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Post-operative complications of subcoronal hypospadias repair in patients receiving caudal block vs. penil block: A comparative study

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Abstract

Objective: The aim of this study was to evaluate the potential impact of caudal nerve block anesthesia on the surgical outcomes of hypospadias repair in male patients aged between 6 and 48 months.

Materials and methods: The study successfully recruited 75 patients dividing two groups, group 1 (Penil block: PB) and group 2 (Caudal block: CB). The following parameters were assessed for each patient: Age, duration of surgery, analgesia requirements, wound dehiscence, fistula formation, meatal stenosis, urethral diverticula, and urethral stricture.

Results: This study involving 75 patients divided into two groups, Group 1 (40 patients) had an average age of 38 ± 23 months and weight of 14.6 ± 4.8 kg, while Group 2 (35 patients) averaged 42 ± 19 months in age and 17.1 ± 8.2 kg in weight. Operative times were comparable between groups. Post-operatively, around 45-49% of participants in both groups required further analgesia within 24 hours. Observations of surgical complications, including fistula, meatal stenosis, urethral stenosis, urethral diverticula, urethral dehiscence, and Chordee, revealed minor variations between groups. However, none of these differences reached statistical significance, indicating similar outcomes for both groups ($p > 0.05$ for each comparison).

Conclusions: Both anesthetic techniques appear safe, and the choice should be based on individual clinical judgment and patient-specific factors.

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Introduction

Hypospadias is one of the most common congenital malformations in male infants, affecting approximately 1 in every 200-300 live male births. This condition is characterized by an abnormal location of the urethral meatus, which is positioned on the ventral aspect of the penis, anywhere from the glans to the perineum. The severity of hypospadias can vary significantly, and the management and prognosis are influenced by the degree of the malformation (1-3).

Management of hypospadias is primarily surgical, aiming to achieve functional and cosmetic correction. However, the surgery is often complex and can be associated with a significant risk of complications, such as fistula formation, wound dehiscence, urethral stricture, and dissatisfaction with cosmetic outcomes. These complications can necessitate further surgical interventions and can have substantial psychological impacts on patients and their families. Hence, the search for optimal surgical techniques and postoperative management strategies that can reduce these complications is ongoing (4,5).

The use of a caudal nerve block has been suggested as a potential risk factor contributing to complications in hypospadias surgeries. This was first reported by Kundra et al. (6) in 2012, who noted a fistula rate of 19.2% in patients who received a caudal nerve block during a single-stage hypospadias repair, compared to a 0% fistula rate in those who received a penile block. Caudal nerve block, a regional anesthetic technique, is commonly used in pediatric sub-umbilical surgeries, and its safety and effectiveness as an anesthetic have been well-established. However, since Kundra and his team's initial findings, the use of caudal anesthesia during hypospadias repair has been a topic of ongoing debate.

The primary aim of this study is to evaluate the potential impact of caudal nerve block anesthesia on the surgical outcomes of hypospadias repair in male patients aged between 6 and 48 months.

Materials and methods

Research design and participant demographics

This research is a retrospective study. The study population consisted of male patients aged between 6 and 48 months who were in need of hypospadias surgery. The research activities conducted from June 2020 to June 2023.

The study successfully recruited 75 patients dividing

two groups, group 1 (Penil block: PB) and group 2 (Caudal block: CB). The following parameters were assessed for each patient: Age, duration of surgery, analgesia requirements, wound dehiscence, fistula formation, meatal stenosis, urethral diverticula, and urethral stricture.

Eligibility criteria

The study included male patients aged between 6 and 48 months with subcoronal hypospadias. However, certain conditions resulted in exclusion from the study. These conditions included patients who needed a two-stage hypospadias repair, those with a glans width less than 14 mm, or those requiring pre-operative testosterone administration as per the surgeon's assessment. Additionally, patients with a history of previous hypospadias repair, skin lesions at the epidural site, coagulopathies, anesthetic allergies (particularly to Bupivacaine hydrochloride), spinal anomalies, chronic granulomatous disease, diabetes, or those on corticosteroid treatment were also excluded.

Ethical approval

The study adhered to all relevant ethical guidelines, consistent with the guidelines set forth by the overseeing committee on human experimentation (both institutional and national levels) and in line with the Helsinki Declaration of 1975, as amended in 2013. The ethical approval was obtained from Mardin Artuklu University local ethical committee (no: 2023/8-4 and date 07.08.2023).

Operative technique

All procedures were carried out under general anesthesia. Antibiotics were administered intravenously one hour before the operation for prophylaxis. The surgical procedure began with a U-shaped incision around the hypospadiac opening, extending to both sides of the plate. The skin was degloved and the glanular wings dissected. A restricted midline cut was made solely within the urethral plate. Following this, the urethral plate was formed into a tube over a 6- or 8-Fr catheter in two stages: initially with continuous subcuticular 6/0 Vicryl stitches, then with interrupted subcuticular 6/0 Vicryl stitches. A flap was crafted from the dartos fascia and positioned atop the newly-formed urethra. The glanuloplasty used 6/0 PDS stitches. A tourniquet was deployed and the glanular wings were dissected for a period less than 15 minutes. No patient received subcutaneous epinephrine during the procedure. At the procedure's conclusion, PB was carried out by the surgeon employing 0.25% bupivacaine, dosed

at 1 mg/kg. We chose to do the PB post-surgery to avert tissue extravasation in the dissected region. An anesthesiologist administered CB prior to the surgery using 0.25% bupivacaine at a dosage of 1 ml/kg.

Every patient stayed in the hospital for a minimum of 3 days, with the urethral catheter being taken out on the seventh day after surgery. Once released from the hospital, patients had routine check-ups in the outpatient department at intervals of 1 week, 1 month, and 3 months, and subsequently every 3 months for the initial year. From the second year onwards, the check-ups were conducted annually.

Statistical analysis

Data gathered from the study were analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to encapsulate the data. The independent t-test and chi-square test were used to compare continuous and categorical variables, respectively. Statistical significance was defined as a p-value less than 0.05.

Results

The study involved a total of 75 participants who were categorized into two distinct groups (group 1= 40 patients and group 2=35 patients) The average age in months for group 1 was 38±23 and for group 2 was 42±19 (p>0.05). Participants in group 1 had an average weight of 14.6±4.8 kg, while those in group 2 weighed 17.1±8.2 kg on average (p>0.05). The mean

operative time for group 1 was 94±17 minutes and 98±26 minutes for group 2. In group 1, 18 participants (45%) needed further analgesia after 24h, while in group 2, 17 participants (49%) required it (p<0.05). Fistula formation was observed in 1 participant (3%) from group 1 and 2 participants (6%) from group 2. There was no statistically significance between groups in term of fistula formation after surgery (p>0.05). In the assessment of meatal stenosis, group 1 demonstrated a prevalence rate of 5% (n=2). Conversely, group 2 showed a slightly elevated incidence at 9% (n=3). However, the difference was not statistically significant (p>0.05). When evaluating urethral stenosis, group 1 presented with a single case, representing 3% of its participants. group 2, however, recorded 2 cases, which is 6% of its population (p>0.05). Neither group showed any incidence of urethral diverticula. An interesting observation was made concerning urethral dehiscence, where both group 1 and group 2 reported an identical rate of 10% and 11%, respectively. This translates to 4 individuals from each group experiencing this condition (p>0.05). Chordee's postoperative observation was minimal and identical in both groups, with only a single participant (3%) from each group showing the condition (p>0.05) (Table 1).

Table 1: Comparison of the demographics and outcomes between groups

	Group 1 (n=40)	Group 2 (n=35)	p-value
Age (months)	38±23	42±19	>0.05
Weight (kg)	14.6±4.8	17.1±8.2	>0.05
Operative time (min)	94±17	98±26	>0.05
Analgesia need at 24h*	15(45%)	17(49%)	>0.05
Fistula*	1(3%)	2(6%)	>0.05
Meatal stenosis*	2(5%)	3(9%)	>0.05
Urethral stenosis*	1(3%)	2(6%)	>0.05
Urethral diverticula*	0(0%)	0(0%)	>0.05
Urethral dehiscence*	4(10%)	4(11%)	>0.05
Chordee*	1(3%)	1(3%)	>0.05

* n(%), Chi-square test; other items independet T-test.

Discussion

The efficacy of caudal blocks on postoperative outcomes after pediatric hypospadias correction remains a topic of discussion (5-7). Some medical professionals theorize that caudal blocks might induce penile swelling, leading to tissue inflammation that subsequently affects wound healing (8-10). Nevertheless, a clear biological rationale explaining the potential adverse outcomes associated with caudal blocks remains elusive. In 2019, a meta-analysis by Tanesco et al. (11) pointed to increased postoperative complications in patients administered caudal blocks. However, two later cohort studies expanded this evidence base significantly. Research from Adler et al. (12) in 2021 and Ngoo et al. (13) in 2020 contributed data from an additional 1104 patients, enhancing the sample size for analysis by more than half. Importantly, these studies included outcomes from an added 14 and 8 surgeons, respectively. Past research often had a restriction with mostly a single surgeon performing the surgeries, limiting the generalizability of results.

Earlier studies indicating an elevated risk of complications after hypospadias corrections due to caudal blocks had several shortcomings. Kim et al.'s research cataloged various complications, including meatal stenosis, infection, and hematoma (14). Yet, when considering fistula development, the rates were almost identical between those given a caudal block (12.0%) and those with a penile block (11.9%) (14). Braga et al.'s study identified only the meatal location/ventral curvature as a stand-alone risk factor for fistula or GD post hypospadias surgery (15). Their findings didn't statistically support the notion that caudal blocks increased complication risks. Kundra et al. (6) conducted the sole prospective study in this context, primarily centered on post-surgical pain management. Within their research, they identified five fistula complications, all within the caudal block cohort.

Ngoo et al. (13) conducted a forward-looking study based on the experiences of eight surgeons, concluding that the use of penile nerve block could increase the likelihood of subsequent surgeries after distal hypospadias repair. In another comprehensive review and meta-analysis, Zhu et al. (16) found that CB was a reliable method for hypospadias repair, showcasing equivalent success rates and postoperative pain relief after distal hypospadias surgery. Interestingly, CB seemed to produce superior results after surgeries for proximal hypospadias. However, they highlighted a potential selection bias in the studies they examined.

Our study, which assessed 75 participants divided into two groups, offers further insights into this matter.

While there were slight variances in operative times, further analgesia needs, and the presence of certain postoperative complications like fistula, urethral stenosis, and meatal stenosis between the two groups, none of these differences reached statistical significance. It is also worth noting that both groups demonstrated an equal rate of urethral dehiscence, indicating that this complication might not be primarily influenced by the choice of block. This aligns with Kundra et al.'s study, the only prospective research primarily focusing on post-surgical pain management, which identified all fistula complications within the caudal block group. This observation calls for further scrutiny.

This research presents certain limitations. Firstly, it utilized a retrospective approach. Secondly, the groups exhibited nearly identical outcome rates. For a more consistent study group, we focused solely on patients with subcoronal hypospadias who had undergone TIPU by the same surgeon.

Conclusions

In this comparative study of post-operative complications in hypospadias repair between caudal block and penile block, no statistically significant differences were observed. Both anesthetic techniques appear safe, and the choice should be based on individual clinical judgment and patient-specific factors.

Conflict of interest:

The authors report no conflict of interest.

Funding source:

No funding was required.

Ethical approval:

The ethical approval was obtained from Mardin Artuklu University local ethical committee (no: 2023/8-4 and date 07.08.2023).

Informed consent:

Written informed consent was obtained from the parents.

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No

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Externally. Evaluated by independent reviewers working in at least two different institutions appointed by the field editor.

Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Contributions

Research concept and design: **SS**

Data analysis and interpretation: **SS**

Collection and/or assembly of data: **SS**

Writing the article: **SS**

Critical revision of the article: **SS**

Final approval of the article: **SS**

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