CONTINUOUS EXTRADURAL INFUSION OF 0.125% BUPIVACAINE FOR PAIN RELIEF AFTER LOWER ABDOMINAL SURGERY

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There is considerable interest in continuous extradural infusions of dilute local anaesthetic solutions for the relief of pain in labour, and success has been claimed for 0.125% bupivacaine given at a rate of 10 ml h$^{-1}$ [1]. Postoperative pain probably requires more profound nerve block because analgesia after operation involves sensory somatic nerves [2]. When using continuous dilute infusions it is generally necessary to inject a more concentrated bolus initially, relying on the infusion to maintain the block rather than initiate it.

Although there is clinical evidence that these infusions are effective, we are not aware of a controlled study which unequivocally demonstrates this in postoperative pain. We have therefore compared the duration of analgesia following an initial bolus of 0.5% bupivacaine after which the extradural space was infused with either saline or 0.125% bupivacaine.

METHODS AND RESULTS

Twenty women undergoing major intra-abdominal gynaecological surgery were studied. The investigation was approved by the regional Ethics Committee and consent was obtained from all patients.

Premedication comprised diamorphine 5 mg and atropine 0.6 mg given i.m. approximately 1 h before induction of anaesthesia.

A single end-hole extradural catheter (Portex) was inserted at the T11–12 space, for approximately 3 cm into the extradural space. Two percent plain lignocaine 16–20 ml was injected slowly over 2 min, while verbal contact was maintained with the patient. Light general anaesthesia was induced subsequently with thiopentone 400–500 mg and maintained with 66% nitrous oxide in oxygen and 0.5–0.8% enflurane given by facemask. Surgery then proceeded.

All patients received an extradural “top-up” of 0.5% bupivacaine 10 ml 1 h after the injection of lignocaine, or on peritoneal closure, whichever was earlier.

The patients were allocated randomly to two groups. Group 1 received an extradural infusion of 0.125% bupivacaine in saline at a rate of 15 ml h$^{-1}$. Group 2 received an extradural infusion of 0.9% saline at a rate of 15 ml h$^{-1}$. The infusion containers were marked identically in both groups. In all patients the infusion was commenced within 30 min of the intra-operative dose of 0.5% bupivacaine.

Solutions were delivered by either an Imed 902 volumetric pump or a Watson–Marlow 101UA peristaltic pump. In all cases a 30-ml graduated burette was interposed between the infusion

SUMMARY

Twenty women, undergoing lower abdominal surgery, were allocated randomly to receive a continuous extradural infusion of either 0.125% bupivacaine or placebo at a rate of 15 ml h$^{-1}$. All had received an intra-operative extradural block. Pain scores were recorded at 30, 60, 90, 120, 150, 180, 240 and 360 min after surgery. From 150 min onwards there was a significant benefit for those receiving the active drug. Six of nine patients in this group had adequate analgesia over the 6-h study period, while all patients in the placebo group required further pain relief.
container and the pump, to permit hourly confirmation of delivered volumes.

Sixteen patients were given ephedrine 30 mg i.m. at the end of surgery as prophylaxis against postoperative hypotension. An independent observer (ML) visited the patients at 30, 60, 90, 120, 150, 180, 240 and 360 min after the end of surgery. The degree of postoperative pain was assessed using a visual analogue scale (VAS) of 100 mm with extremes “no pain” and “worst pain imaginable”. If a patient demanded further analgesia, an extradural “top-up” of 0.5% bupivacaine 6–8 ml was given and the study terminated. All patients were subsequently given an infusion of 0.125% bupivacaine until the next morning, according to our usual practice.

Difference between distributions were analysed by repeated measurements and paired analysis using the Wilcoxon two-sample test and Mann-Whitney test. Differences between frequencies were analysed by the Fisher exact one-sided test.

There were no significant differences in age, weight or height between the two groups. The mean duration of the surgical procedure was 58 min in group 1 (range 30–115 min) and 69 min in group 2 (range 33–120 min) \( (P > 0.05) \).

One patient in group 1 was withdrawn from the study because of a unilateral block. One patient in group 1 was given diamorphine 5 mg i.m. 5.5 h after surgery and the pain scores for this patient at 6 h were therefore excluded from analysis. Three patients in group 1 and all 10 patients in group 2 required an extradural top-up during the 6-h study period. This difference is significant \( (P < 0.01) \).

All 19 patients had good analgesia in the early postoperative period and there was no significant difference between median VAS scores until 150 min (fig. 1). In all patients good pain relief was obtained from the “escape” bolus dose of bupivacaine.

**COMMENT**

The purpose of continuous infusions of local anaesthetic into the extradural space is to maintain a degree of nerve blockade compatible with analgesia. To achieve this, there should be a balance between the concentration and volume of the infused drug. Small volumes of high concentrations may be ineffective because of inadequate spread. Larger volumes of high concentration may be effective, but are likely to be accompanied by an unacceptable degree of motor block and the possibility of systemic toxicity. Trial and error over several years have suggested that 0.125% bupivacaine at a rate of 10–20 ml h\(^{-1}\) is an acceptable compromise for postoperative analgesia in lower abdominal surgery.

The present study shows that the extradural block produced by a bolus injection of 0.5% bupivacaine can be prolonged by infusing 0.125% bupivacaine at a rate of 15 ml h\(^{-1}\). However, some patients require “top-up” doses from time to time. Once the necessary degree of nerve blockade has been “lost”, it is necessary to give a bolus dose of a higher concentration of bupivacaine to re-establish the block. Bupivacaine 0.125% given as a single bolus often fails to produce a demonstrable nerve block and it may even fail to relieve labour pain unless it is repeated soon after the initial injection [3].

Lund and colleagues [4] found that continuous extradural infusions of bupivacaine failed to stop regression of an established block over 24 h, but they were able to re-establish the block with i.v. morphine. Other studies [5,6] have shown that the addition of an opioid to the local anaesthetic infusion increases analgesic effectiveness and prevents regression. Obviously, an extradural block does not treat discomfort originating outside the area of blockade, for example visceral or diaphragmatic pain. We have found that small i.m. doses of opioid are often required to deal with
EXTRADURAL INFUSIONS

such discomfort in patients receiving only local anaesthetic in the extradural infusion. In the present study, no injections of opioid were given during the study period.

Continuous extradural infusion of bupivacaine $15 \text{ ml h}^{-1}$ is an effective method of prolonging a block produced by a single bolus dose of $0.5\%$ bupivacaine. However, it is not always adequate as the sole method of providing analgesia after lower abdominal surgery, and it may be necessary to give additional extradural bolus doses of $0.5\%$ bupivacaine while increasing the rate of infusion, add small amounts of opioid to the solution or give parenteral opioids.

REFERENCES

1. Li DF, Rees GAD, Rosen M. Continuous extradural infusion of $0.0625\%$ or $0.125\%$ bupivacaine for pain relief in primigravid labour. *British Journal of Anaesthesia* 1985; 57: 264–270.