Comparison of ropivacaine with bupivacaine for paediatric caudal block


Abstract

In a double-blind, multicentre study 245 children aged 1–10 yr undergoing elective minor surgery as inpatients were randomly allocated to receive a single caudal extradural injection of 1 ml kg\(^{-1}\) of either 0.25% bupivacaine or 0.2% ropivacaine after induction of light general anaesthesia. The groups were comparable for age, weight, vital signs and duration of surgery. The onset time was similar for ropivacaine and bupivacaine (9.7 vs 10.4 min). Further analgesia was not required in 40% of children. The mean time to first analgesia in the ropivacaine group and 271 min in the ropivacaine group. No motor block was measurable in either group. Ropivacaine 2 mg kg\(^{-1}\) was as effective as bupivacaine 2.5 mg kg\(^{-1}\) for caudal analgesia in children. (Br. J. Anaesth. 1998; 81:247–248)

Keywords: anaesthesia, regional; anaesthesia, paediatrics; anaesthetics local, ropivacaine; anaesthetics local, bupivacaine; anaesthetic techniques, extradural

Ropivacaine is a new aminoamide local anaesthetic which in adults appears to cause less motor block and less cardiotoxicity than bupivacaine but produces a similar duration of analgesia. A preliminary evaluation of ropivacaine for caudal analgesia in children suggests a quicker onset and a longer duration of action. The aim of this study was to compare an equal volume of bupivacaine and ropivacaine for caudal analgesia in paediatric patients undergoing subumbilical surgery.

Methods and results

After Ethical Committee approval and parental written informed consent, 245 patients, aged 1–10 yr, ASA I, undergoing elective minor surgery as inpatients were studied (table 1). All patients received oral midazolam 0.5 mg kg\(^{-1}\) 30 min before surgery. Sevoflurane, halothane or propofol 2.5 mg kg\(^{-1}\) were given for induction and sevoflurane or isoflurane in oxygen/air (\(F_{\text{O}_2}=0.4\)) were administered for maintenance with spontaneous breathing until the end of surgery. The study used a double-blind methodology with random allocation to the two groups by a computer-generated list. Group B (123 patients) received 0.25% bupivacaine 2.5 mg kg\(^{-1}\) (1 ml kg\(^{-1}\)) and group R (122 patients) received 0.2% ropivacaine 2 mg kg\(^{-1}\) (1 ml kg\(^{-1}\)) via the caudal route. Heart rate (HR), non-invasive arterial pressure (NIAP) and oxygen saturation by pulse oximetry (\(S_{\text{O}_2}\)) were monitored and recorded during surgery. We evaluated the duration of surgery, the onset of block by pinprick according to the method of Dalens, and the duration of postoperative analgesia using hourly observations of a validated objective pain scale. Rectal paracetamol 20 mg kg\(^{-1}\) was given if the score was 6 or more out of 10 and motor block was assessed once on awakening using a four-point Bromage scale. Observations were continued for 24 h by an anaesthetist who was blinded to the local anaesthetic agent administered.

Statistical analysis was performed using the chi-squared test, Student’s t test and the log-rank test; \(P<0.05\) was considered statistically significant. SPSS software was used for the analyses.

The types of surgery are detailed in table 1. The two groups were comparable for age (Group B 4.12 yr [range 1–9]; Group R 4.18 yr [range 1–9 yr]); weight (18.4 kg [SD 6.3] [range 9–30] vs 18.1 [SD 6.05] [range 10–28]); and duration of surgery (38 min [SD 16.4] vs 37.3 min [SD 16.4]). The mean onset time was 10.4 min (SD 2.3 min) for Group B and 9.7 min (SD 2.2 min) for Group R. No further analgesia was required in 98 of the 245 children (40%), 49 from each group. In the other 147 children, the mean time to first analgesia after bupivacaine was 233.2 min (SD 120.9) for ropivacaine (ns). No motor block was seen in either group on awakening. No side effects were seen.

Comment

Previous studies have shown that lidocaine, mepivacaine and bupivacaine all produce relatively short-lived analgesia when given by the caudal route and their action can be prolonged by additives such as epinephrine, opioids, clonidine or ketamine.

Recently ropivacaine has been studied in adults for...
surgery, Caesarean section, labour and postoperative analgesia. The sensory block produced by ropivacaine is equivalent to bupivacaine but motor block is less intense and shorter in duration. We previously found in a preliminary study in children that 0.2% ropivacaine 2 mg kg\(^{-1}\) (1 ml kg\(^{-1}\)) produced a more rapid onset and more prolonged analgesia compared with 0.25% bupivacaine 2 mg kg\(^{-1}\) (0.8 ml kg\(^{-1}\)). In the present study, the dose and volume of bupivacaine was increased to 2.5 mg kg\(^{-1}\) (1 ml kg\(^{-1}\)) so that equal volumes of solution could be given to maintain the blindness of the study. Low concentrations and large volumes are the key to obtaining differential block in children because of the small diameter of the A-delta and C-fibres and the small distance between the nodes of Ranvier. This study suggests that 0.2% ropivacaine 1 ml kg\(^{-1}\) given as a single shot caudal extradural block is equivalent to the same volume of 0.25% bupivacaine. The lower intrinsic toxicity of ropivacaine and lower mass of drug needed gives an increased margin of safety which may be important, particularly in younger children.

**References**


**Table 1** Type of surgery

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<th>Group R</th>
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