CONTINUOUS SUBARACHNOID INFUSION OF 0.125% BUPIVACAINE FOR ANALGESIA DURING LABOUR

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SUMMARY
We have studied 20 primiparous women requesting pain relief for labour, to determine the feasibility of subarachnoid infusions of bupivacaine for analgesia. A 28-gauge catheter was inserted into the subarachnoid space through a modified 22-gauge Sprotte needle. After a bolus dose of up to 1.5 ml of 0.25% bupivacaine, a continuous infusion of 0.125% bupivacaine was commenced. If analgesia became inadequate, additional 0.5-ml boluses of 0.25% bupivacaine were given (mean number of top-ups 2.8; range 0–6). Persistent perineal pain occurred in four women and this was relieved by 0.5% hyperbaric bupivacaine. Analgesia was good or excellent in 15 of 20 mothers within 30 min and it remained good or excellent throughout labour and delivery. Motor block was complete in three of the women who needed hyperbaric 0.5% bupivacaine. There were no difficulties with insertion of the catheter, no episodes of significant hypotension (systolic arterial pressure less than 100 mm Hg) or postdural puncture headache. Seven mothers delivered their babies vaginally, eight required assistance with forceps and five needed a Caesarean section.

METHODS AND RESULTS
This study was approved by the local Ethics Committee and informed consent was obtained from all women. We studied 20 primiparae at more than 36 weeks gestation, in labour with a cervical dilatation less than 5 cm and with a single, normally formed baby who presented cephalically.

After an i.v. preload of at least 500 ml of compound sodium lactate solution, each woman was placed in the left lateral position, and a standard aseptic technique was used to introduce a modified 22-gauge Sprotte needle through the midline into the subarachnoid space at the L2-3 or L3-4 interspace. After free flow of cerebrospinal fluid (CSF) was obtained, a 28-gauge spinal catheter (Kendall) was inserted through the needle. The needles were modified to ensure that, as the catheter was passed along the barrel, it would be directed out through the side hole. The needle and the Teflon coated stylet were then removed and the catheter was withdrawn so that the 10-cm mark was visible at the site of skin puncture. To confirm placement of the catheter in the subarachnoid space, CSF was aspirated and a 0.2-μm filter was attached.

All women were placed in the semi-recumbent position, supported by a wedge at an angle of 30°, and 0.25% bupivacaine 1.0 ml was injected. Maternal analgesia was assessed at 5 and 10 min and if, after 10 min, analgesia was unsatisfactory, an additional 0.25% bupivacaine 0.5 ml was given. When analgesia was satisfactory, an infusion of 0.125% bupivacaine was started at a rate of 1.5 ml h⁻¹ and continued until delivery. If the analgesia became inadequate during labour, a top-up of 0.25% plain bupivacaine 0.5 ml was given. Persistent perineal pain was relieved with 0.5% hyperbaric bupivacaine 0.1–0.5 ml. The mother was allowed to adopt any position she found comfortable. Systolic arterial pressure was checked every 2 min for the first 10 min, every 5 min for the next 20 min and every 30 min during the period of the infusion. The following were assessed at 5, 10 and 30 min after the initial dose and thereafter every 1 h: level of sensory

KEY WORDS

Subarachnoid infusions of local anaesthetic solution may have some advantages over extradural analgesia for labour, namely speed of onset, reliability and lack of maternal and fetal toxicity because of the small amounts of drug required. Until recently, the design and size of the spinal needles resulted in an unacceptably high incidence of postdural puncture headaches (PDPH) in labouring women, and therefore continuous spinal infusions have not been popular as a technique for analgesia. Some workers have investigated the use of 32-gauge catheters for intermittent administration of 0.25% bupivacaine [1, 2], 1% lignocaine [3] and diamorphine [4] and found the technique to be feasible. This study was undertaken to assess the feasibility of a continuous intrathecal infusion of bupivacaine for analgesia during labour in a group of primiparvae.

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loss to cold on each side using an ethyl chloride spray; extent of motor block using a Bromage score (0 = absence of motor block; 1 = partial motor block; 2 = almost complete motor block; 3 = complete motor block); presence of proprioception in the great toe; patient’s satisfaction on a four-point scale (excellent, good, fair or poor). When an instrumental or an operative delivery became necessary, the infusion was discontinued and up to 2.0 ml of 0.5% hyperbaric bupivacaine was used to extend the block. The fetal heart rate was monitored continuously using a scalp electrode. In this unit it is the practice to manage labour actively, whereby primiparous women are examined 2-hourly, and if the cervix fails to dilate by at least 1 cm each hour, an infusion of oxytocin is commenced [5].

After delivery, the time to full return of motor function was recorded, and the mothers were followed up until discharge home to assess for any neurological deficit or headache.

Mean maternal age was 25.1 yr (range 17–32 yr), mean body weight 64.8 kg (range 46–82 kg) and mean height 158.2 cm (range 148–166 cm). Fourteen mothers started labour spontaneously and the others had labour induced. Of those women with a spontaneous onset of labour, 14 had labour augmented with oxytocin.

Eleven mothers described analgesia as excellent or good 5 min after the initial 1.0 ml of 0.25% bupivacaine. Four others described it as excellent or good 10 min after the initial dose, and another four at 30 min after an additional 0.25% bupivacaine 0.5 ml. The block was always bilateral and the upper level of sensory loss to ethyl chloride spray was T3-9. Four women complained of persistent perineal pain which was relieved only by boluses of 0.5% hyperbaric bupivacaine 0.1–0.5 ml. One mother complained of suprapubic pain which was not relieved by 0.5 ml of either 0.25%, plain bupivacaine or 0.5% hyperbaric bupivacaine, despite an upper level of sensory loss of T6. It was decided to insert an extradural catheter at a higher space, and 2% lignocaine 3 ml relieved the pain. The spinal infusion was then maintained effectively throughout the rest of her labour.

The mean duration of the bupivacaine infusion was 3 h 13 min (range 1 h 3 min–7 h 14 min) and mean number of top-ups was 2.8 (range 0–6). The shortest time before a top-up was required (when adequate analgesia had been achieved) was 30 min. The maximum dose given was bupivacaine 27.25 mg and the minimum, bupivacaine 7.5 mg. Proprioception was lost on at least one side in six of the mothers, whilst three had a Bromage score of 3, five of 2, six of 1 and six of 0 during labour. The systolic arterial pressure remained greater than 100 mm Hg in all the women, despite an upper sensory level of T3 in four.

There were seven spontaneous deliveries and eight forceps deliveries, three of which were rotational. The indication for all of the forceps deliveries was fetal distress. Five women needed a Caesarean section as an emergency, 6 had intrapartum obstruction of labour and the others for fetal distress. In four, the intrathecal block was extended with 0.5% hyperbaric bupivacaine 1.0–2.0 ml, which produced an upper level of sensory loss to at least T4 in less than 13 min. The highest level of sensory loss was T3. The fifth mother wanted a general anaesthetic, which was administered without difficulty. All babies had Apgar scores of at least 8 at 5 min after delivery and none needed to go to the special care unit. All the catheters were removed intact and full motor power had returned within 2–3 h following delivery.

All mothers considered analgesia as excellent or good when questioned the following day. There were no neurological sequelae and no PDPH.

**Comment**

We have found that continuous subarachnoid infusion of bupivacaine was a feasible method for provision of analgesia during labour.

The modified 22-gauge Sprotte needle was easy to insert and the 28-gauge catheters were threaded without difficulty through the side hole. CSF was aspirated easily down the catheters, confirming correct placement, and this may account for the number of successful blocks. This is in contrast with other studies of 32-gauge spinal catheters with a technical failure rate of 25% [3], and difficulty in threading the catheters beyond the tip of the spinal needle in five of 14 subjects [2].

We have no explanation for the suprapubic pain experienced by one woman which, despite an upper sensory level of block at T6 on both sides, was relieved only by 2% lignocaine 3 ml injected extradurally. There was no change in the height of the block and the subarachnoid infusion was continued effectively during the rest of her labour. There was no evidence to suggest a dural puncture at the time of the extradural insertion, and the woman did not subsequently develop any type of headache.

Four mothers complained of persistent perineal pain as their labour progressed, which was not treated adequately with 0.25% plain bupivacaine but required 0.5% hyperbaric bupivacaine to produce analgesia. This resulted in complete motor block in three of the women and an almost complete block in the other. Of the 16 women not requiring hyperbaric bupivacaine, only four had a Bromage score of 2. Huckaby and colleagues also used hyperbaric 0.5% or 5% lignocaine to relieve the perineal pain that occurred in 10 of 20 parturients who received intermittent intrathecal 1% lignocaine during labour [3]. It seems, therefore, that neither plain lignocaine nor plain bupivacaine is adequate when used as the sole agent intrathecally.

Intermittent intrathecal diamorphine has been given to 20 women during labour and analgesia was reported as excellent or good in 16 of them within 30 min [4]. However, despite further top-ups of diamorphine, 80% of the mothers needed additional 0.5% plain bupivacaine to maintain analgesia in the first stage and opioid side effects were common: 15 mothers had pruritus, 15 had nausea and vomiting and eight had mild sedation.

In the present study, there were no PDPH, despite the use of a 22-gauge Sprotte needle. Our results confirm previous work indicating that the type of the
needle might be relevant in the incidence of PDPH in the pregnant population [6].

The low spontaneous vaginal delivery rate (35%) observed in this study was unexpected. This may be a reflection of the effectiveness of the analgesia in the second stage, with the infusions being maintained throughout. Other workers have reported a spontaneous delivery rate of 100% with intermittent lignocaine [3], but they did not confine themselves to primiparous women as in this study. Fetal distress was diagnosed by the obstetricians in 60% of subjects, and was not associated with maternal hypotension or aorto-caval compression. Caesarean section was considered necessary if there was both a poor cardiotocograph tracing and a fetal scalp pH reading of less than 7.25 during the first stage of labour. Forceps deliveries were indicated if there were persistent decelerations in fetal heart rate after uterine contractions in the second stage of labour with or without an abnormal fetal scalp pH reading. The forceps rate of 40% is probably not atypical and the Caesarean section rate of 25% could have occurred by chance.

In conclusion, this study shows that intrathecal infusion of a dilute solution of bupivacaine appears to be an effective method of maintaining analgesia during labour, and the height of the block can be extended rapidly in the event of an instrumental or an operative delivery. The likelihood of catheter breakage which has been reported with 32-gauge catheters, should be reduced when 28-gauge catheters are used. Larger studies are required to confirm this and any increased risk of infection associated with intrathecal infusions. It remains to be seen if the addition of opioids or selection of other local anaesthetics might provide better analgesia during labour and maintain a greater rate of spontaneous vaginal delivery.

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REFERENCES