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Comparing caudal and penile nerve blockade using bupivacaine in hypospadias repair surgeries in children

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ABSTRACT

Background: Caudal anaesthesia is recommended for most surgical procedures of the lower part of the body, mainly below the umbilicus. It has been well established that a dorsal penile nerve block immediately after surgery decreases postoperative pain in children undergoing hypospadias repair. This study aimed to compare caudal or penile nerve block using bupivacaine in postoperative pain control in hypospadias repair in children. **Patients and Methods:** After local ethical committee approval and obtaining informed parental consent, 85 American society of Anesthesiologists status I and II patients, aged 6 months to 6 years old, undergoing hypospadias repair, were prospectively enrolled in this study. The patients were randomly divided into the following two groups: Caudal block was performed in 44 and penile block was performed in 41 patients. Cardiorespiratory systems data, analgesic requirement and complications were compared between the groups. **Results:** There were statistically significant haemodynamic (blood pressureand heart rate) alteration during operation in each group (P<0.01). The haemodynamic parameters were stable during operation in successful blocks in both groups. Caudal block success rate is 97.7%, whereas in penile block is 92.6%. Nineteen of 43 patients (44%) in caudal group and 29 of 41 patients (70%) in penile group received analgesia in the postoperative period and this difference was significant between the two groups (P = 0.025). **Conclusions:** Without ultrasonography and with blind block, with anatomic landmarks only, the caudal block success rate is high and if there is no contraindication for caudal block, it is the best choice in children under 6 years old (or 25 kg) for hypospadias repai.

Key words: Bupivacaine, caudal block, children, hypospadias repair, penile block

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INTRODUCTION

Caudal anaesthesia is recommended for most surgical procedures of the lower part of the body, mainly below the umbilicus, including inguinal hernia repair, urinary and digestive tract surgery and orthopaedic procedures on the pelvic girdle and lower extremities.[1]

It has been well established that a dorsal penile nerve block immediately after surgery decreases postoperative pain in children undergoing hypospadias repair.[2] For decades, penile block was widely and effectively used for various types of penile reconstructive surgery.[3] Recently, due to improved composition, dosage and concentration of local anaesthetics and low incidence of negative side effects, such as motor blockade and postoperative nausea and vomiting, caudal anaesthesia has become one of the most used and accepted regional blocks for children undergoing hypospadias repair.[3]

However, postoperative patient comfort is a major issue after distal hypospadias repair and depends on adequate analgesia and unimpaired micturition, especially when no suprapubic catheter is in place. Micturition impairment and urinary retention is a known side effect of caudal block anaesthesia.[3]

The comparison of penile block and caudal block has not been described in the literature to our knowledge. With these advantages and disadvantages of both caudal and penile block in postoperative pain control in hypospadias repair, the primary aim of our study was to determine which nerve block might prolong the duration of analgesia by decreasing objectively measured pain scores.

PATIENTS AND METHODS

After local ethical committee approval and obtaining informed parental consent, 85 American society of Anesthesiologists status I and II patients, aged 6 months to 6 years old, undergoing hypospadias repair, were

prospectively enrolled in this study.

Inclusion criteria were patients with distal penile, subcoronal and coronal type of hypospadias, scheduled for Mathieu or Snodgrass repairs with an intermittent non-dribbling urethral stent for 7 days or less.

Study exclusion criteria were parental refusal, contraindications to caudal or penile block, a history of developmental delay or mental retardation (which could make observational pain intensity assessment difficult), known or suspected coagulopathy, known allergy to any of the study drugs, any signs of infection at the site of the proposed caudal block and if had taken aspirin or any analgesic drug in the preceding week.

Patients with glandular or proximal type, need of chordee excision and placement of a suprapubic drain were excluded from the study. The patients were then randomised to one of the two groups using a computer-generated randomisation table. Caudal block was performed in group I and penile block was performed in group II. All subjects received a conventional preoperative dose of intravenous midazolam (0.03 mg/kg IV), approximately 20 minutes before induction of anaesthesia, and the induction was with lidocaine (1 mg/kg IV) and propofol (3 mg/kg IV). Appropriate size laryngeal mask airway for each patient was inserted. General anaesthesia was maintained with isoflurane (minimum alveolar concentration [MAC] = 1) delivered in oxygen (50%) and N_2O (50%). In group I (caudal group) after prep and drep, in left lateral position, caudal block was performed with bupivacaine 0.25%, 1 ml/kg (max 20 ml).

In the second group (penile group), after prep and drep in supine position, the penis was retracted downward and fixed with leucoplast. The markers for injection was, symphysis pubis, 0.5 to 1 cm lateral to the midline, the needle was inserted vertically (medially-caudally) until penetrating fascia scarpa and bupivacaine 0.5%, 0.1 ml/kg (max 2.5 ml), was injected in each side. All blocks were performed with 22-G needles and skin incision was performed 20 minutes after block in each group. No analgesic drug was used during the surgery. MAC of isoflurane was reduced 20 minutes after skin incision in both groups. Standard monitoring was used during anaesthesia and surgery.

Heart rate (HR) and blood pressure (BP) were recorded before anaesthesia, after anaesthesia and after block and then every five minutes, until the end of surgery and in the recovery period. If BP or HR increased more than 20% of baseline after skin incision, then we decided that block was unsuccessful and we injected 1 μg/kg fentanyl for pain relief. The postoperative pain was evaluated by FLACC (Face, Legs, Activity, Crying and Consolability) pain Scale. The patient's recovery nurse recorded the emergence numerical pain score on a scale of 0–10: The Facial expression, Leg activity, Crying and Consolability. All data collection could be considered blinded. In recovery or ward, rectal acetaminophen was administered for an age-appropriate pain score between 3 and 5 (0–10) and intravenous meperidine 1 mg/kg for an age-appropriate pain score of >5 (0–10).

Data analysis was performed using the SPSS for windows programme package version 16.0 (SPSS Inc, Chicago, IL, USA). Categorical variables were compared with the Chi-square or Fisher's exact test as appropriate. Continuous variables were analysed with independent samples *t*-test. Repeated measures ANOVA test was used for analysing the variations of haemodynamic parameters in different times within each study group. All tests were 2-tailed, and a level of significance was set at $P \leq 0.05$.

RESULTS

Demographic data including age, weight, preoperative systolic BP, diastolic BP and HR are shown in Table 1. Haemodynamic changes before and after caudal *vs* penile block is shown in Table 2.

Trend of alterations in haemodynamic variables (BP, HR) in each group was statistically significant over time during operation ($P<0.01$). One patient in caudal group had pain (success rate, 43/44 or 97.7%), whereas three patients in penile group had pain during operation (success rate, 38/41 or 92.6%). The BP and HR were stable during operation in successful blocks in both groups, but after 45 minutes, in penile group HR and BP increased, whereas they remained stable in caudal group [Figures 1 and 2].

After surgery, the children were transferred to the

Table 1: Demographic data of patients

	Caudal group (N = 44)	Penile group (N = 41)	*P*
Mean age (months)	31.84±19.91	40.53±20.89	0.056
(kg) weight	12.52±3.73	15.04±63	0.290
Preoperative SBP*	98.09±17.22	107.34±12.17	0.420
Preoperative BPD**	57.45±16.83	56.76±14.87	0.441
Preoperative HR***	135.79±33.97	121.83±28.06	0.148

*SBP = Systolic blood pressure; **DBP = Diastolic blood pressure; ***HR = Heart rate

Table 2: Haemodynamic changes before and after nerve block in the study groups

	Caudal block group (N = 44)	Penile block group (N = 44)	*P*
Pre-block SBP*	92.86±12.96	94.65±10.06	0.062
Pre-block DBP**	46.98±11.4	47.90±10.01	0.421
Pre-block HR***	124.02±17.56	111.15±16.47	0.903
Post-block SBP	89.05±10.41	98.09±17.22	0.230
Post-block DBP	41.07±9.72	43.50±7.70	0.424
Post-block HR	119.32±17.02	115.93±16.97	0.971

*SBP = Systolic blood pressure; **DBP = Diastolic blood pressure; ***HR = Heart rate

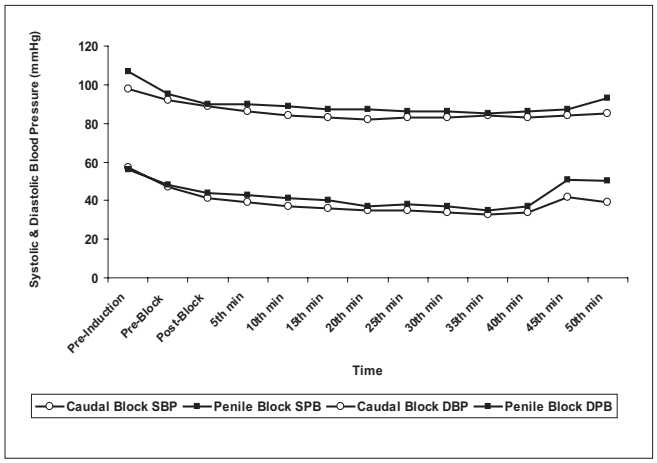


Figure 1: Variation in systolic (SBP) and diastolic (DBP) blood pressures in the both study groups by the time

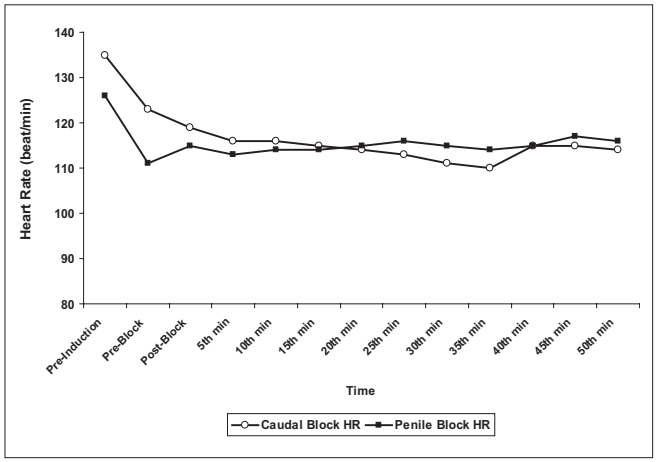


Figure 2: Variation in heart rate (HR) in caudal and penile block groups by the time

recovery room. HR, peripheral O_2 saturation and respiratory rate were monitored every 15 minutes, until the child was awake and cooperative. Forty eight patients (19 of 43 patients [44%] in caudal group and 29 of 41 patients [70%] in penile group) received analgesia in the postoperative period (recovery period until 24 hours postoperative) and the difference was significant between two groups ($P = 0.025$). Most of the patients, 33 patients (12 in caudal group and 21 in penile group), had pain about 1 to 2 hours postoperatively. There was not any complication in both groups.

Acetaminophen as suppository (40 mg/kg) was the drug of choice in the postoperative period, but intravenous analgesic (meperidine) was also used in 8 patients (2 in caudal group and 6 in penile group). Five of 48 (10%) patients received analgesia twice in the postoperative period (1 in caudal group and 4 in penile group), the remaining patients received analgesia in single dose.

DISCUSSION

This prospective study evaluated efficacy and complication of caudal block and penile block in children undergoing hypospadias repair. This study could demonstrate that caudal anaesthesia is associated with high success rates and a low incidence of postoperative pain.

Caudal anaesthesia is the most commonly performed regional anaesthetic technique in infants and children undergoing inguinal, anorectal and lower extremity surgical procedures.[4] Penile blockade is a simple and effective technique.[5] Penile block is easy to learn[6] and provides prolonged pain relief for up to 24 hours. Probably, all long-acting local anaesthetics can be used; a case of transient ischemia of the glans following the use of ropivacaine has been reported.[7] Sub pubic penile block is substantially free of complications;[8] we had no reported complication in this study.

Caudal block has almost replaced the use of penile block for various infraumbilical surgical procedures in children.[9-14] The majorities of studies on caudal block are focused on lasting analgesia and reduced side effects.[9-12] Compared with a published data on caudal block in children, learning processes in performing penile blockade in paediatric patients require a lower number of procedures to achieve high success rates,[15] but in our centre, the anaesthesia residents are more familiar with caudal block, and in most of the cases, they perform caudal analgesia with high success rate.

A Cochrane Database Systemic Review from 2008, comparing caudal epidural block *vs* other methods of postoperative pain relief for circumcision in boys, revealed that there were no differences in the need for rescue analgesics between caudal, parenteral and penile block methods.[16] One study postulated that the evidence from trials is still limited by small numbers

and poor methodology. Similarly, there is still lack of comparable data for distal hypospadias repair in children. Therefore, a randomised prospective trial is needed.[3] Penile surgery without using a regional block should be considered as substandard.[17] In one series, children undergoing distal hypospadias repair experienced significantly less impaired micturition when using penile block instead of caudal anaesthesia. They recommend penile block as the first choice perioperative analgesia, when spontaneous postoperative micturition must be guaranteed.[18] In this patient series, urinary bladder catheter was used, so micturition have not been evaluated.

Other study found similar postoperative pain scores for 6 hours in both Dorsal penaile nerve block and caudal block groups. Both techniques are easy, simple and safe. Dorsal penaile nerve block and caudal block provided similar postoperative analgesic effects without major complications for children under general anaesthesia.[19]

Caudal anaesthesia is established to be safe in children, because the procedure is technically simple to perform, the success rate is high and complications are rare.

In our study, the patient population was homogenous and was comparable in the two groups (the mean age, mean weight, preoperative mean systolic BP, preoperative mean diastolic BP and preoperative mean HR were not significantly different between two groups).

In this study, the patients in penile group needed more analgesia, so it is obvious that without ultrasonography and with blind block, with anatomic landmarks only, the caudal block success rate is high and we think that if there is no contraindication for caudal block, it is the best choice in children below 5 to 6 years old [or less than 25 kg][17] for hypospadias repair. We recommend this regimen for penile surgical procedures in infants and children.

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