



EVALUATING THE EFFECTIVENESS OF ROPIVACAINE VERSUS BUPIVACAINE FOR POSTOPERATIVE ANALGESIA THROUGH CAUDAL BLOCK IN PAEDIATRIC AGE GROUPS

Anaesthesiology

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ABSTRACT

BACKGROUND: Pain management is a crucial aspect of care provided by paediatric anesthesiologists. Caudal epidural blockade is one of the most frequently utilized regional anesthesia techniques, particularly for managing pain during and after pediatric infraumbilical surgeries. **OBJECTIVES-** The aim is to Compare ropivacaine (0.125%) (1ml/kg) with bupivacaine (0.125%) (1ml/kg) in Caudal block for infraumbilical surgeries in children aged between 1-12 yrs with respect to postoperative analgesia. **METHODOLOGY-** A Prospective Randomized Double blinded clinical was carried out in 44 children. 22 in group R (Ropivacaine) and 22 in group B (Bupivacaine) of 1-12 years with ASA 1 and 2 who are admitted for elective infraumbilical surgeries. **RESULTS:** The differences in means between Group-R and Group-B are small, the 95% confidence intervals include zero, and the p-values are all above 0.05. This indicates that there is no statistically significant difference between Group-R and Group-B at any measured time point. **CONCLUSION:** Caudal Ropivacaine 0.125%, 1ml/kg provided good quality, reliable and long duration of analgesia similar to Bupivacaine 0.125 % 1ml/kg and ensured sufficient analgesic effect postoperatively in children undergoing infraumbilical surgeries.

KEYWORDS

Caudal block, Ropivacaine, Bupivacaine, Infraumbilical surgery, Postoperative analgesia.

INTRODUCTION:

Pain is an unpleasant, emotional and subjective sensory experience associated with actual or potential tissue damage.¹ In fact, pain experienced by infants and children often goes unrecognized or even neglected.² Research over the past two decades has provided incontrovertible evidence that not only do neonates experience pain but also that unrelieved pain has adverse long-term consequences, including harmful neuroendocrine responses, disrupted eating and sleep cycles, and increased pain perception during subsequent painful experiences.^{3,4,5}

Caudal epidural anaesthesia is the most commonly practiced regional technique in children. The practice of placing a caudal block before incision in general anaesthesia results in reduced inhaled concentrations of volatile anaesthetics intraoperatively.^{6,7} Bupivacaine is a long-acting amide local anaesthetic that has provided reliable anaesthesia and analgesia with differential motor/sensory blockade. But, toxicity due to accidental intravascular or intrathecal injections of bupivacaine resulting in severe neurological, cardiovascular depression even leading to death prompted studies on the mechanism of the cardiotoxic effects of local anaesthetics and search for drugs with less cardiotoxicity.^{8,9} Bupivacaine is commercially available as racemic mixture of R and S enantiomers. In response to the problem of increased cardiac toxicity of racemic mixtures of bupivacaine, single enantiomers were developed and Ropivacaine is the first local anaesthetic to be prepared as a pure S-enantiomer.¹⁰ Studies have shown that ropivacaine is less cardio and neurotoxic than bupivacaine.^{10,11,12} The sensory block provided by ropivacaine is similar to that produced by an equivalent dose of bupivacaine in extradural and peripheral nerve block whereas the motor block produced by ropivacaine is slower in onset, less intense and shorter in duration than bupivacaine.¹⁰

OBJECTIVES:

To compare ropivacaine (0.125%) (1ml/kg) with bupivacaine (0.125%) (1ml/kg) in caudal block for infraumbilical surgeries in children aged between 01-12 yrs with respect to postoperative analgesia.

METHODOLOGY:

A Prospective Randomized Double blinded study was conducted on 44 children. 22 each in group R (Ropivacaine) and 22 in group B (Bupivacaine) of 1-12 years with ASA 1 and 2 who are admitted for elective infraumbilical surgeries at Navodaya medical college, Raichur over a period of 18 months from July 2022 to December 2023 after approval from our college ethics committee.

A. INCLUSION CRITERIA^{13,14,15}:

1. Age 01 to 12 years of either sex.
2. Patients belonging to ASA Grade I and II.
3. Patients coming for infraumbilical surgeries.

B. EXCLUSION CRITERIA

1. Patient parents refusal for the procedure.
2. Patients with significant coagulopathies and other contraindications for regional anaesthesia.
3. Patients with pre-existing significant systemic diseases.
4. Patient allergic to local anaesthetics.
5. Infection of the skin at the injection site
6. Immunocompromised patients

Sample formula:

$$n = \frac{(Z_1 \alpha + Z_1 \beta)^2 (VS + Ve)}{(\mu_S \mu_E \delta)^2}$$

Here we considered, mean time from caudal placement to the first administration of analgesia postoperatively was 8.18±4.86 hours in the bupivacaine group and 7.61±4.12 hours in the ropivacaine group (Reference: Omar Elsfty, Ahmed MS Hamed, Sherif Wadie5). Therefore, Sample size for each group is 22.

The study was explained to the parents and written Informed Consent was obtained. 44 children satisfying the selection criteria were randomized by computer generated randomization table into two groups of each— Group B and Group R. NPO guidelines were followed. All children were premedicated with oral midazolam 0.5mg/kg 30 min prior to the procedure. Only after child is adequately sedated child was taken to the operation theatre. Monitors were connected. Anaesthesia induction was done using sevoflurane concentrated to 4-6 %. Vascular access was achieved after eyelash reflex was eliminated. IV fluids were started according to 4-2-1 rule. Orotracheal intubation was done using rocuronium bromide 0.6mg/kg. Caudal block given using conventional landmark technique. "Swoosh test" was performed to confirm caudal space. Haemodynamic parameters were continuously monitored. Anaesthesia was maintained using concentrated 2% sevoflurane in 50% nitrous oxide and oxygen. Anaesthetic agents were discontinued at the end of skin closure. 100 % oxygen was administered for 3-5 minutes. Once the vitals were stable and the child is awake, the child was shifted in recovery room for six hours and later shifted to ward and monitored. Post operative analgesia was assessed by FLACC Score used for children aged 1-3 years (Table-1) and Wong Baker Facies Pain Rating score for children aged 4-12 years. (Figure

1). Assessment was done for 24hr and if the pain score showed more than four then Inj Paracetamol(15 mg/kg) was given.(Graph 1) FLACC SCORE (Table- 1)

CATEGORY	SCORE 0	SCORE 1	SCORE 2
Face	No particular expression or smile	Occasional grimace or frown, withdraw, disinterested	Frequent to constant quivering chin, clenched jaw
Legs	Normal position or relaxed	Uneasy, restless, tense	Kicking or legs drawn up
Activity	No cry (awake or asleep)	Squirming, shifting back and forth, tense	Arched, rigid or jerking
Cry	No cry (awake or asleep)	Moans or whimpers; occasional complaint	Crying steadily, screams or sobs, frequent complaints
Consolability	Content and relaxed	Reassured by occasional touching, hugging or being talked	Difficult to console or comfort



Figure 1- Wong-Bakers scale

The collected data was entered in Microsoft excel. Descriptive statistics such as mean, SD and percentage were used to present the data. Comparison between Ropivacaine (0.125%) (1ml/kg) and Bupivacaine (0.125%) (1ml/kg) in Caudal block with respect to haemodynamics parameters, duration of action were assessed by using t-test for normally distributed data or MannWhitney U test for non-normally distributed data. Chi-square or Fisher's exact test were used for categorical variables.

RESULTS:

Assessment of post operative analgesia over a period of time made at 1,2,3,4,8,12 and 24 hours after caudal block was evaluated by repeated measures of ANOVA or Friedman's test. Data analysis was performed by using statistical software SPSS v20.0. Mean duration of anaesthesia for group R is 78.41 ± 8.51 and for group B is 77.50 ± 9.35 (Table-2)

Table 2 - Duration of Surgery and anaesthesia

	Group-R	Group-B	Mean difference	95% CI of difference	z-value	p-value
Duration of surgery	32.05 ± 5.91	31.82 ± 5.68	0.23	-3.29 – 3.75	-0.061	0.95#
Duration of anaesthesia	78.41 ± 8.51	77.50 ± 9.35	0.91	-4.53 – 6.35	0.34	0.74

Postoperatively, there were no adverse hemodynamic alterations without any significant difference in the pulse rate, blood pressure and the oxygen saturation between the two groups.

Across all time points, the differences in means between Group-R and Group-B are small, the 95% confidence intervals include zero, and the p-values are all above 0.05. This indicates that there is no statistically significant difference between Group-R and Group-B at any measured time point. (Table 3)

Table 3 - Postoperative events

	Group-R	Group-B	Mean difference	95% CI of difference	z-value	p-value
Paracetamol Dose Given	283.86 ± 133.97	352.04 ± 120.74	68.18	-145.78 – 9.42	1.99	0.05

First Analgesic Time needed in wards (Hrs)	5.43 ± 1.0	5.36 ± 0.99	0.068	-0.54 – 0.67	0.24	0.81
Duration of Hospitalisation in days	2.18 ± 0.39	2.04 ± 0.21	0.14	-0.06 – 0.33	1.41	0.16

DISCUSSION :

Our study showed that a caudal injection of ropivacaine 0.125% and bupivacaine 0.125% both were effective and provided similar good quality postoperative analgesia in children who underwent infraumbilical surgeries. The quality of postoperative analgesia was measured by FLACC Score and Wong Baker Faces Pain Rating score. Ropivacaine has less cardiotoxic effect compared to bupivacaine and its sensorial and motor effectiveness is superior to bupivacaine.^{15,16,17} Bosenberg et al. obtained the same analgesic effect with ropivacaine 0.175% and 0.2% in a study conducted on children aged over one year and that ropivacaine 0.175% caused even less motor block development.¹⁸ Luz et al. stated that singly administered 0.1% ropivacaine remained ineffective and that 0.2% ropivacaine was equivalent to 0.25% bupivacaine.¹⁹

CONCLUSION

Caudal Ropivacaine 0.125%, 1ml/kg provided good quality, reliable and long duration of analgesia similar to Bupivacaine 0.125 % 1ml/kg and ensured sufficient analgesic effect postoperatively in children undergoing infraumbilical surgeries. None of the two local anaesthetic were superior to other one regarding efficacy and side effects.

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