic effect or a residual effect of local anaesthetic coating the epidural nerves in the epidural group, resulting in a reduced amount of local anaesthetic required in the second injection. This effect has been described by de Jong in terms of mantle and core nerve fibre local anaesthetic blockade, within a nerve root [18]. In contrast, the epidural nerves in the CSE group were not directly exposed to local anaesthetic until the second injection.

We measured the maximum sensory block height and found lower block heights in the CSE group after the first injection (median T8 vs T6 to pinprick, $p < 0.05$). However, as the first stage labour analgesia only requires a blockade of the T10/T11 to L1/L2 nerve roots, both groups should have achieved comparable analgesia despite the variation in block height. It was interesting to note that despite the greater regression in block height in the CSE group before the second injection, the VAS scores were similar. This is most likely to reflect a residual spinal opioid effect once the local anaesthetic block has started to regress.

One other finding was a significantly greater variability ($p = 0.001$) in bupivacaine requirements following an epidural (wider confidence intervals) compared with a CSE (Fig. 1). This could be due to chance, but may suggest more predictable local anaesthetic requirements in the CSE group. Studies have shown that epidural opioids have primarily a spinal mechanism of action [19, 20]. In the CSE group, the intrathecal fentanyl is immediately 'available', whereas fentanyl administered via the epidural route would have to cross the meningeal barrier (dura and arachnoid mater), and this may occur to a variable degree.

There are several aspects of the study that warrant further discussion. First, could the greater MLAC in the CSE group be explained by a relatively lower dose for the first injection? The first doses were approximately twice the EC_{50} of epidural bupivacaine and 3.6 times the ED_{50} of intrathecal bupivacaine estimated in previous MLAC studies [7, 9]. Point estimates can be derived for the EC_{95} or ED_{95} from these median effective estimates using the table of normal deviates [6]. The EC_{95} of epidural bupivacaine was 0.091% when combined with fentanyl 2 $\mu g.ml^{-1}$, and the ED_{95} of intrathecal bupivacaine was 1.69 mg when combined with fentanyl 5 μg. We gave 1.1 times the EC_{95} to the epidural group and

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1.48 times the ED_{95} to the CSE group. Based on these MLAC studies, in proportional terms, the CSE group received the greater dose at ED_{50}/EC_{50} (by a factor of 1.8), and to a lesser extent the greater dose at ED_{95}/EC_{95} (factor of 1.35). The greater MLAC in the CSE group for the second injection cannot therefore simply be explained by a relatively lower dose for the first injection. Repeating the study using a larger dose of intrathecal fentanyl (15–25 μg) would be a logical step and may help clarify this interesting issue. Wong et al. found that the duration of intrathecal analgesia for labour after 2.5 mg bupivacaine with 15 μg fentanyl was longer compared with 5 μg [21].

The aim of our study was to investigate if a spinal induction dose with bupivacaine and opioid leads to a subsequent improvement in analgesia when compared with an epidural induction dose. We intended to study two techniques and drug regimens in routine clinical use in our institution. We did not compare the impact of a spinal induction dose with an equivalent epidural induction dose. From previous MLAC and minimum local analgesic dilution (MLAD) studies, it was seen that 40 μg fentanyl resulted in a 30% reduction in the MLAC of bupivacaine [9], whereas 5 μg intrathecal fentanyl caused a 66% reduction in the MLAD of bupivacaine [7]. This would possibly suggest that the spinal injection may have more analgesic efficacy than the epidural dose.

One possible contributory factor to a greater MLAC following a CSE block may be a difference in the quality of analgesia perceived between the initial intrathecal injection and the second epidural injection [1, 2]. There is controversy surrounding whether CSEs lead to an increased incidence of breakthrough pain and a higher number of epidural top-ups, or not. Two randomised studies reported a significantly higher number of mean epidural top-ups [2] or a greater incidence of breakthrough pain following CSE analgesia [22, 23]. However, Goodman et al. reported similar incidences of breakthrough pain and epidural top-ups in both CSE and epidural groups [14].

Secondly, although there were there twice as many analgesic failures in the CSE group, this was not significant ($p = 0.08$). Various factors may have influenced this result. Technical failure may have occurred with the intrathecal injection despite the precautions described. The exclusion rate due to ineffective analgesia after the first injection was higher in this study than we experience in our normal clinical practice, using the same intrathecal doses, because the definition of effective analgesia was strictly a VAS ≤ 10 mm. This meant that our protocol was more stringent than previous studies, and ensures that the MLAC value obtained implies very effective analgesia. We believe that this may be in part responsible for our high failure rate and may have led to more patient exclusions.

Lastly, many factors may affect the efficacy of analgesia including cervical dilatation and initial VAS [24]. Although the median cervical dilatation was similar in both groups at the start of the study, we did not specifically measure this again before administering the second injection. This is a potential confounding variable. Although the patients may still have been in the first stage of labour, they could have had different cervical dilatations at the time of the second injection, depending on the duration of analgesia from the first injection. Some may have been approaching the second stage of labour, and it is known that bupivacaine requirements increase at this stage due to progressive recruitment of Aδ fibres and pain outside the T10-L1 distribution [25].

It has previously been shown that cervical dilatation is more rapid in nulliparous women receiving CSE labour analgesia compared with those receiving epidural analgesia [26]. In our study, we feel that labour progress was probably affected in both groups to a similar degree, as shown by Norris et al. [27]. The cervical dilatation rates assessed before the first injection were similar between both groups. Ideally, it would have been preferable to have assessed cervical dilatation before the second injection. It was not part of our standard obstetric or anaesthetic protocol to assess cervical dilatation before each subsequent epidural top-up; rather, cervical examinations were performed purely for obstetric clinical indications.

Fentanyl is known to alter the subsequent sensitivity to epidural local anaesthetic as shown by a bupivacaine dose-sparing effect [9]. It is interesting to speculate whether our dose of spinal fentanyl had a different dose-sparing effect to that of epidural fentanyl. Further complicating the issue, a recent review article looked at neuraxial labour analgesia techniques and highlighted

studies comparing analgesia using spinal local anaesthetics without opioids. This review suggested that for all patients, a dose of 2.5–3 mg of local anaesthetic provided efficacious analgesia [28].

To summarise, this study shows that the MLAC of epidural bupivacaine was increased by a factor of 1.45 following initial intrathecal analgesia, when compared with a similar group of parturients receiving initial epidural analgesia with a low-dose bupivacaine/fentanyl solution. This effect, although statistically significant, is not necessarily clinically significant and may not be realised at doses used in routine clinical practice, which are on the upper flat portion of the dose-response curve. This finding suggests that differences between CSE and epidural analgesia that may be perceived by clinicians are not due to a reduction in drug requirement during the maintenance phase of epidural analgesia.

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