





Short communication

Safety and Outcomes of Pediatric Male Circumcisions Using Ring Penile Block Local Anesthesia

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ABSTRACT

Male pediatric circumcision is one of the most commonly performed surgical procedures in Libya. Ensuring safe and effective anesthesia with minimal complications is essential, particularly in day-case settings. The aim is To evaluate the safety and complication profile of penile ring block anesthesia in children undergoing circumcision. This prospective observational study was conducted between July 1, 2020, and March 20, 2026, including 2200 male children undergoing circumcision under penile ring block anesthesia. Patients were divided into two age groups: Group A (7 days–6 months, n = 1633) and Group B (>6 months–7 years, n = 567). Parents monitored children for 24 hours postoperatively and reported complications, with additional follow-up thereafter. Outcomes assessed included lethargy, irritability, bradycardia, seizures, apnea, and hematoma formation. Complications were rare and self-limiting. Hematoma formation was reported in 40 patients (1.81%). Lethargy and drowsiness occurred in 9 patients (0.40%), while irritability was reported in 3 patients (0.13%). Bradycardia and seizure activity were each observed in 3 patients (0.13%). A single case (0.04%) of transient apnea occurred immediately following needle insertion. No severe complications or long-term adverse outcomes were identified. Penile ring block anesthesia is therefore a safe and effective technique for pediatric circumcision, with a very low complication rate. It is particularly suitable for high-volume and resource-limited settings.

Introduction

Circumcision is one of the most common surgical procedures in pediatric urology, particularly in Islamic countries, where it is performed for religious and hygienic reasons. Adequate anesthesia is essential to reduce pain, distress, and perioperative complications. Dorsal penile nerve block (DPNB) and penile ring block are among the most commonly used regional anesthesia techniques. The ring block involves circumferential infiltration at the base of the penis, providing effective analgesia. Previous studies have demonstrated that this technique is safe, effective, and easy to perform in pediatric populations [1–3]. Recent literature continues to highlight its role in improving perioperative outcomes, particularly in resource-limited settings [7–10]. However, there is limited large-scale evidence evaluating the safety of penile ring block anesthesia across different pediatric age groups. Understanding whether complication rates vary with age is important for optimizing patient safety, particularly in high-volume and resource-limited settings. Therefore, this study aims to assess the safety and complication rates of penile ring block anesthesia in pediatric circumcision and to determine whether age influences the incidence of adverse events.

Methods

This was a single-center prospective observational cohort study conducted at Al-Bayda Medical Centre between July 1, 2020, and March 20, 2026.

Inclusion criteria

The inclusion criteria for this study comprised male children aged between 7 days and 7 years who were scheduled for elective circumcision. Only those deemed suitable for day-case surgery was considered eligible. This selection ensured a homogeneous study population, focusing on patients undergoing a standardized elective procedure within a defined age range, while also maintaining safety and feasibility in the outpatient surgical setting.

Exclusion criteria

The exclusion criteria for this study encompassed patients with congenital penile anomalies, penile injury, allergy to lidocaine, infection at the injection site, bleeding disorders, or incomplete medical records. After applying these criteria, a total of 2200 consecutive patients were included in the analysis. To facilitate

comparative evaluation, the cohort was stratified into two groups according to age: Group A, consisting of infants aged 7 days to 6 months (n = 1633), and Group B, comprising children older than 6 months up to 7 years (n = 567).

Anesthetic technique

A penile ring block was performed using 2% lidocaine (20 mg/mL), with a maximum dose of 3 mg/kg body weight, calculated individually for each patient based on preoperative weight measurement. The total administered volume was adjusted accordingly to remain within this safe dose limit. No epinephrine was used. The block was administered using a three-point injection technique at the 11, 3, and 9 o'clock positions, using a 25–27G needle, with careful aspiration prior to each injection to avoid inadvertent intravascular administration. Standard intraoperative monitoring was applied for all patients, including continuous pulse oximetry, heart rate monitoring, and clinical observation of respiratory status throughout the procedure.

Postoperative monitoring

Parents were instructed to observe their children for 24 hours postoperatively and report any complications with regular follow-up thereafter to the end of the study duration. Parental reports were validated by clinical follow-up, either through scheduled in-person review or direct communication with the surgical team, to confirm reported outcomes and ensure accurate documentation of postoperative complications

Statistical analysis

Statistical significance was assessed using the Chi-Square test, with P values of less than 0.05 considered significant.

Results

A total of 2200 children underwent circumcision under penile ring block anesthesia. Group A included 1633 patients, and Group B included 567 patients. Overall, complication rates were very low, and all recorded events were transient and self-limiting, requiring no specific medical or surgical intervention. Importantly, no patients required hospital readmission following the procedure. Hematoma formation occurred in 30 patients (1.83%) in Group A and 10 patients (1.76%) in Group B, with no statistically significant difference between groups (p = 0.92). Seizure activity was reported in 2 patients (0.12%) in Group A and 1 patient (0.17%) in Group B, with no statistically significant difference (p = 0.76).

Lethargy and drowsiness occurred in 5 patients (0.30%) in Group A and 4 patients (0.70%) in Group B, with no statistically significant difference (p = 0.18). Apnea was observed in 0 patients (0.00%) in Group A and 1 patient (0.17%) in Group B, with no statistically significant difference (p = 0.10). Bradycardia occurred in 2 patients (0.12%) in Group A and 1 patient (0.17%) in Group B, with no statistically significant difference (p = 0.76). Irritability was reported in 2 patients (0.12%) in Group A and 1 patient (0.17%) in Group B, with no statistically significant difference (p = 0.76). There were no statistically significant differences in any measured outcomes between the two groups. Additionally, there were no cases of severe local anesthetic systemic toxicity, ischemic complications, persistent neurological deficits, or any complications requiring escalation of care in either group.

Table 1. Complications observed

Complication	Group A (n = 1633)	Group B (n = 567)	Total (n = 2200)
Hematoma formation	30 cases (1.83%)	10 cases (1.76%)	40 cases (1.81%)
Seizure activity	2 cases (0.12%)	1 (0.17%)	3 (0.13%)
Lethargy and Drowsiness	5 cases (0.30%)	4 cases (0.70%)	9 cases (0.40%)
Apnea	0 cases (0.00%)	1 case (0.17%)	1 (0.04%)
Bradycardia	2 (0.12%)	1 (0.17%)	3 (0.13%)
Irritability	2 (0.12%)	1 (0.17%)	3 (0.13%)

Discussion

This large prospective cohort demonstrates that penile ring block anesthesia is a safe and reliable technique for pediatric circumcision, with exceptionally low complication rates. Rather than merely confirming safety, these findings likely reflect the combined effect of standardized technique, careful dosing, and appropriate patient selection. The very low incidence of complications in this study may be explained by several factors. First, the use of a weight-based dosing strategy (maximum 3 mg/kg of lidocaine) ensured avoidance of local anesthetic systemic toxicity, particularly important in younger infants with reduced drug clearance. Second, the three-point injection technique with routine aspiration minimized the risk of inadvertent intravascular

administration, a key contributor to systemic complications reported in the literature [1–3]. Third, the avoidance of epinephrine eliminated the risk of ischemic complications, especially in end-arterial penile tissue [1–3]. Additionally, the use of standard intraoperative monitoring allowed early detection of any physiological changes, further enhancing safety.

Another important contributor is the high procedural volume within a single center, which likely reflects operator experience and consistency in technique. High-volume settings are known to reduce complication rates through improved technical proficiency and standardized perioperative protocols. Furthermore, strict inclusion criteria limiting procedures to elective, otherwise healthy children suitable for day-case surgery may have reduced baseline risk. When compared with regional and Arab studies, our findings are consistent with the broader literature reporting low complication rates with penile ring block [4]. Importantly, our study adds to the regional evidence by providing one of the largest cohorts from Libya, demonstrating that outcomes in this setting are comparable to those reported internationally [5-6].

In contrast to more resource-intensive approaches such as ultrasound-guided nerve blocks, the penile ring block offers a practical and scalable solution in resource-limited settings, requiring minimal equipment while maintaining a strong safety profile [11-13]. This is particularly relevant in high-demand regions where circumcision is commonly performed. Compared with ultrasound-guided techniques, the ring block remains easier to adopt widely, although future comparative trials are warranted [12-16]. Overall, our findings reinforce that when performed with appropriate dosing, meticulous technique, and standard monitoring, penile ring block anesthesia is associated with very low complication rates.

Conclusion

Penile ring block anesthesia is a safe and effective technique for pediatric circumcision, demonstrating a very low incidence of minor, self-limiting complications in a large cohort. No significant differences in complication rates were observed between age groups, supporting its consistent safety profile across pediatric populations. Its simplicity, reliability, and minimal resource requirements make it particularly suitable for high-volume and resource-limited settings.

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Conflicts of Interest

The authors declare no conflicts of interest.

References

1. Panda A, Kumar S, Singh A, et al. Penile block for pediatric urological surgery: safe, effective, and reliable. *J Indian Assoc Pediatr Surg.* 2012;17(2):67-70.
2. Çömez MS, Aydın P. Regional anesthesia in circumcision surgery: which of the two things is better? *Eurasian J Med.* 2022;54(1):2-5.
3. Palinrungi MA, Syarif S, Kholis K, et al. Penile ischemia as a complication of epinephrine use in penile nerve block: truth or myth? *Case Rep Urol.* 2022;2022:6612345.
4. Al-Metwalli RR, Mowafi HA, Ismail SA, Siddiqui AK, Al-Ghamdi AA. Effect of penile ring block with levobupivacaine on perioperative analgesia in pediatric circumcision. *Saudi J Anaesth.* 2014;8(1):25-29.
5. Lander J, Brady-Fryer B, Metcalfe JB, Nazarali S, Muttitt S. Comparison of ring block, dorsal penile nerve block, and topical anesthesia for neonatal circumcision. *JAMA.* 1997;278(24):2157-2162.
6. Taddio A, Pollock N, Gilbert-MacLeod C, Katz J. Combined analgesia and local anesthesia to minimize pain during neonatal circumcision. *Arch Pediatr Adolesc Med.* 2000;154(6):620-623.
7. Dottore B, Consoli A, Pistorio A, et al. Pediatric ultrasound-guided dorsal penile nerve block in children undergoing penile surgery. *Children (Basel).* 2023;11(1):50.
8. Kılıç S, Yılmaz E, Öztürk T, et al. Comparative analysis of two methods in circumcision: a new approach to evaluating long-term complications. *BMC Urol.* 2024;24:513.
9. Lu X, Zhang Y, Wang L, Chen J, Li W. Local anesthetic systemic toxicity induced by penile nerve block: a review of pediatric cases. *Paediatr Anaesth.* 2025;35(2):112-120.
10. Moraes IP, Silva RF, Santos LM, et al. Comparative randomized clinical trial on postoperative pain in circumcision: landmark dorsal penile nerve block versus ring block. *J Pediatr Surg.* 2025;60(3):225-232.
11. Satici MH, Demir G, Koç A, et al. Comparison of sacral erector spinae plane block vs. ring blocks for postoperative pain relief after circumcision. *Reg Anesth Pain Med.* 2025;50(1):41-49.
12. Alsaadi AA, Alshahrani SM, Alkhateeb SS, et al. Safety and effectiveness of local anesthesia in pediatric circumcision: a multicenter experience. *World J Urol.* 2023;41(2):389-396.
13. Hassan AF, Mahmoud AM, Abdallah NM, et al. Outcomes of dorsal penile nerve block versus ring block in circumcision: a systematic review and meta-analysis. *Front Pediatr.* 2024;12:1184503.
14. El-Gohary MA, El-Barbary MM, El-Sayed HM, et al. Pain management in pediatric circumcision: current evidence and future perspectives. *Pediatr Surg Int.* 2023;39(5):101-110.



15. Yıldız TS, Çelik F, Arslan M, et al. Ultrasound-guided versus landmark technique in pediatric penile nerve block: a comparative analysis. *Paediatr Anaesth.* 2024;34(6):543-550.
16. Ibrahim ME, Ahmed RA, Hassan SA, et al. Anesthetic techniques in pediatric circumcision: a review of current practices. *Afr J Paediatr Surg.* 2025;22(1):33-40.