

# Comparison of Subcutaneous Ring Block of the Penis with Caudal Epidural Block for Post Circumcision Analgesia in Children

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## Abstract

**Background:** Pain is an inevitable consequence of circumcision and a number of methods have now been described to ameliorate this. Local anesthetic techniques have been shown to be more effective than systemic opioids.

**Objective:** This study compared the subcutaneous ring block of the penis with caudal epidural block for post circumcision analgesia in children.

**Materials and method:** This comparative study was done during the period of January 2020 to December 2020 in BIRDEM General Hospital, Dhaka, Bangladesh. A randomized, prospective, blind trial was conducted comparing caudal epidural blockade (caudal block) with subcutaneous ring block of the penis (penile ring block) in forty healthy boys between three to five years of age undergoing elective circumcision.

**Results:** Subjects receiving caudal block had a longer duration of analgesia ( $p < 0.05$ ), and longer to first micturition ( $p < 0.05$ ) but there was no difference in time taken to awaken from anesthesia or spontaneously walk unaided. There were no local or systemic complications related to either block and a very low incidence of vomiting.

**Conclusion:** It is concluded that both techniques are effective. Caudal block is more reliable and provides a longer duration of analgesia but penile ring block is inherently safer and has a lower incidence of adverse effects.

**Key words:** Pediatric anesthesia; infiltration, caudal block, circumcision

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## Introduction

Pain is an inevitable consequence of circumcision and a number of methods have now been described to ameliorate this. Local anesthetic techniques have been shown to be more effective than systemic opioids<sup>1</sup> and the two most effective methods in general use are caudal epidural block and dorsal nerve block of penis<sup>2-4</sup>. Unfortunately, these techniques have potential risks and complications<sup>5,6</sup>. A study has shown the comparatively safe and simple method of topical analgesia using lignocaine jelly to be less effective than dorsal nerve block<sup>7</sup> limiting its usefulness. However, Broadman and colleagues described a

technique of subcutaneous ring block of penis which they found to be a simple and more effective method of post-circumcision analgesia without complications or delays in discharge<sup>8</sup>.

The purpose of this study was to compare the efficacy and incidence of side-effects of this method with the more established and proven technique of single injection caudal epidural block.

## Materials and method

Following local Ethics Committee approval, forty boys of ASA I aged between three to five years and scheduled for elective inpatient circumcision were studied following informed parental consent.

Anesthesia was induced by intravenous fentanyl 2.5-3 mg/kg, propofol 2.5-3 mg/kg and maintained with spontaneous breathing of 66% nitrous oxide in oxygen and halothane 0.5 to 2%. Patients were randomized to receive either caudal epidural bupivacaine 0.25%, 0.75 ml/kg or subcutaneous ring block of the penis<sup>8</sup>. This was performed using a 25-gauge needle to inject 1.0 to 2 ml of 0.5% bupivacaine around the proximal shaft of penis near the root of penis. Circumcision was then carried out by the same surgeon using the same technique in all patients. The foreskin was excised with scalpel after applying a straight clamp and the mucosa trimmed with scissors. Hemostasis was achieved with 4/0 catgut ligatures or use of bipolar diathermy. The mucosa was approximated with skin with interrupted 4/0 catgut.

At the completion of surgery patients were observed by a nurse in the recovery room who noted the time taken for them to wake up and give their own name coherently on questioning (time to self-recognition) and the presence or absence of pain. Pain was identified using a previously described system<sup>9</sup> which considers crying, facial expression, verbal complaint and posture of torso and legs to give a score of 0-10

(table 1). Those children with a score of 5 or more when fully awake were deemed to have a failed block, given IV pethidine (1-1.5 mg/kg) and excluded from the rest of the study. Nausea and vomiting also noted before transfer to the ward.

Postoperatively children were assessed at least half-hourly by the nursing staff and the time to onset of pain was noted using the above scoring system. Analgesia was then provided with paracetamol 15 mg/kg given orally. The time at which each boy spontaneously walked unaided, the incidence of nausea or vomiting and the time of first micturition were also recorded. They were allowed to eat or drink as soon as they wished. The following day the penis was examined by the surgeon for signs of hematoma or infection.

Statistical analysis of data was performed using Student's t test or chi square test, where appropriate. P<0.05 was taken as statistically significant.

#### Results

There were twenty children in each group and they were comparable for age, weight and duration of surgery (table II). There were no failed penile or caudal block.

**Table I** Modified CHEOPS pain score (0-10)

Score	0	1	2
Cry	No cry	Crying, moaning	Screaming
Facial	Smiling	Composed	Grimace
Verbal	Verbal	None or other complaint	Pain complaint
Torso	Neutral	Shifting, tense, upright	Restrained
Legs	Neutral	Kick, squirm, drawn-up	Restrained

**Table II** Distribution of Patient according to characteristic (n=40)

	Caudal	Penile	P value*
Age (years)	4.15 ± 0.81 ( 4 )	3.85 ± 0.81 ( 4 )	0.245
Weight (kg)	17.10 ± 1.55 (17)	16.75 ± 1.65 (17)	0.487
Duration of surgery(minutes)	40.50 ± 4.84 (40)	42.00 ± 2.51 (40)	0.529

\*Mann-Whitney U test was done to measure the level of significance. Data was expressed as Mean ± SD. Figure within parenthesis indicates in Median.

**Table III** *Distribution of patients according to Influence of block technique on recovery and postoperative analgesia (n=40)*

	Caudal	Penile	P value*
Time to self- recognition (min)	32.00 ± 2.51 (30)	31.00 ± 2.62 (30)	0.109
Duration of analgesia (hours)	3.75 ± 0.26 (3.75)	1.80 ± 0.25 (2.0)	Â0.001
Time of micturition(hours)	5.80 ± 0.25 (6)	2.80 ± 0.25 (3)	Â0.001
Time of walking(hours)	3.75 ± 0.26 (3.75)	3.85 ± 0.24 (4.0)	0.202

\*Mann-Whitney U test was done to measure the level of significance. Data was expressed as Mean ± SD. Figure within parenthesis indicates in Median.

The results of other variables measured are shown in table III. There was no difference between the two groups in time taken to postoperative self-recognition or time to spontaneous unassisted walking. Although both techniques, when successful, provided satisfactory postoperative analgesia, the median duration of analgesia with the caudal block was longer than with penile ring block ( $p < 0.05$ ). It also took significantly longer for boys with a caudal block to pass urine postoperatively ( $p < 0.05$ ).

There were no instances of hypotension, bradycardia, residual paralysis, or toxic reaction to bupivacaine during or after administration of any of the blocks and no evidence of hematoma or infection at the penile injection site when examined the next day.

### Discussion

Our technique of penile ring block differs slightly from that originally described using 0.25% bupivacaine 1.5 to 5 ml administered at completion of surgery<sup>8</sup>. We adapted it to a smaller volume and stronger concentration, since in preliminary assessment we found large volumes often made the penile skin appear edematous and interfered with surgery. We also performed the blocks preemptively as this reduces intraoperative anesthetic requirements and may have beneficial effects on the quality and duration of postoperative analgesia. An effective local anesthetic nerve block should provide virtually complete pain relief and therefore we used the previously validated modified CHEOPS behavioral scoring system<sub>9</sub> to ascertain whether or not the block had been successful rather than attempting a qualitative analgesic score which is very difficult to accurately determine in children.

Circumcision results in severe pain during the first two hours postoperatively after which analgesic requirement diminish<sup>10</sup>. Both blocks were generally effective during this two- hour period although the median duration of analgesia with the caudal technique was twice as long. Paracetamol provide satisfactory analgesia following the return of sensation all patients.

Previous studies involving caudal block in children have used various dose schedules, with those using higher doses and stronger concentrations producing a 100% success rate but a higher incidence of motor weakness<sup>2</sup>. The dose of caudal bupivacaine we used is slightly larger than that recommended by Armitage<sup>11</sup>, as it has been our experience that 0.5 ml/kg of 0.25% bupivacaine does not give reliable analgesia in all patients has a previously reported failure rate of 4%<sup>3</sup>. We found 0.75 ml/kg to be 100% effective for analgesia.

Pediatric circumcisions are often performed as day case and the ability to walk unaided is one of the criteria for postoperative discharge. It is well known that caudal block can adversely affect this<sup>3,12</sup>. However, our subjects were in-patients and not actively encouraged to ambulate, if they were happy playing in bed or sleeping, in order to minimize anxiety and distress. As there was no difference in the time taken for them to walk spontaneously and no assistance was necessary at this time, motor weakness was obviously not a clinical or practical problem for these boys. However, the higher caudal dose might have been expected to have an effect on early if we had been seeking discharge home within four hours following surgery.

The results showing a longer time to micturition in children receiving caudal block. This is to be expected since subcutaneous penile ring block has no effect on autonomic innervation of the bladder. Caudal epidural local anesthesia inhibits the sacral parasympathetic outflow from the spinal cord as well as affecting somatic afferent and efferent conduction and may, therefore, result in disturbances of micturition<sup>3</sup>. However, in our experience, this does not appear to cause any clinical problem and requires no medical intervention.

In our study there was no incidence of nausea and vomiting. The possible contributing factors include the use of propofol as an induction agent<sup>13</sup>, the preemptive administration of the block leading to a decreased inspired concentration of volatile anesthetic agent, and avoiding active early mobilization postoperatively. Good regional analgesia and a low incidence of postoperative nausea and vomiting are particularly important in day case surgery for children<sup>14</sup>.

### Conclusion

We have demonstrated that subcutaneous penile ring block is a safe and effective method of providing post-circumcision analgesia. It avoids the potential dangers of dural puncture, sepsis, or intravenous injection of large volume of local anesthetic. Though caudal block is superior in terms of its reliability and duration of action but subcutaneous penile ring block should be considered as a safe and technically easier alternative.

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