

## Penile block is associated with less urinary retention than caudal anesthesia in distal hypospadias repair in children

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### Abstract

**Background** Caudal anesthesia (CA) is widely recommended due to excellent analgesia in distal hypospadias repairs, but its potential side effect on urinary retention interferes with patient comfort. To objective is to determine the impact of CA versus penile block (PB) on postoperative micturition.

**Methods** Sixty distal hypospadias repairs performed over a 48-month period were analyzed concerning the impact of applied analgesia on postoperative micturition. Inclusion criteria were Mathieu or Snodgrass procedures, use of a non-dribbling urethral stent, CA or PB. Endpoint was first postoperative micturition (<6 h), or treatment of delayed postoperative micturition (>6 h).

**Results** CA was used in 27 and PB in 33 cases. Compared groups had similar age (mean: 31 months, range 12–68 vs. 28 months, range: 14–145), weight (mean: 13 kg, range 9–18 vs. 15 kg, range 8–59), operation duration (mean 61 min, range 30–105 vs. mean 67 min, range 35–120) and surgical technique (Mathieu/Snodgrass: 7/20 CA vs. 19/14 PB). Micturition was significantly less impaired in the PB than CA group (5/33 vs. 15/27;  $p < 0.05$ ). Delayed or non-micturition was successfully treated in 4 and 14 patients, respectively, by cholinergic agonists. One patient of each group required a suprapubic drain on the first operative day after unsuccessful medical treatment.

**Conclusions** In our series, children undergoing distal hypospadias repair experienced significantly less impaired micturition when using penile block instead of caudal anesthesia. We recommend penile block as the first choice perioperative analgesia, when spontaneous postoperative micturition must be guaranteed.

**Keywords** Distal hypospadias repair · Children · Penile block · Caudal block anesthesia · Urinary retention · Micturition impairment

### Introduction

For decades, penile block anesthesia was widely and effectively used for various types of penile reconstructive surgery. Recently, due to improved composition, dosage and concentration of local anesthetics [1, 2], and low incidence of negative side effects such as motor blockade and postoperative nausea and vomiting [3], caudal anesthesia has become one of the most used and accepted regional blocks for children undergoing hypospadias repair [1, 4].

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 anesthesia and its incidence in larger series of infraumbilical surgical procedures ranged from 0.7 to 5.3%, while hypospadias repair seems to cause urinary retention more than other procedures [4, 5].

With routine use of caudal block anesthesia for hypospadias repair since 2003, we observed several cases of

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urinary retention after distal hypospadias repair. Therefore, we reintroduced penile block anesthesia for a consecutive series of children scheduled for distal hypospadias repair from the end of 2005.

The aim of our retrospective study was to compare the incidence of impaired postoperative micturition in a consecutive group of patients with penile block with a former caudal anesthesia group.

## Patients and methods

### Study population

The study included 60 distal hypospadias repairs from December 2003 to November 2007. 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. Patients with glandular or proximal type, need of chordee excision, and placement of a suprapubic drain were excluded from the study. In addition, patients with successfully applied regional anesthesia as described by Silvani et al. [2] were included. Patients not suitable for caudal anesthesia, due to underlying contraindicating disease, were excluded.

Until December 2005, distal hypospadias repair was performed under caudal anesthesia and penile anesthesia in a consecutive series thereafter. Three re-do procedures were performed within the penile block anesthesia period from December 2005, and after former caudal anesthesia in one patient.

Primary endpoint of the study was first postoperative micturition and the incidence of impairment. Secondary endpoints were type and duration of operation, postoperative pain assessment, stent problems, and type of medical or surgical treatment to relieve micturition impairment.

### Anesthesia

General anesthesia was induced with sevoflurane in oxygen via facemask and remifentanyl ( $1 \mu\text{g kg}^{-1}$ ) and rocuronium ( $0.5 \text{ mg kg}^{-1}$ ) were used thereafter to facilitate tracheal intubation. Maintenance of anesthesia was routinely performed with sevoflurane in an oxygen/air mixture and a continuous intravenous infusion of remifentanyl at a dosage of  $0.1\text{--}0.5 \mu\text{g kg}^{-1} \text{ min}^{-1}$ . Additionally, each patient received an isotonic electrolyte solution (Jonosteril<sup>®</sup>, Fresenius, Bad Homburg, Germany) at a dosage of  $5\text{--}10 \text{ ml kg}^{-1} \text{ h}^{-1}$ , adding 1% glucose for children up to 2 years of age.

Caudal anesthesia was used in 27 patients from December 2003 to November 2007. At the end of the

operation, we used the standard technique in lateral decubitus position and all patients received a “high volume, low concentration” caudal anesthesia ( $1 \text{ ml kg}^{-1}$  ropivacaine 0.2%) [2, 4].

Penile block was used at the end of the surgical procedure in 33 patients (December 2005–November 2007) by applying  $0.2 \text{ ml kg}^{-1}$  bupivacaine 0.5% to anesthetize dorsal penile nerves subpubic via one puncture in the midline as described elsewhere [2, 6].

### Surgical technique

All procedures were performed by pediatric surgeons experienced in penile reconstructive surgery. Details of the Mathieu and the modified Snodgrass techniques were performed as described elsewhere [7, 8]. To unburden the distal part of the urethra, we placed an 8 or 10 French urethral stent in the perineal part of the urethra at the end of the procedure to allow spontaneous micturition. The stent was removed after 7 days postoperative.

The first micturition was defined as delayed after 6 h postoperatively. Treatment of delayed micturition due to urinary retention included application of cholinergic agonists (carbachol;  $0.05\text{--}0.1 \text{ mg kg}^{-1} \text{ day}^{-1}$  s.c.) or, if necessary, placement of a suprapubic drainage. Pain was assessed by the attending nurse using the Children’s and Infant’s Postoperative Pain Scale (CHIPPS) [9] in children younger than 4 years and the Smiley Scale and Visual Analogue Scale (VAS) in older children [10, 11]. Postoperative analgesia included paracetamol (max  $90 \text{ mg kg}^{-1} \text{ day}^{-1}$ ), metamizole (max  $40 \text{ mg kg}^{-1} \text{ day}^{-1}$ ) and, in children weighing less than 10 kg ibuprofen (max  $30 \text{ mg kg}^{-1} \text{ day}^{-1}$ ). Rescue analgesia treatment was provided with intravenous nalbuphine ( $100 \mu\text{g kg}^{-1} \text{ body-weight}^{-1}$ ).

### Statistical analysis

Data of patient characteristics are given as median, mean and range. Statistical comparison was performed using the Student *t* test after testing for normal distribution (SigmaStat-Software, Jandel Scientific). The incidence of impaired postoperative micturition was compared using the Chi-Square-test. Significance was assumed at a *p* value of less than 0.05.

## Results

Patient demographics, including age and weight distribution and operation duration in compared regional anesthesia groups, were not statistically different and are shown in Table 1.

**Table 1** Demographics of patient and operation duration when caudal block versus penile block anesthesia was used

Patient characteristics	Caudal anesthesia ( <i>n</i> = 27)	Penile block anesthesia ( <i>n</i> = 33) <sup>a</sup>	Significance
Mean age (range) [median]	31 months (12–86) [26]	28 months (14–145) [19]	NS
Mean weight (range) [median]	14 kg (9.2–15.7) [13]	15 kg (8–59) [12]	NS
Mean operation time (range) [median]	61 min (30–105) [60]	67 min (35–120) [65]	NS

<sup>a</sup> Including 3 re-do procedures

Micturition was considered unimpaired up to 6 h postoperative in 40 out of 60 distal hypospadias repairs (67%). Postoperative impaired micturition was noticed after 20 hypospadias repairs and its incidence was significantly higher after caudal block compared to penile block anesthesia [15/27(45%) vs. 5/33 (15%),  $P < 0.05$ ] as shown in Table 2.

Twenty-six of 60 distal hypospadias repairs (43%) were Mathieu, whereas 34 (57%) were modified Snodgrass procedures. Distribution of the types of distal hypospadias was similar in compared regional anesthesia groups (caudal vs. penile: distal penile 3/5; subcoronal 15/17; coronal 9/11). Micturition impairment occurred in 7 Mathieu and 13 Snodgrass cases, with no significant difference between the type of surgical repair [7 of 26 (27%) vs. 13 of 34 (38%); n.s.], which excludes an impact of the surgical technique. There were no cases of catheter blockage.

Analysis of type of surgical repair within regional anesthesia groups revealed delayed micturition after 4 Mathieu/11 Snodgrass procedures in caudal versus 3 Mathieu/2 Snodgrass repairs in penile block groups. Urinary retention was the leading symptom in the majority of the 20 patients with delayed micturition (14 caudal, 5 penile block anesthesia). Treatment with cholinergic agonists was successful in 14 (3 Mathieu, 11 Snodgrass), respectively, in 4 (3 Mathieu, 1 Snodgrass) cases, whereas one patient of each regional anesthesia group required intermittent suprapubic drainage on the first postoperative day after Snodgrass repair (Table 2). Pain assessment, as well as applied analgesics, revealed similarity in

compared groups. Painful micturition was observed in one patient after caudal block anesthesia. No patient in our series required rescue analgesia with nalbuphine.

## Discussion

Caudal block anesthesia has almost replaced the use of penile block anesthesia for various infraumbilical surgical procedures in children [1–4, 12, 13]. The majority of studies on caudal block anesthesia are focused on lasting analgesia and reduced side effects [1–4], but the problem of impaired postoperative micturition is somewhat underestimated in these reports. Moreover, the reported spectrum of the type of infraumbilical surgery and penile surgery was inhomogeneous in these series.

Our results indicate, for the first time, that the rate of impaired postoperative micturition was significantly higher in children undergoing caudal compared to penile block anesthesia. The association of micturition and regional anesthesia was given because of the homogeneity of compared regional anesthesia groups, as our results were affected neither by the type of the two surgical techniques nor by the distribution of distal hypospadias types.

Besides type of regional anesthesia, there are several other factors influencing postoperative voiding behavior. Postoperative voiding patterns in infants and children depend on the type of regional anesthesia, intraoperative application of additional analgesics, the grade of bladder distension, hydration, bladder capacity, psychomotor state

**Tab. 2** Number of patients with impaired postoperative micturition in groups with caudal anesthesia versus penile block anesthesia with regard to symptoms and treatment

Micturition impairment	Caudal anesthesia ( <i>n</i> = 27)	Penile block ( <i>n</i> = 33) <sup>a</sup>
Delayed micturition >6 h postoperatively	15	5
Symptoms		
Urinary retention	14	5
Painful micturition	1	None
Stent problems	None	None
Treatment		
Medical	14	4
	Cholinergic agonists	Cholinergic agonists
Need of operative intervention	1 Suprapubic drainage (1. postop. day)	1 Suprapubic drainage (1. postop. day)

<sup>a</sup> 15/27 versus 5/33;  $P < 0.05$

of arousal, psychosocial status of the child and individual voiding habits, and a wide range of 2–20 daily voids in different age groups [14]. Koomen et al. [15] suggested ultrasound scan to detect postoperative urinary distension after caudal anesthesia. We have no data on postoperative bladder filling as we did not perform ultrasound studies, but we observed similar conditions in our groups such as operation duration, surgical technique and application of a standardized intraoperative fluid substitution regime. We defined impaired micturition as more than 6 h postoperative. This is in contrast to Koomen et al. who rated a normal postoperative voiding within 12 h [15], but this time interval might be too long and not acceptable, especially in younger infants.

In our series, regional block anesthesia was generally performed at the end of the operation. This is in contrast to reports by Chhibber et al. [16], who suggested penile block before and after penile surgery, as well as Silvani et al. [2], who recommended caudal block anesthesia at the beginning and the end of the operation. As we did not observe any need for rescue analgesics, we consider our regional block anesthesia regimen as sufficient.

In our series, micturition impairment was not related to the type of reconstructive procedure, i.e. Mathieu or Snodgrass and re-do procedures (3 patients). Placement of transurethral stents in distal hypospadias repair is a matter of debate [7, 17]. Like others [18], we unburden the distal urethra with intermittent urethral stents for one week.

A Cochrane Database Systemic Review from 2008 [19] comparing caudal epidural block versus 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. The authors postulated that the evidence from trials is still limited by small numbers and poor methodology [19]. Similarly, there is still lack of comparable data for distal hypospadias repair in children. Therefore, a randomized prospective trial is needed.

## Conclusions

In our series, children undergoing distal hypospadias repair experienced significantly less impaired micturition when penile block was used instead of caudal anesthesia. Thus, with regard to postoperative patient comfort, we recommend penile block as the first choice of perioperative analgesia, when spontaneous postoperative micturition is warranted.

**Conflict of interest statement** There is no conflict of interest.

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