

Evaluation of the effect of preoperative caudal epidural block on early complications of hypospadias in distal hypospadias surgery

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ABSTRACT

Aims: Hypospadias is an anomaly of the urogenital system with an incidence of approximately 0.5% in children. Caudal epidural block (CEB) is one of the most preferred analgesia methods in hypospadias surgery. Recently, there have been reports in the literature about an increase in postoperative complications (especially fistula) due to CEB after hypospadias surgery. In this study, we aimed to retrospectively evaluate the effect of CEB analgesia on surgical outcomes in distal hypospadias surgery performed in our center.

Methods: The study included 63 pediatric patients operated for distal hypospadias between 2020 and 2023. These patients were divided into two groups according to whether CEB was applied during surgery. Patients were evaluated in terms of surgical technique, age, and complications.

Results: Sixty-three pediatric surgeries with a mean age of 45.12 ± 26.76 months ranging from 1 to 10 years were analyzed. Sixty-three cases with subcoronal hypospadias were included in the study. Twenty-two cases (41.3%) underwent CEB, while 37 cases (58.7%) received intravenous analgesia (IA). The surgical complication rate in our study was 30.1% (n=19). There was no significant difference in postoperative complications between CEB and IA groups (p=0.197).

Conclusion: In this study, there was no statistically significant difference in the incidence of postoperative complications between CEB and IA in children operated for distal hypospadias. CEB can be used as a safe pain management method in hypospadias repair. However, we think prospectively designed studies with more patients will be more helpful in clarifying the issue.

Keywords: Anesthesia, epidural, caudal, child, hypospadias, postoperative complications

INTRODUCTION

Hypospadias is one of the most common congenital urogenital anomalies, with a prevalence of approximately 0.5%.¹ There is still controversy about the analgesic methods used for hypospadias surgery in the perioperative period.

The complication rate of distal hypospadias surgery varies between 5% and 10%. Each procedure performed after the complication develops increases the complication rate even more.^{2,3} The most common long-term complications are fistula, meatal stenosis, tissue or glans separation, chordee, and diverticulum.^{2,4}

In hypospadias surgery, it is essential to reduce postoperative pain in the early postoperative period until routine oral analgesia is initiated. There are many methods for early postoperative pain relief; penile block, caudal epidural block (CEB), and intravenous/ oral analgesics are frequently used for this purpose. CEB and intravenous analgesia (IA) are the most used methods among these methods. However, publications indicate that CEB, which has recently been widely used in hypospadias surgery, causes more postoperative complications.⁵⁻⁸ Our study aimed to compare these two methods regarding postoperative surgical complications.



METHODS

The study was conducted with the permission of the Clinical Researches Ethics Committee of University of Health Sciences Gülhane Training and Research Hospital (Date: 27.09.2023, Decision No: 2023/209), the records of 103 hypospadias cases performed between 2020 and 2023 were retrospectively analyzed. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. Data such as operative procedures, patients' ages, or outcomes were obtained from patient digital archives. Patients who underwent their first operation in a different center and operated in our center due to a fistula or another complication were excluded from the study. A total of 63 patients who were operated on for distal hypospadias, who had not undergone previous surgery, and who underwent tubular incised plate urethroplasty (TIPU) technique were included in the study. The pressure dressing was opened on the 3rd day, the urethral catheter was withdrawn on the 7th day postoperatively, and the patients were discharged. Patients were followed up at 1 week, 1 month, 3 months, 6 months, 1 year, and then annually after discharge. Surgical complications (according to the Clavien-Dindo grading system, Grade III complications), fistula development, and meatal stenosis were evaluated.

Patients were divided into two groups: CEB and IA groups. In the IA group, paracetamol IV at 10 mg/kg and pethidine HCL at 0.5 mg/kg/dose were administered at the end of surgery (before extubation). In the CEB group, CEB (0.2 ml/kg 0.25% bupivacaine) was performed using a Tuohy needle under preoperative ultrasound (USG) guidance. In both groups, IA was given at the 4th hour postoperatively, and oral analgesia was given afterward.

Statistical Analysis

The Kolmogorov-Smirnov and Mann-Whitney U tests were used to compare the data, and the Student t-test was applied after normal distribution. Jamovi open-source software package version 2.3.26 was used for all statistical procedures.

RESULTS

The study included 63 patients, divided into the CEB group (n=26) and the IA group (n=37). The mean age was 45.12±26.76 months (12-108 months) in the CEB group and 47.28±25.56 months (12-120 months) in the IA group. The difference between the ages was not statistically significant (p=0.197).

Our study's surgical complication rate (Clavien-Dindo III grading system) was 30.1% (n=19). When the patients were evaluated in terms of complications (urethral fistula, meatal stenosis), 4 (15.3%) of a total of 14 (22.2%) urethral fistula cases were observed in the CEB group and 10 (27.0%) in the IA group. The sum of the complication rate for meatal stenosis was 5 (7.9%) patients, such as 3 (11.5%) in the CEB group and 2 (5.4%) in the IA group. Patients in both groups responded thoroughly to one-time dilatation. There was no statistically (Chi-Square) significant difference between IA and CEB groups in terms of development of urethral fistula (p=0.639) and meatal stenosis (p=0.375) (Table).

The mean age of patients who developed complications was 51.24±25.44 months (12-120 months), and the mean age of patients who did not develop complications was 43.8±25.32 months (12-108 months); this difference was not statistically significant (p=0.407).

Table. Development of fistula and meatal stenosis after CEB and IA in pediatric patients with distal hypospadias and age correlation

	CEB	IA	Total
n	26 (41.3%)	37 (58.7%)	63 (100%)
Mean age (months)	45.12	47.28	46.38
SD	26.76	25.56	25.56
Min. (months)	12	12	12
Max. (months)	108	120	120
Complications	7	12	19
Meatal stenosis	3 (15.6%)	2 (10.4%)	5 (26%)
Fistula	4 (21.5%)	10 (52.5 %)	14 (74%)

CEB: Caudal epidural block, IA: Intravenous analgesia, SD: Standard deviation, Min: Minimum, Max: Maximum

DISCUSSION

Hypospadias surgery and related complications are still a challenging problem for pediatric urologists. Numerous surgical techniques to cope with this issue prove this requirement. Another issue that challenges physicians in hypospadias surgery is the fact that different results are obtained in cases with hypospadias of almost similar severity degree despite performing as standardized as possible surgical procedures.⁵⁻⁹ This issue has necessitated a detailed examination of the dressing, analgesia, and surgery materials. Recent studies have raised questions about the effect of perioperative analgesia methods on the success rates of hypospadias surgery. Some of the studies, which are pretty limited in number, report the negative impact of CEB on surgical outcomes, while others claim that it does not affect postoperative outcomes.⁹⁻¹³

In a study by Kim et al.¹⁴ it was reported that caudal block caused pelvic congestion and associated penile edema during hypospadias repair and could potentially cause postoperative complications, especially urethral fistula. The primary physiopathological mechanism is vasodilatation in the penile sinuses due to sympathetic block and consequent pelvic venous stasis.¹¹ In our series, significant penile edema was observed in both groups, and it is often not possible to avoid penile edema in surgery of this region. Therefore, since no significant penile edema difference was observed in both groups, we think it is impossible to differentiate postoperative complications related to the analgesic method from surgical penile edema. Our opinion is consistent with the data in a multicenter study by Hu et al.¹⁵

Development of urethral fistula is one of the most common complications after hypospadias surgery. Fistula development after distal hypospadias was reported to be between 0-65% in a meta-analysis, including 17 studies.¹⁶ In our study, the rate of the urethral fistula was 15.3% in the CEB group, 27% in the IA group, and 22.2% in total. No statistically significant difference was found between the groups (p=0.274). In a study by Kim et al.¹⁴ it was reported that the rate was 2.1 times higher in patients who underwent caudal penile block compared to those who did not. Kundra et al.⁵ also associated CAB with a high surgical complication rate (especially in terms of urethral fistula development) due to pelvic congestion in hypospadias patients. We think that the high rate of urethral fistula in our series is because we are a pediatric surgery training hospital.



In the same study, the rate of meatal stenosis developing after hypospadias repair was reported between 0-25%. The rate of development of meatal stenosis was calculated as 5%.¹⁶ In our study, the rate of meatal stenosis was 7.9%, slightly higher than the general average. We attribute this slightly higher rate to the limited number of cases. There were no statistically significant differences between the analgesia methods and the development of meatal stenosis between the groups in our study ($p=0.375$).

Regarding the rate of meatal stenosis after hypospadias repair, the mean age of the patients in our study was 3.76 ± 2.23 years (1-10 years). The total complication rate of meatal stenosis was 17.46%. When the mean ages of patients with and without complications were analyzed, a statistically significant difference was observed between age and the risk of surgical complications ($p=0.045$).

Caudal block is a preferred regional analgesia technique widely used in sub-umbilical procedures in children due to its safety and cost-effectiveness.¹⁷⁻¹⁹ CEB in children provides a good balance between protection and risks in the perioperative period. Data from a large European multicenter study conducted by Ecoffey and colleagues²⁰ show that regional anesthesia is safe and has a meager overall complication rate of 0.12% in children. However, CEB has some complications, even quite rare, such as epidural hematoma, dural penetration, intravascular injections, overdose, and micturition disorder. In our study, no complications related to CEB were developed.

Penile block is one of the most commonly used postoperative analgesia methods in hypospadias surgery. When the literature was reviewed, it was seen that most of the studies compared the effects of CEB and penile block. It has been reported that the analgesic substance given to the area in the penile block may partially decrease the nutrition of the tissues in the surgical area with both volume and vasoconstriction effects.⁵⁻⁸ Therefore, we think it would be more appropriate to compare CEB with intravascular analgesics to evaluate the surgical complications.

Limitations

The main limitations of this study are that it was not prospective, the number of patients was limited, and the evaluations were not performed using visual analog scale (VAS). Since our study was not prospective, the selection of patients for the IA or CEB group was based on the selection at that time and was not standardized. It has also been disregarded by potential confounding factors such as the meatus's position, the chordee's level, and the surgery duration.

CONCLUSION

In our study, CEB did not increase complications after hypospadias. Therefore, we think CEB is a safe method for postoperative analgesia in hypospadias surgery. However, prospectively designed studies in larger groups would more effectively clarify the issue.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was conducted with the permission of the Clinical Researches Ethics Committee of University of Helath Sciences

Güllhane Training and Research Hospital (Date: 27.09.2023, Decision No: 2023/209).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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