

POSTOPERATIVE PAIN MANAGEMENT AFTER HYPOSPADIAS SURGERY IN CHILDREN

Dëfrim Koçinaj¹, Lazar Todorovic², Shaban Memeti², Antigona Hasani³, Era Salihu⁴

¹University Clinical Center of Kosovo,

²University Clinic for Pediatric Surgery, Faculty of Medicine, University "St. Cyril and Methodius" University in Skopje, North Macedonia,

³Department of Anesthesiology and Reanimation, Faculty of Medicine, University of Pristina, Pristina, Kosovo,

⁴Faculty of Medicine, University of Pristina, Kosovo

Abstract

Introduction: Postoperative pain after hypospadias surgery in children causes discomfort and may delay recovery. Effective pain management shortens hospital stays and improves satisfaction. Guidelines recommend a multimodal approach combining pharmacologic therapy, local or regional anesthesia, and nonpharmacologic strategies.

Objective: To evaluate postoperative pain management in children undergoing hypospadias repair at the Department of Pediatric Surgery, University Clinical Center of Kosovo, and assess the effectiveness of different analgesic strategies.

Materials and Methods: A prospective study included 60 children over 1 year old undergoing hypospadias repair between February and October 2023. Children with prior penile surgery were excluded. Pain was measured using the Faces Pain Scale. Analgesia included opioids, nonsteroidal anti-inflammatory drugs, caudal or penile blocks, or combinations, with supplemental acetaminophen or diclofenac for pain above mild.

Results: Postoperative pain was reported in 42 children (70%), with some reporting multiple episodes. Nonsteroidal anti-inflammatory drugs alone were mostly associated with mild pain (15 reports) peaking at 2-6 hours. Caudal and penile blocks (n=10 each) produced mild to moderate pain within 2-6 hours. Penile block combined with nonsteroidal anti-inflammatory drugs (n=11) caused mainly mild pain. Caudal plus nonsteroidal anti-inflammatory drugs (n=2) and opioids plus nonsteroidal anti-inflammatory drugs (n=2) produced few scattered reports between 2-12 hours.

Conclusions: All analgesic methods relieved pain, with modest benefit for caudal block. Multimodal strategies, though limited, provided high-quality analgesia. Broader use may reduce opioid reliance, improve comfort, and enhance recovery and satisfaction in pediatric patients.

Keywords: analgesia, caudal block, NSAIDs, opioids, penile block, postoperative pain.

Introduction

Postoperative pain in children after hypospadias surgery results in significant discomfort and need effective pain management strategies. The anxiety experienced by parents regarding congenital abnormalities in their children affects the children's emotional and psychological state, leading to increased perception of pain.

Untreated postoperative pain can lead to various complications and prolong the rehabilitation process. If acute pain is not properly managed, it may develop into chronic pain, ultimately reducing the patient's quality of life. On the other hand, effective pain management results in shorter hospital stays, lower medical costs, and higher patient satisfaction.[1]

The primary objective of postoperative pain management is to minimize or eliminate pain and discomfort while minimizing side effects.[2]

The American Pain Society, with input from the American Society of Anesthesiologists, appointed an interdisciplinary expert panel to develop a clinical practice guideline promoting evidence-based, effective, and safer postoperative pain management in children and adults.[3]

Based on this guideline, below is a list of multimodal treatments for postsurgical pain:

- Systemic pharmacologic therapy

Medications that are commonly used for postoperative pain control include opioids, nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, steroids, gabapentin or pregabalin, ketamine, and lidocaine.

- Local, intra-articular, or topical techniques

Topical anesthetics, intra-articular anesthetic injections, and anesthetic wound infiltration can be used for targeted pain control.

- Regional anesthetic techniques

Types of regional anesthesia are spinal anesthesia, caudal and epidural anesthesia, and peripheral nerve blocks are widely used in surgery.

- Nonpharmacologic therapies (e.g., cognitive modalities, physical therapy, transcutaneous electrical nerve stimulation).[4,5]

Another important component of postoperative pain management is pain monitoring and assessment. Pain scales are considered to be useful tools for assessing postoperative pain and for monitoring the effectiveness of treatment. Most are based on self-reports of pain in the form of a unidimensional scale intended to represent subjective pain intensity. The visual analogue scale (VAS) and the numerical rating scale (NRS) are the most commonly used in practice.[6]. The Faces Pain Scale (FPS) is mostly used in the pediatric population. It uses six faces and can be scored on a 0-5 or 0-10 metric. [7]

Objective

The aim of this study is to determine the quality of postoperative pain management in children undergoing hypospadias repair surgery at the Department of Pediatric Surgery of the University Clinical Center of Kosovo (UCCCK), and also to assess the impact of various pain management strategies, within and after the first 24 hours.

Material and methods

This prospective study analyses 60 children who underwent hypospadias repair surgery at the Pediatric Department of Pediatric Surgery, UCCCK, between February and October 2023.

The inclusion criteria for this study were pediatric patients over one year of age who had not undergone previous penile surgery. Eligible cases included those diagnosed with glanular, subcoronal, distal penile, and midshaft penile hypospadias.

Exclusion criteria included patients with a history of previous penile surgery, severe penoscrotal hypospadias, cripple hypospadias, or Disorders of Sexual Development (DSD).

This study focuses on postoperative pain assessment. Data were collected using a questionnaire based on the Faces Pain Scale (Figure 1), completed by the surgeon or, in some cases, by the nurse in charge. The evaluation was based on information provided by the patient or by the patient's parent.

The collected data include the type of postoperative pain management, the intensity of pain experienced by the children, and the time at which the pain first occurred during the postoperative period.

Opioids, nonsteroidal anti-inflammatory drugs (NSAIDs), caudal block, penile block, or a combination of these methods were used for postoperative pain management.

If a patient reported pain exceeding the 'mild pain' level on the Faces Pain Scale, additional analgesics were administered, primarily acetaminophen (10–15 mg/kg, i.v) or diclofenac (1 mg/kg i.v).

The data obtained from these questionnaires were analyzed with statistical programs Statistica 7.1 for Windows and SPSS 23 and were presented with relevant tables and graphs, and finally, the chi-square test was calculated for the level of reliability 95% $p < 0.05$ and 99.7% $p < 0.01$.

The study was conducted according to ethical guidelines and approved by the Ethics Committee of the Kosovo Doctors Chamber, following the recommendations of the Helsinki Declaration medical guide to biomedical research involving human subjects, adopted by the 18th World Medical Assembly, Helsinki, Finland, June 1964, and as revised by the 29th World Medical Assembly, Tokyo, Japan, October 1975.[8,9]

Postoperative pain assessment protocol:

1. Postoperative analgesia has been treated with (more than one can be circled):
 - a) Caudal block
 - b) Nonsteroidal anti-inflammatory
 - c) Opioids
 - d) Penile block
2. The average level of pain is noted (more than one can be circled):
 - a) 0-1 postoperative hours
 - b) 2-6 postoperative hours
 - c) 6-12 postoperative hours
 - d) 12-24 postoperative hours
 - e) After 24 hours
3. Moderate degree of pain is marked (more than one can be circled):
 - a) 0-1 postoperative hours
 - b) 2-6 postoperative hours
 - c) 6-12 postoperative hours
 - d) 12-24 postoperative hours
 - e) After 24 hours
4. High/very high level of pain is marked (more than one can be circled):
 - a) 0-1 postoperative hours
 - b) 2-6 postoperative hours
 - c) 6-12 postoperative hours
 - d) 12-24 postoperative hours
 - e) After 24 hours
5. Duration of operation and type of hypospadias:
 - a) under 1 hour
 - b) over 1 hour
 - c) distal hypospadias
 - d) proximal hypospadias



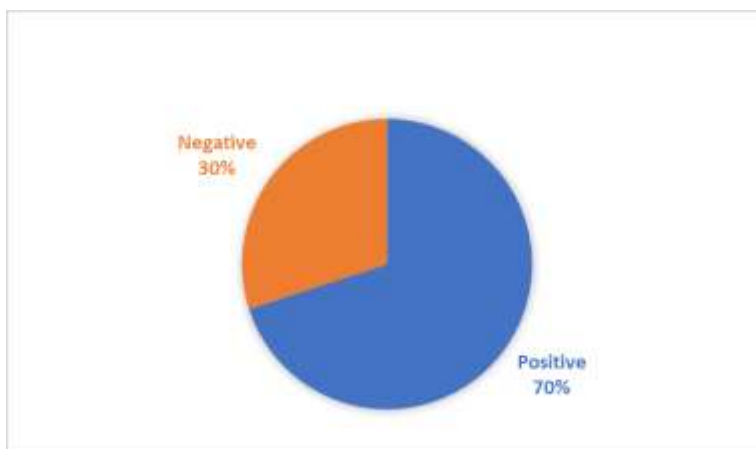
Figure 1. The Questionnaire based on the Faces Pain Scale

Results

Between February and October 2023, sixty children met the study's inclusion criteria. All the children underwent hypospadias repair surgery. The mean age of the patients was 5.5 years old.

Forty-two children (70%) experienced varying degrees of postoperative pain and required additional analgesia.

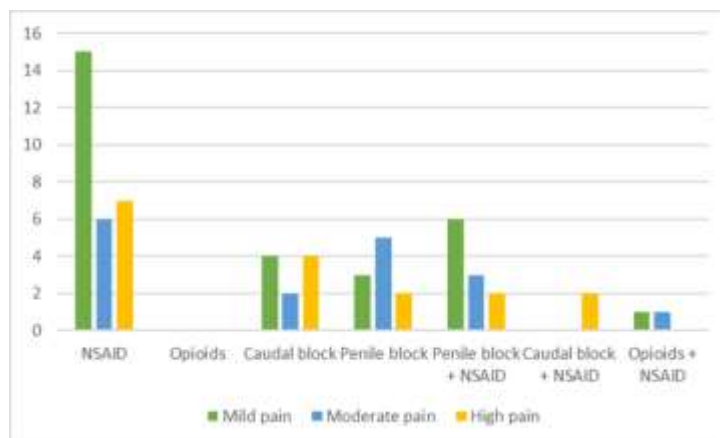
Figure 2. The chart shows the percentage of patients who experienced postoperative pain after surgery.



Postoperative pain varied according to the analgesic method, with individual patients able to report pain more than once. NSAID treatment was predominantly associated with mild pain (15 reports), with moderate and severe pain reported in 6 and 7 cases, respectively. Caudal block recipients reported mild and severe pain equally (4 each) and moderate pain in 2 cases. Penile block was most frequently associated with moderate pain (5 reports), followed by mild (3) and severe pain (2). The combination of penile block and NSAIDs primarily resulted in mild pain (6 reports), with fewer moderate (3) and severe (2) cases. Patients receiving caudal block combined with NSAIDs reported only severe pain (2 cases). Opioids combined with NSAIDs were associated with low pain levels, with 1 report each of mild and moderate pain and no severe pain.

Based on these data, at a confidence level of 99.7% ($p < 0.01$) and 95% ($p < 0.05$), no significant differences were observed between the level of postoperative pain and the method of analgesic treatment.

Figure 3. The graph shows the number of patients who experienced the respective degrees of postoperative pain



Across all analgesic methods, the majority of pain reports were recorded within the first 12 postoperative hours, with a clear peak between 2-6 hours. NSAIDs alone accounted for the highest number of reports ($n=28$), most frequently at 2-6 hours (9 reports) and 6-12 hours (8 reports), with some persisting beyond 24 hours.

Caudal block ($n=10$) and penile block ($n=10$) both showed their highest frequency within 2–6 hours (4 and 6 reports, respectively), with only occasional reports later.

The combination of penile block with NSAIDs ($n=11$) produced reports across several intervals, with a peak at 2-6 hours (4 reports) and a smaller rise at 12-24 hours (3 reports). By contrast, caudal block with NSAIDs ($n=2$) and opioids with NSAIDs ($n=2$) yielded very few reports, scattered mainly between 2-12 hours. Based on the reported data, no statistically significant differences were observed among the analgesic methods or across the time intervals of pain onset, at both the 99.7% confidence level ($p < 0.01$) and the 95% confidence level ($p < 0.05$).

Table 1. Distribution of Pain Reports by Method and Time Interval

Method	0–1 h	2–6 h	6–12 h	12–24 h	>24 h	Total
NSAID	7	9	8	2	2	28
Caudal block	3	4	1	2	0	10
Penile block	1	6	2	1	0	10

Penile block + NSAID	3	4	0	3	1	11
Caudal block + NSAID	0	1	0	1	0	2
Opioids + NSAID	0	0	2	0	0	2
Total	14	24	13	9	3	63

Discussion

Pain is a common symptom after surgery in children, resulting in multiple undesirable physiologic and psychological outcomes, and it should be managed in a multimodal approach.[10]. In this study, cases that were analyzed were treated with nonsteroidal anti-inflammatory drugs, penile block, caudal block, and combinations of the aforementioned.

Nonsteroidal anti-inflammatory drugs (NSAIDs) are considered safe and effective in the treatment of postoperative pain. Based on the literature, NSAIDs have been shown to increase patient satisfaction and decrease opioid requirements, minimizing opiate-induced adverse events.[11]

Also, a PubMed search was conducted to identify randomized controlled trials evaluating the use of conventional systemic NSAIDs as pain management for children. The results from this study suggest that NSAIDs are generally safe and effective, can reduce opioid requirements, do not compromise pain control, and are subsequently associated with similar or reduced frequencies of opioid-related adverse events (AEs), such as nausea and vomiting, in pediatric patients.[12]

The dorsal penile nerve block has already been established as an effective technique for obtaining regional penile anesthesia with small volumes of a local anesthetic. [13]

Dorsal penile nerve block immediately postoperatively has been shown to reduce postoperative pain in children undergoing hypospadias repair. [14]

Based on a study conducted by Frederick J. Goulding, it provides total relief of pain for the first 6 hours postoperatively. It is superior to analgesics in providing for quick recovery and relief of pain.[15]

Caudal block is another widely used technique of providing analgesia by depositing local anesthetics into the epidural space through the sacral hiatus, which is preferred for postoperative pain management in children, especially those who have had procedures below the umbilicus. The caudal block is being practiced as the first line for pain control over other options, including peripheral nerve blocks or treatment with opioids and other medications with an analgesic effect, due to its technical simplicity, high success rate (98 %-100%) and the ability to provide reliable analgesia. [16]

However, this was not the case in our study. In fact, based on the results of this study, no significant difference was observed in the presentation of postoperative pain in any of the aforementioned methods.

No significant difference was observed either based on the level of pain or the time of onset of pain for the different methods of postoperative pain treatment used during this study. It should be noted that a smaller amount of analgesic supplements was used in all patients treated with a caudal block.

These results are based on data obtained from The Facies Pain Scale performed in 60 pediatric patients where 45% of them were treated with NSAIDs, 16.67% were treated with penile block, 20% were treated with caudal block, 15% were treated with penile block and NSAIDs, 1.67% were treated with caudal block and NSAIDs and only 1.67% were treated with NSAIDs and opioids.

Conclusion

Our results demonstrate that all types of analgesia have been effective, with a slight advantage observed in the caudal block. Multimodal analgesia was applied to a small number of patients with high-quality analgesia.

However, the high percentage of children who experienced pain (70%) indicates that the level of analgesia was not satisfactory.

The implementation of new analgesics and a multimodal approach will lead to improved outcomes in the management of postoperative pain in children. By combining different analgesic techniques, we can enhance pain relief, reduce the need for opioids, and improve overall patient comfort. This approach ensures more effective and tailored pain management, ultimately leading to better recovery and patient satisfaction.

References:

1. Cintron L. Persistent Postsurgical Pain. *Pract Pain Manag*. 2012;12(4).
2. Horn R, Hendrix JM, Kramer J. Postoperative pain control. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2024.
3. Chou R, Gordon DB, de Leon-Casasola OA, Rosenberg JM, Bickler S, Brennan T, et al. Management of postoperative pain: A clinical practice guideline from the American Pain Society, the American Society of Regional Anesthesia and pain medicine, and the American Society of Anesthesiologists' committee on Regional Anesthesia, executive committee, and administrative council. *J Pain* [Internet]. 2016;17(2):131–57. Available from: <http://dx.doi.org/10.1016/j.jpain.2015.12.008>
4. Garimella V, Cellini C. Postoperative pain control. *Clin Colon Rectal Surg*. 2013 Sep;26(3):191-6. doi: 10.1055/s-0033-1351138. PMID: 24436674; PMCID: PMC3747287.
5. Hasani A. Regional anesthesia in children: indications and limitations. *Periodicum Biologorum*. 2015;117(2):215–8.
6. Myles PS, Myles DB, Gallagher W, Boyd D, Chew C, MacDonald N, et al. Measuring acute postoperative pain using the visual analog scale: the minimal clinically important difference and patient acceptable symptom state. *Br J Anaesth* [Internet]. 2017;118(3):424–9. Available from: <http://academic.oup.com/bja/article-pdf/118/3/424/14060157/aew466.pdf>
7. Hicks CL, von Baeyer CL, Spafford PA, van Korlaar I, Goodenough B. The Faces Pain Scale-Revised: toward a common metric in pediatric pain measurement. *Pain*. 2001 Aug;93(2):173-183. doi: 10.1016/S0304-3959(01)00314-1. PMID: 11427329.
8. World Medical Association. Declaration of Helsinki. 1964 [Internet]. Ferney-Voltaire: WMA; [cited 2025 Oct 2]. Available from: <https://www.wma.net/what-we-do/medical-ethics/declaration-of-helsinki/doh-jun1964/>
9. World Medical Association. Declaration of Tokyo: guidelines for physicians concerning torture and other cruel, inhuman or degrading treatment or punishment in relation to detention and imprisonment [Internet]. Ferney-Voltaire: WMA; 1975 [cited 2025 Oct 2]. Available from: <https://www.wma.net/policies-post/wma-declaration-of-tokyo-guidelines-for-physicians-concerning-torture-and-other-cruel-inhuman-or-degrading-treatment-or-punishment-in-relation-to-detention-and-imprisonment/>
10. Gupta A, Bah M. NSAIDs in the treatment of postoperative pain. *Curr Pain Headache Rep* [Internet]. 2016;20(11):62. Available from: <http://dx.doi.org/10.1007/s11916-016-0591-7>
11. Kokki H. Nonsteroidal anti-inflammatory drugs for postoperative pain: a focus on children. *Paediatr Drugs* [Internet]. 2003;5(2):103–23. Available from: <http://dx.doi.org/10.2165/00128072-200305020-00004>
12. Cooney MF. Pain Management in Children: NSAID Use in the Perioperative and Emergency Department Settings. *Paediatr Drugs*. 2021 Jul;23(4):361-372. doi: 10.1007/s40272-021-00449-z. Epub 2021 May 28. PMID: 34046854; PMCID: PMC8275553.
13. McPhee AS, McKay AC. Dorsal penile nerve block. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2025.
14. Chhibber AK, Perkins FM, Rabinowitz R, Vogt AW, Hulbert WC. Penile block timing for postoperative analgesia of hypospadias repair in children. *J Urol* [Internet]. 1997;158(3 Pt 2):1156–9. Available from: <http://dx.doi.org/10.1097/00005392-199709000-00118>

15. Goulding FJ. Penile Block for Postoperative Pain Relief in Penile Surgery. *Journal of Urology* [Internet]. 1981 Sep 1;126(3):337. Available from: [https://doi.org/10.1016/S0022-5347\(17\)54514-0](https://doi.org/10.1016/S0022-5347(17)54514-0)
16. Endeshaw AS, Aligaz EM, Molla MT, Mekonnen BA, Tesema AT, Dinku TA, Atero KB, Regassa TL. Review of clinical evidence of caudal block for postoperative analgesia in children with ketamine added local anesthetics. *Ann Med Surg (Lond)*. 2022 Mar 8;75:103480. doi: 10.1016/j.amsu.2022.103480. PMID: 35386802; PMCID: PMC8978094.