

*Osmangazi Journal of Medicine**e-ISSN: 2587-1579***Landmark-Guided Pudendal Nerve Block versus Penile Block for Postoperative Analgesia in Paediatric Urogenital Surgery: A Retrospective Cohort Study**

Pediyatrik Ürogenital Cerrahide Postoperatif Analjezi İçin Landmark Kılavuzlu Pudendal Sinir Bloğu ile Penil Sinir Bloğunun Karşılaştırılması: Retrospektif Kohort Çalışması

Eylem Yaşar¹, Melike Korkmaz Tokar²

¹ Muğla Eğitim ve Araştırma Hastanesi, Anesteziyoloji ve Reanimasyon Kliniği, Muğla, Türkiye

² Muğla Sıtkı Koçman Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon Anabilimdalı, Muğla, Türkiye

Correspondence / Sorumlu yazar:

Eylem YAŞAR

Muğla Eğitim ve Araştırma Hastanesi,
Anesteziyoloji ve Reanimasyon Kliniği,
Muğla, Türkiye

e-mail: eylemtarakci@gmail.com

Received : 25.03.2026

Accepted : 23.06.2026

Ethics Committee Approval: The study was approved by the Muğla Sıtkı Koçman University Medical and Health Sciences Research Ethics Committee (Decision No:66, Date:25.12.2025).

Informed Consent: The authors declared that obtaining informed consent was not required due to the retrospective nature of the study and the use of anonymized data.

Authorship Contributions: Surgical and Medical Practices: E.Y., M.K.T., Concept: E.Y., M.K.T., Design: E.Y., M.K.T., Data Collection or Processing: E.Y., Analysis or Interpretation: E.Y., M.K.T., Literature Search: E.Y., Writing: E.Y., Critical Review: M.K.T.

Copyright Transfer Form: Copyright Transfer Form was signed by author.

Peer-review: Externally peer-reviewed.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The author declared that this study received no financial support

Acknowledgments: The authors thank the surgical ward and postanesthesia care unit (PACU) nursing staff of Muğla Training and Research Hospital for their dedicated postoperative patient care and for maintaining accurate and complete clinical records.

Abstract: Postoperative pain control is a fundamental component of optimal perioperative management in patients undergoing paediatric urogenital surgery. Although pudendal nerve block and dorsal penile block are commonly used regional techniques, comparative data—particularly for landmark-guided approaches—remain limited. Therefore, this study aimed to compare the analgesic effectiveness of bilateral pudendal nerve block and dorsal penile block. This retrospective cohort study included children aged 2–10 years who underwent elective urogenital surgery under general anaesthesia between January 2024 and November 2025. Patients were grouped according to the regional block technique documented in the anaesthesia records: bilateral landmark-guided pudendal nerve block (PDB) or penile nerve block (PNB). Postoperative pain was assessed using the FLACC scale in the post-anaesthesia care unit and at 2, 6, 12 and 24 hours. Total paracetamol consumption and rescue analgesia were recorded. Ninety-nine patients were analysed (PDB: 45; PNB: 54). FLACC scores were lower in the PDB group at 6 hours (0.84 ± 1.15 vs 1.72 ± 1.37 , $p < 0.001$). Total paracetamol consumption was lower in the PDB group (109.6 ± 73.9 mg vs 188.3 ± 85.4 mg, $p < 0.001$), and fewer patients required rescue analgesia (53.3% vs 74.1%, $p = 0.03$). In this retrospective cohort study, landmark-guided bilateral pudendal nerve block was associated with lower postoperative pain scores at 6 hours and reduced analgesic consumption compared with dorsal penile block in paediatric urogenital surgery.

Keywords: Pudendal nerve block, dorsal penile block, postoperative pain, pediatric surgery, regional anesthesia

Özet: Pediyatrik ürogenital cerrahi geçiren hastalarda postoperatif ağrı kontrolü, optimal perioperatif yönetimin temel bileşenlerinden biridir. Pudendal sinir bloğu ve penil blok yaygın kullanılan bölgesel teknikler olmakla birlikte, özellikle landmark kılavuzlu yaklaşımlara ilişkin karşılaştırmalı veriler sınırlıdır. Bu nedenle, bu çalışmada bilateral pudendal sinir bloğu ile penil bloğun analjezik etkinliği karşılaştırılmıştır. Ocak 2024 – Kasım 2025 tarihleri arasında genel anestezi altında elektif ürogenital cerrahi geçiren 2–10 yaş arası çocuklar retrospektif olarak incelendi. Hastalar uygulanan blok tipine göre iki gruba ayrıldı. Postoperatif ağrı FLACC skoru ile değerlendirildi. Analjezik tüketimi ve kurtarıcı analjezi gereksinimi kaydedildi. Toplam 99 hasta değerlendirildi (PDB:45, PNB:54). 6. saatte FLACC skoru PDB grubunda daha düşüktü (0.84 ± 1.15 vs 1.72 ± 1.37 , $p < 0.001$). Toplam parasetamol tüketimi ve kurtarıcı analjezi ihtiyacı PDB grubunda daha azdı. Bu retrospektif kohort çalışmada, landmark kılavuzlu bilateral pudendal sinir bloğu, pediyatrik ürogenital cerrahide postoperatif 6. saatte daha düşük ağrı skorları ve daha düşük analjezik tüketimi ile ilişkili bulunmuştur.

Anahtar Kelimeler: Pudendal sinir bloğu, penil blok, postoperatif ağrı, pediyatrik cerrahi, bölgesel anestezi

How to cite/ Atf için: Yaşar E , Korkmaz Tokar M, Landmark-Guided Pudendal Nerve Block versus Penile Block for Postoperative Analgesia in Paediatric Urogenital Surgery: A Retrospective Cohort Study, Osmangazi Journal of Medicine, 2026;48(5):903-911

1. Introduction

Despite advances in perioperative care, postoperative pain remains a common clinical problem in paediatric patients. A substantial proportion of children continue to experience clinically significant pain during the early postoperative period despite routine analgesic strategies (1). Current international recommendations emphasise multimodal analgesia and the use of regional anaesthetic techniques to minimise opioid exposure and improve postoperative recovery in children (2).

Evidence suggests that severe acute postoperative pain may constitute a risk factor for the development of chronic postsurgical pain in children (3).

In paediatric urogenital surgery (such as circumcision, hypospadias repair, and orchiopexy), the choice of analgesic strategy should consider analgesic efficacy, rapid recovery, side-effect profile, and safety parameters, including the risks of respiratory depression, postoperative nausea and vomiting, urinary retention, and sedation (1,2). In this context, the European Society for Paediatric Anaesthesiology (ESPA) pain management recommendations emphasise multimodal analgesia, safety-oriented opioid use, and opioid-sparing strategies through regional anaesthetic techniques when appropriate (2).

Several analgesic approaches have long been used for penile procedures such as circumcision, including caudal block, dorsal penile block, systemic opioids, and topical local anaesthetics (4). A Cochrane review on pain control after circumcision included randomized trials comparing caudal block with other regional techniques, and no single method was free of disadvantages (4). Because caudal block may be associated with motor weakness, delayed discharge, and urinary retention, peripheral nerve blocks have become a more attractive option in clinical practice.

One of the most widely used peripheral techniques for penile analgesia is the dorsal penile nerve block (DPNB). The dorsal penile nerves arise from terminal branches of the pudendal nerve and run along the dorsal aspect of the penis together with the dorsal vessels. However, sensory innervation of the ventral penile surface and frenulum may also involve branches of the perineal nerve (5,6). Therefore, dorsal penile nerve block alone may not always provide complete coverage of all penile

structures, and some techniques include additional ventral infiltration or circumferential ring block to improve analgesic efficacy.

In contrast, pudendal nerve block targets the nerve at a more proximal level and may provide somatic blockade of the perineum and external genitalia (5,7). Local anaesthetic deposition at this level may therefore result in sensory blockade of the perineal branches supplying the external genitalia (8). In paediatric patients, transperineal approaches using nerve stimulation or ultrasound guidance have been reported with favourable efficacy and safety profiles. Furthermore, ultrasound guidance may reduce theoretical risks associated with blind techniques, such as rectal puncture or inadvertent intravascular injection (5,9).

Clinical studies comparing pudendal nerve block and dorsal penile nerve block in paediatric urogenital surgery have reported heterogeneous results. For example, Naja et al. reported lower early postoperative pain scores and reduced analgesic requirements with pudendal nerve block compared with dorsal penile nerve block (10). Similarly, Tutuncu et al. observed improved postoperative analgesia lasting up to 24 hours with pudendal block in children undergoing circumcision (11). However, other studies have reported different findings. In children undergoing hypospadias surgery, Aksu et al. found that ultrasound-guided dorsal penile nerve block provided a longer duration of analgesia than neurostimulator-guided pudendal nerve block (12). Overall, current evidence remains inconsistent regarding the relative analgesic efficacy of these techniques. Taken together, these findings indicate that the relative analgesic effectiveness of pudendal and penile nerve blocks remains uncertain and may depend on surgical procedure, block technique, and anatomical coverage.

Although ultrasound guidance has become increasingly common in regional anaesthesia, landmark-based techniques remain widely used in clinical practice. Evidence comparing commonly used landmark-guided blocks in paediatric urogenital surgery remains limited. The present study aimed to compare the postoperative analgesic effectiveness of landmark-guided bilateral pudendal nerve block and dorsal penile block. We hypothesised that pudendal nerve block would provide superior postoperative analgesia.

2. Materials and Methods

This study was designed as a retrospective, single-centre, two-group comparative cohort study and was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement. Ethical approval was obtained from the local institutional ethics committee (Decision No. 66, 25 December 2025). Because of the retrospective design, the requirement for written informed consent was waived. All patient data were anonymised prior to analysis.

Relevant clinical information was extracted from electronic medical records, anaesthesia charts, and post-anaesthesia care unit (PACU) observation forms. Eligible cases were identified retrospectively between January 2024 and November 2025.

Paediatric patients undergoing elective urogenital surgery were divided into two groups according to the regional block technique documented in the anaesthesia records. The PDB group (pudendal block) consisted of patients who received bilateral landmark-guided pudendal nerve block, whereas the PNB group consisted of patients who received landmark-guided dorsal penile nerve block according to institutional practice.

Inclusion criteria were paediatric patients aged 2–10 years with American Society of Anaesthesiologists (ASA) physical status I–II who underwent elective urogenital surgery under general anaesthesia and had complete postoperative FLACC pain score recordings at PACU, 2, 6, 12 and 24 hours. Patients were excluded if neuraxial anaesthesia had been performed, if there was documented allergy to local anaesthetics, severe systemic disease, incomplete postoperative follow-up data, or perioperative complications requiring intensive care.

All patients underwent surgery under general anaesthesia according to the institutional anaesthesia protocol. General anaesthesia was induced using intravenous propofol and fentanyl. Anaesthesia was then maintained with sevoflurane delivered in an oxygen–air mixture. Airway control was achieved with either a laryngeal mask airway or endotracheal intubation. Antiemetic prophylaxis and perioperative fluid therapy were provided as part of routine perioperative management.

In our institution, landmark-guided bilateral pudendal nerve block is routinely performed using a transperineal approach with the patient in the frog-leg position. The needle is advanced toward the

region adjacent to the ischial spine where the pudendal nerve exits the pelvis, and local anaesthetic is injected after negative aspiration. Blocks were performed bilaterally after induction of general anaesthesia and before the surgical procedure. Bupivacaine 0.25% was used according to institutional practice, and the total dose did not exceed the recommended weight-based maximum dose. Aspiration was repeated before each injection to reduce the risk of intravascular administration. Procedures were performed by anaesthesiologists experienced in paediatric regional anaesthesia.

Dorsal penile nerve block is also commonly used for postoperative analgesia in paediatric urogenital surgery. A landmark-based dorsal penile nerve block is performed via an infrapubic approach, with bilateral injections administered near the 10 and 2 o'clock positions at the base of the penis. According to the anaesthesia records, additional ventral infiltration or circumferential ring block was not routinely performed.

Postoperative pain was assessed using the Face, Legs, Activity, Cry, Consolability (FLACC) scale in the PACU and at the 2nd, 6th, 12th and 24th postoperative hours. Pain scores were recorded by PACU and ward nurses according to routine postoperative follow-up protocols. Because of the retrospective nature of the study, blinding of assessors could not be confirmed. The FLACC scale ranges from 0 to 10, with higher scores indicating more severe pain. In this study, a score of ≥ 4 was taken as evidence of clinically significant pain and triggered rescue analgesia. Postoperative pain control was provided using a multimodal regimen routinely applied in our institution. Baseline postoperative analgesia consisted of intravenous paracetamol (15 mg/kg). When the FLACC score was ≥ 4 , additional intravenous paracetamol (15 mg/kg) was administered as rescue analgesia according to institutional practice. No routine surgical local infiltration was performed.

The primary outcome was postoperative FLACC pain scores at PACU, 2, 6, 12 and 24 hours. Secondary outcomes included total paracetamol consumption within the first 24 hours, requirement for rescue analgesia, intraoperative opioid use, postoperative complications, and demographic and surgical variables.

Statistical Analysis

Normality of continuous variables was assessed using the Shapiro–Wilk test. Continuous variables

are presented as mean $\pm$ standard deviation (SD), whereas categorical variables are reported as number and percentage. Comparisons between the two groups were performed using the independent samples t-test for normally distributed continuous variables and the Mann–Whitney U test for non-normally distributed variables. Categorical variables were compared using the chi-square test or Fisher’s exact test, as appropriate. Because postoperative FLACC scores were measured repeatedly in the same patients over time, differences in pain trajectories between groups were analysed using a linear mixed-effects model. The model included group (pudendal nerve block vs dorsal penile nerve block), time (PACU, 2, 6, 12 and 24 hours), and the group $\times$ time interaction as fixed effects, while patient identity was included as a random effect to account for within-subject correlation. When significant effects were detected in the mixed-effects model, post-hoc pairwise comparisons were performed to explore differences between groups at individual time points. All statistical analyses were performed using IBM SPSS Statistics for Windows, Version 26.0 (IBM Corp.,

Armonk, NY, USA). A p-value < 0.05 was considered statistically significant. Due to the retrospective nature of the study and the use of available clinical data, no a priori sample size calculation was conducted.

3. Results

A total of 116 paediatric patients who underwent elective urogenital surgery during the study period were identified from institutional medical records. After screening for eligibility, 17 patients were excluded because of incomplete postoperative pain score documentation. Consequently, 99 patients were included in the final analysis: 45 in the pudendal block group (PDB) and 54 in the dorsal penile nerve block group (PNB).

Baseline demographic characteristics were broadly comparable between groups. Body weight was statistically higher in the PNB group, although the difference was not considered clinically relevant. (Table 1). The types of surgery were not exactly the same in the two groups.

Table 1. Baseline characteristics of the study population

Variable	PDB Group (n=45)	PNB Group (n=54)	p-value
Age (years)	4.7 $\pm$ 2.4	5.5 $\pm$ 2.2	0.10 ¹
Weight (kg)	18.7 $\pm$ 5.8	21.7 $\pm$ 7.0	0.02 ¹
Surgery type, n (%)			0.015 ²
Undescended testis	16 (35.6%)	23 (42.6%)	
Hypospadias repair	21 (46.7%)	31 (57.4%)	
Inguinal hernia repair	4 (8.9%)	0	
Bilateral orchiopexy	4 (8.9%)	0	

Values are presented as mean $\pm$ SD or number (%).

¹Independent samples t-test

² Chi-square test

Repeated-measures analysis using a mixed-effects model demonstrated a significant time effect ($p < 0.001$), whereas the group $\times$ time interaction did not reach statistical significance ($p = 0.062$). Post-hoc comparisons nevertheless showed that FLACC scores were significantly lower in the PDB group at the 6-hour postoperative time point ($p < 0.001$). The temporal evolution of postoperative pain scores for both groups is illustrated in Figure 1. FLACC scores in the PACU were similar between the two groups.

The same pattern was seen at 2 hours after surgery. At 6 hours, the values were lower in children who received pudendal block than in those who received dorsal penile nerve block (0.84 ± 1.15 vs 1.72 ± 1.37 , $p < 0.001$). This difference was no longer evident at 12 or 24 hours (Table 2). Overall, postoperative pain scores decreased progressively over time in both groups, with the largest between-group difference observed at the 6-hour time point.

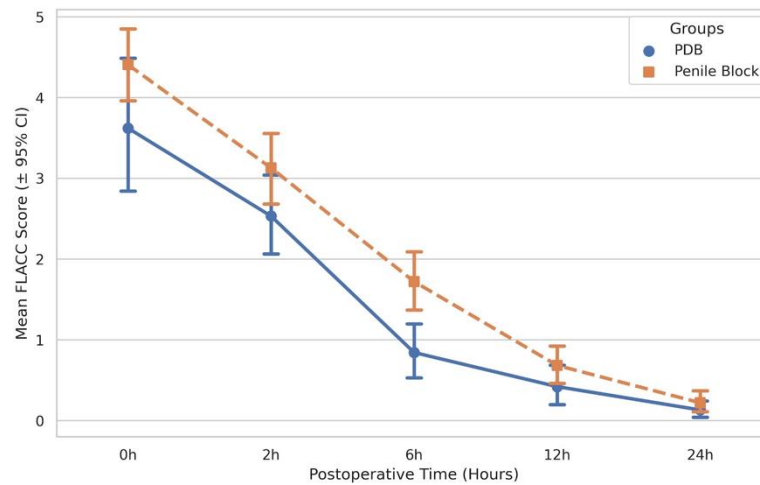


Figure 1. Postoperative FLACC pain scores in the pudendal nerve block (PDB) and penile nerve block (PNB) groups during the first 24 postoperative hours.

Table 2. Postoperative FLACC pain scores

Time point	PDB Group (n=45)	PNB Group (n=54)	p-value
PACU (0 h)	3.62 ± 2.81	4.41 ± 1.67	0.12 ¹
2 h	2.53 ± 1.83	3.13 ± 1.64	0.11 ¹
6 h	0.84 ± 1.15	1.72 ± 1.37	<0.001 ¹
12 h	0.42 ± 0.84	0.69 ± 0.86	0.06 ¹
24 h	0.13 ± 0.40	0.22 ± 0.50	0.31 ¹

¹ Independent samples t-test

Total paracetamol consumption during the first 24 postoperative hours was significantly lower in the PDB group than in the PNB group (109.6 ± 73.9 mg vs 188.3 ± 85.4 mg, $p < 0.001$). Rescue analgesia was required in 24 patients (53.3%) in the PDB group and in 40 patients (74.1%) in the PNB group ($p = 0.03$).

Postoperative adverse events were recorded in 5 patients (11.1%) in the PDB group and in 14 patients

(25.9%) in the PNB group ($p = 0.048$). Minor hematoma and local oedema were considered block-related findings, whereas urinary retention and surgical site infection were evaluated as general postoperative complications. No cases of local anaesthetic systemic toxicity were observed in either group (Table 3).

Table 3. Postoperative analgesic consumption and complications

Variable	PDB Group (n=45)	PNB Group (n=54)	p-value
Total paracetamol consumption within 24 h (mg)	109.6 ± 73.9	188.3 ± 85.4	<0.001 ¹
Patients requiring rescue analgesia, n (%)	24 (53.3%)	40 (74.1%)	0.03 ²
Any postoperative complication, n (%)	5 (11.1%)	14 (25.9%)	0.048 ²

Variable	PDB Group (n=45)	PNB Group (n=54)	p-value
Hematoma / bruising, n (%)	2 (4.4%)	4 (7.4%)	
Surgical site infection, n (%)	2 (4.4%)	0	
Urinary retention, n (%)	1 (2.2%)	4 (7.4%)	
Local oedema, n (%)	0	6 (11.1%)	
¹	Independent	samples	t-test
² Chi-square test / Fisher's exact test			

To account for potential confounding factors related to the retrospective study design, multivariable linear regression analyses were performed adjusting for age, body weight, and surgery type. After adjustment, dorsal penile nerve block remained associated with higher FLACC scores at the 6th

postoperative hour (adjusted $\beta = 0.84$, 95% CI: 0.29–1.39, $p = 0.003$) and higher total paracetamol consumption within the first 24 hours (adjusted $\beta = 61.24$ mg, 95% CI: 29.89–92.58, $p < 0.001$) (Table 4).

Table 4. Multivariable linear regression analysis

Outcome variable	Adjusted β	95% CI	p-value
FLACC score at 6 h	0.84	0.29 to 1.39	0.003
Total paracetamol consumption within 24 h (mg)	61.24	29.89 to 92.58	<0.001

Adjusted for age, body weight, and surgery type.

Clinically significant pain (FLACC ≥ 4) was recorded in 22 patients (48.9%) in the PDB group and 35 patients (64.8%) in the PNB group. Most cases occurred in the early postoperative period,

especially in the PACU and at 2 hours (Table 5). All patients who experienced clinically significant pain did so within the first postoperative hour.

Table 5. Clinically significant postoperative pain (FLACC ≥ 4)

Variable	PDB Group (n=45)	PNB Group (n=54)	p-value
Clinically significant pain at any time, n (%)	22 (48.9%)	35 (64.8%)	0.12 ¹
PACU (0 h), n (%)	22 (48.9%)	35 (64.8%)	0.12 ¹
2 h, n (%)	12 (26.7%)	21 (38.9%)	0.20 ¹
6 h, n (%)	2 (4.4%)	7 (13.0%)	0.17 ¹
12 h, n (%)	1 (2.2%)	0	0.45 ¹
24 h, n (%)	0	0	—

¹ Chi-square test / Fisher's exact test

Clinically significant pain was defined as FLACC ≥ 4 .

4. Discussion

The present retrospective cohort study compared the postoperative analgesic effectiveness of landmark-guided bilateral pudendal nerve block and dorsal penile nerve block in children undergoing urogenital surgery. The main finding was that pudendal nerve block was associated with lower pain scores at the 6-

hour postoperative time point. Although the mixed-effects analysis demonstrated a significant time effect, the group $\times$ time interaction did not reach statistical significance. Nevertheless, post-hoc comparisons suggested a transient analgesic

advantage of pudendal block during the early postoperative period.

Pain scores were comparable immediately after surgery and at the 2-hour assessment but diverged at 6 hours, when children who received pudendal nerve block had significantly lower FLACC scores. In the early postoperative period, residual anaesthetic drugs and intraoperative opioids may influence behavioural responses to pain, which can make differences between regional techniques less apparent. As the effects of these medications wear off, the analgesic contribution of the regional block may become clearer. The FLACC scale is commonly used to assess postoperative pain in young children and has been applied in many paediatric clinical studies (13-14).

The clinical relevance of this difference is further supported by the reduction in postoperative analgesic requirements. In the present cohort, children who received pudendal nerve block required rescue analgesia less frequently and had lower total paracetamol consumption during the first 24 postoperative hours. These findings are consistent with contemporary paediatric pain management strategies that emphasise opioid-sparing and multimodal analgesia, particularly in ambulatory surgical settings (15). Effective regional techniques can substantially reduce postoperative opioid exposure and contribute to improved early recovery (5).

The difference between the two techniques may partly be related to their anatomical targets. The dorsal penile nerve block mainly affects the terminal branches of the pudendal nerve at the base of the penis, whereas the pudendal nerve block is performed more proximally. For this reason, pudendal block may provide sensory blockade not only of the dorsal penile region but also of perineal structures and parts of the external genitalia (8). The ventral surface of the penis and the frenulum can receive sensory input from perineal branches of the pudendal nerve (5). Therefore, dorsal penile nerve block may not completely cover these structures (6). A proximal pudendal nerve block can provide broader sensory blockade of the perineal and external genital regions. Supporting this concept, Long et al. demonstrated that the ventral penile region may remain partially sensitive following dorsal penile block alone (16). This anatomical distribution may partly account for the lower FLACC scores at the 6-hour postoperative assessment in the pudendal block group.

Several clinical studies have examined the analgesic effects of pudendal and penile nerve blocks in paediatric urogenital surgery. Naja et al. reported lower postoperative pain scores and reduced analgesic consumption in children undergoing circumcision who received pudendal nerve block compared with dorsal penile nerve block (10). Similarly, Tutuncu et al. demonstrated improved analgesic efficacy with pudendal nerve block in paediatric circumcision procedures (11). These findings are broadly consistent with the present results showing lower FLACC scores and reduced analgesic requirements in the pudendal block group.

According to some reports, the analgesic effects of penile nerve blocks and pudendal blocks are comparable. In children undergoing circumcision, Boisvert-Moreau et al. observed similar postoperative pain scores between ultrasound-guided pudendal and penile nerve blocks (7). Likewise, Aksu et al. reported that ultrasound-guided dorsal penile nerve block provided longer postoperative analgesia than neurostimulator-guided pudendal block in children undergoing hypospadias surgery (12). Such discrepancies may be related to differences in surgical procedures, block techniques, and the precision of local anaesthetic deposition. Ultrasound guidance allows more accurate localisation of neural structures and more precise delivery of local anaesthetic. When both blocks are performed under ultrasound guidance, differences related to anatomical coverage may become less pronounced. Previous studies have shown that ultrasound guidance can improve block success rates and reduce potential complications in paediatric regional anaesthesia (9,17).

Analgesic consumption also differed between groups in the present study. Total paracetamol consumption during the first 24 postoperative hours was significantly lower in the pudendal block group, and fewer children required rescue analgesia. Although this finding suggests a clinically meaningful analgesic benefit, it should be interpreted cautiously because paracetamol administration was recorded as absolute milligram values rather than weight-adjusted doses. Since body weight differed slightly between groups, this may have influenced the comparison of total analgesic consumption. Future studies should report weight-adjusted dosing to allow more accurate comparisons in paediatric populations.

Fewer children in the pudendal block group experienced clinically significant pain (FLACC ≥ 4), although the difference was not statistically

significant. The relatively small sample size for this secondary outcome may have limited the ability to detect a difference between the groups. Even so, the lower mean pain scores and the reduced need for additional analgesia in the pudendal block group suggest that pain control may have been somewhat better in these patients.

The majority of postoperative complications were minor and uncommon. Despite the retrospective design, it is challenging to explicitly attribute these events to the regional block technique, as the overall incidence of complications was lower in the pudendal block group. Importantly, no instances of systemic toxicity from local anaesthetics were documented. The low incidence of serious complications in children is associated with peripheral nerve blocks administered with appropriate dosing and monitoring, as indicated by large multicentre analyses and current paediatric regional anaesthesia guidelines (18,19).

4.1. Study Limitations

Several limitations should be acknowledged. First, the retrospective design limits causal inference and introduces the possibility of selection bias. Second, the inclusion of different types of urogenital procedures may have contributed to variability in postoperative pain patterns. The distribution of surgical procedures differed between groups. This may have influenced postoperative pain scores and analgesic consumption. Third, blocks were performed under general anaesthesia, and therefore block success could not be confirmed using sensory testing. Fourth, variations in dorsal penile nerve block technique, such as the use of additional ventral infiltration or circumferential ring block, could not

be fully evaluated from the available medical records. In addition, detailed surgical and anaesthesia duration data were not consistently available in the retrospective records for all patients, which prevented reliable comparative analysis between groups. Finally, analgesic consumption was recorded as absolute milligram values rather than weight-adjusted doses, which may have influenced comparisons in this paediatric population.

Although the study has several limitations, it reflects everyday clinical practice in centres where landmark-guided regional techniques are still commonly used. In this setting, bilateral pudendal nerve block was linked to better early postoperative pain control and lower analgesic requirements than dorsal penile nerve block.

4.2. Conclusion

In this retrospective cohort study of children undergoing urogenital surgery, landmark-guided bilateral pudendal nerve block was associated with lower postoperative pain scores at the 6-hour assessment and reduced analgesic requirements during the first 24 hours compared with dorsal penile nerve block. Although this advantage was not sustained across all postoperative time points, the findings suggest that pudendal nerve block may provide a clinically relevant benefit for early postoperative analgesia in paediatric urogenital procedures.

Further prospective randomized studies with standardized block techniques, procedure-specific analyses, and weight-adjusted analgesic reporting are needed to better clarify the relative effectiveness of pudendal and penile nerve blocks in this patient population.

REFERENCES

1. Walker SM. Pain after surgery in children: clinical recommendations. *Curr Opin Anaesthesiol.* 2015;28:570-6.
2. Vittinghoff M, Lönnqvist PA, Mossetti V, et al. Postoperative pain management in children: guidance from the Pain Committee of the European Society for Paediatric Anaesthesiology. *Paediatr Anaesth.* 2018;28:493-506.
3. Batoz H, Semjen F, Bordes-Demolis M, et al. Chronic postsurgical pain in children: prevalence and risk factors. *Br J Anaesth.* 2016;117:489-96.
4. Cyna AM, Middleton P. Caudal epidural block versus other methods of postoperative pain relief for circumcision in boys. *Cochrane Database Syst Rev.* 2008;CD003005.
5. Okoro C, Cannon S, Low D, Lendvay TS. How I do it: the pudendal nerve block for pediatric ambulatory urologic surgery. *Can J Urol.* 2021;28:10648-51.
6. Ecoffey C. Penile block for circumcision in children. *BJA Educ.* 2016;16:345-9.
7. Boisvert-Moreau F, Turcotte B, Albert N, et al. Ultrasound-guided pudendal nerve block vs ultrasound-

- guided penile nerve block for pediatric circumcision. *Reg Anesth Pain Med.* 2023;48:127-33.
8. Bendtsen TF, Parras T, Moriggl B, et al. Ultrasound-guided pudendal nerve block at the entrance of the pudendal (Alcock) canal: description of anatomy and clinical technique. *Reg Anesth Pain Med.* 2016;41:140-5.
 9. Gaudet-Ferrand I, De La Arena P, Bringuier S, et al. Ultrasound-guided pudendal nerve block in children: transperineal approach. *Paediatr Anaesth.* 2018;28:53-8.
 10. Naja ZM, Al-Tannir MA, Faysal W, et al. Pudendal block versus dorsal penile nerve block for circumcision in children. *Anaesthesia.* 2011;66:802-7.
 11. Tutuncu AC, Kendigelen P, Ashyyeralyeva G, et al. Pudendal nerve block versus penile nerve block in children undergoing circumcision. *Urol J.* 2018;15:109-15.
 12. Aksu C, Akay MA, Sen MC, Gurkan Y. Ultrasound-guided dorsal penile nerve block vs neurostimulator-guided pudendal nerve block in hypospadias surgery. *Paediatr Anaesth.* 2019;29:1046-52.
 13. Peng T, Qu S, Du Z, et al. A systematic review of the measurement properties of Face, Legs, Activity, Cry and Consolability scale for pediatric pain assessment. *J Pain Res.* 2023;16:1185-96.
 14. Pizzinato A, Liguoro I, Pusiol A, et al. Detection and assessment of postoperative pain in children with cognitive impairment: a systematic review and meta-analysis. *Eur J Pain.* 2022;26:965-79.
 15. Oliver JA, Oliver LA, Aggarwal N, et al. Ambulatory pain management in the pediatric patient population. *Curr Pain Headache Rep.* 2022;26:15-23.
 16. Long RM, McFarlane J, O'Brien M. A preliminary study of the sensory distribution of the penile dorsal and ventral nerves: implications for effective penile block for circumcision. *BJU Int.* 2010;105:1576-8.
 17. Tsui BC, Suresh S. Ultrasound imaging for regional anesthesia in infants, children, and adolescents: a review of current literature and its application in the practice of neuraxial blocks. *Anesthesiology.* 2010;112:719-28.
 18. Walker BJ, Long JB, Sathyamoorthy M, et al. Complications in pediatric regional anesthesia: an analysis of more than 100,000 blocks from the Pediatric Regional Anesthesia Network. *Anesthesiology.* 2018;129:721-32.
 19. Marhofer P, Willschke H, Kettner SC. Pediatric regional anesthesia: current concepts and practical considerations. *Anesthesiology.* 2025;143:444-61.