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Comparison of Penile Block and Caudal Block Applications in Patients Undergoing Circumcision Surgery

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What's known on the subject? and What does the study add?

A lot of medical agents and anesthetic methods are available to control pain during circumcision surgery and in the postoperative period, but no specific agent or method has been defined in the literature. In addition, the number of studies comparing the superiority of the agents and methods given for pain control in circumcision surgery is limited. Therefore, we aimed to compare the effectiveness of caudal block and penile block methods applied under general anesthesia with different pain scoring methods in preventing postoperative pain in patients undergoing circumcision surgery.

Abstract

Objective: To evaluate the effectiveness of caudal block and penile block methods, in patients who underwent circumcision surgery in preventing postoperative pain.

Materials and Methods: Patients who underwent elective circumcision surgery between January 2019 and May 2022 were retrospectively evaluated. After the exclusion criteria, 56 patients were included in the study. They were divided into two groups as penile block (group P, n=31) and caudal block (group C, n=25). Anesthesia technique applied, anesthesia duration, postoperative first micturition time, postoperative complications, time of first analgesia, analgesia need in the first six hours, observer pain score and Modified Pediatric Objective Pain Scale scores (MPOPS) were scanned.

Results: When the first micturition time in the postoperative period was compared, it was found that group P took a significantly shorter time than group C (p=0.001). It was determined that group C needed analgesia in a shorter time than group P (p=0.028). When the MPOPS at 30th min (p=0.031), 90th min (p=0.043) and 6th hour (p=0.016) were compared, group C higher scores than group P.

Conclusion: As a result, both methods can be used effectively and safely for appropriate pain control in patients who will undergo circumcision surgery. Both methods have advantages and disadvantages over each other. The choice of methods may vary with the experience of the surgeon and anesthetist.

Keywords: Caudal anesthesia, dorsal penile nerve block, male circumcision

Introduction

The aim of ideal anesthesia is to provide motor block and analgesia with the least damage to the patient's physiology and metabolism and to return the patient to normal life in the earliest period (1,2). Nowadays, plenty of agents are available at different doses to control pain during circumcision surgery and in the postoperative period. Many techniques such as caudal block, penile block, and pudendal nerve block can be listed with these agents (3). No specific agent or method has been defined in the literature for pain control during circumcision surgery (3,4). In addition, the number of studies comparing the superiority of the agents and methods used for pain control

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in circumcision surgery is limited. Therefore, in our study, we aimed to compare the effectiveness of caudal and penile block methods applied under general anesthesia with different pain scoring methods in preventing postoperative pain in patients undergoing circumcision surgery.

Materials and Methods

Patients Selection and Study Design

The study was initiated with the approval of the University of Health Sciences Turkiye, Ankara Dışkapı Yıldırım Beyazıt Training and Research Hospital Ethics Committee (date: 18/07/2022, approval no: 142/02). Patients who underwent elective circumcision surgery between January 2019 and May 2022 were retrospectively evaluated. Age, body weight, anesthesia technique applied, duration of anesthesia, duration of surgical procedures, surgical technique, postoperative first micturition time, postoperative complications, time to first analgesia, whether analgesia is needed in the first 6 h, observer pain score (OPS) and Modified Pediatric Objective Pain Scale (MPOPS) (30-60- 90 minutes and 3-6-12 hours) were scanned and recorded retrospectively from our hospital's electronic database and past patient files.

Presence of known allergy to medical agents to be used during anesthesia, presence of infection in the area to be anesthetized, American Society of Anesthesiologists score of 3 and above, history of bleeding diathesis, presence of neurological disease, presence of bone deformity, patients undergoing circumcision under local anesthesia, and patients who underwent surgery other than the sleeve method. The proksimal and distal parts of the skin is marked with a pen to determine the circumcision boundaries. The skin is incised with the help of a scalpel over the marks. The part between the incisions is circumferentially excised. The remaining part of the proximal skin is sutured to the remaining skin in the distal part (5) and parents who did not agree to provide detailed informed consent were the exclusion criteria of our study.

Anesthesia Method and Equipment

All patients were evaluated in the anesthesia outpatient clinic at least one day before the planned operation. Detailed information about the anesthesia method to be applied was provided by the anesthesiologist, and informed consent was obtained. All patients were premedicated by an anesthesiologist 20 min before the surgical procedure (0.5 mg/kg-1 peroral midazolam, maximum 15 mg). During the premedication waiting period, one of their parents and a nurse accompanied the patients. Routine monitoring was performed with peripheral oxygen saturation, 3-lead electrocardiogram, and non-invasive blood pressure in the operating room. Intravenous propofol (2 mg/kg-1) was administered at the beginning of anesthesia to patients with peripheral vascular access. In patients who could not obtain peripheral vascular access, a laryngeal mask was placed according to the weight of the patient, following the application of 6-8% sevoflurane to a mixture of 50% O_2 and 50% N_2O. As a maintenance anesthetic, 3% sevoflurane was added to a mixture of 50% O_2 and 50% N_2O.

Anesthesiologists work in rotation at our hospital. The choice of postoperative analgesia was determined on the basis of the experience of the anesthesiologists responsible for the operation on the caudal block. Caudal block was applied to patients who received postoperative analgesia by specialist physicians with caudal block experience. Penile block was preferred in patients because experts without caudal block experience did not prefer this method.

In patients who applied caudal block, a lateral decubitus position and a sterile area were provided, and the sacral hiatus was entered with a 22G caudal needle. Caudal block was achieved with 1 mg/kg of 0.25% bupivacaine (maximum 20 mL). The patient was then placed in a supine position, and after the sterile field was provided, the surgical procedure was performed.

In patients undergoing penile block, after providing a sterile field in the supine position, 0.5 mg/kg1 0.5% bupivacaine was applied using a 23G needle equally to the root of the penis at 10 o'clock and the other half at the 2 o'clock position. The procedure was performed by an experienced surgical team.

If the blood pressure and heart rate increased by 20% or more from the basal value after the procedure was started, the block was considered unsuccessful, and 15 mg/kg acetaminophen was intravenously administered for rescue analgesia in these patients.

At the end of the surgical procedure, the anesthetic administered for inhalation is stopped. The durations of anesthesia and surgery were recorded. The patient was taken to the recovery unit after spontaneous opening of his eyes. One of his parents and a nurse accompanied him in the recovery unit. Patients who did not develop any complications in the recovery unit were taken to their rooms in the inpatient clinic.

Post-Procedure Follow-up and Forms Used

All patients were dressed with skin ointment after surgery (Basitrasin 15000 U.I., Neomycin Sulfate 150 mg). The penis was wrapped with a lightly pressed coban bandage. After surgery, patients come to the inpatient clinic. The doctors of the inpatient clinic, 30-60-90 min and 3-6-12 h, evaluated patients with OPS and MPOPS over time periods. In addition, the patient's first micturition time and first analgesia need time were recorded. At the same time, complications that may develop in the patients (such as headache, urinary retention,

bleeding, agitation, fever, nausea-vomiting) were followed up and recorded. Complications were evaluated according to the Clavien-Dindo classification. Patients who did not need analgesia within the first 6 h were noted. The ward physician who followed the patient was blinded to the type of block applied before surgery.

OPS (1-5 points) and MPOPS (0-10 points) were determined as a result of the evaluation of patients with five criteria, including movements, crying, anxiety, pain localization, and posture.

Analgesics were administered if the OPS or MPOPS score was 4 during the inpatient clinic follow-up of the patients. The patients were given 15 mg/kg acetaminophen peroral as a postoperative analgesic (maximum 90 mg) by the inpatient clinic doctor. It was repeated every 4 h if necessary. The patients were followed for 12 h in the inpatient clinic. After the 12th hour records were taken by the inpatient clinic doctor, patients who did not develop any complications were discharged by removing the lightly compressed coban bandages.

Statistical Analysis

The analysis of the data was performed using the "IBM SPSS Statistics 22" package program. Descriptive statistics are shown as mean ± standard deviation (mean ± SD) for variables with a normal distribution, median (minimum-maximum) for variables with a non-normal distribution, and number of cases (n) and percentage (%) for nominal variables. The significance of the difference between the groups in terms of the means t-test was investigated. Nominal variables were evaluated using Pearson's chi-square or Fisher's exact test. The significance level was specified as <0.05.

To determine sufficient patients, the effect size was calculated in the G*Power 3.1.9.4 program using the mean ± SD values of the MPOPS scoring in comparison with a similar study published in a reliable journal (6). The minimum sample size was calculated with a significance level of 0.05 and a power value of 0.9. The sample size in our study was found to be statistically sufficient.

Results

After the exclusion criteria, 56 male patients aged 2-12 years were included in the study. The patients were divided into two groups: Those who underwent penile block under general anesthesia (group P, n=31) and those who underwent caudal block (group C, n=25). During the postoperative period, the need for analgesia developed in 26 (46%) patients. Of these patients, 23 (41%) required analgesia in the first 6 h. No complications occurred during surgery in either group. Complications that could be improved with medical treatment or follow-up developed in 7 (13%) patients in the postoperative inpatient clinic follow-up. Nausea vomiting developed in 2 patients and agitation developed in 1 patient in group C. In group P, nausea-vomiting developed in 2 patients, severe headache in 1 patient, and agitation in 1 patient. All complications were found to be grade 1 according to the Clavien-Dindo classification. There was no difference between the two groups in terms of complications. When the mean ± SD first micturition time was compared between the two groups in the postoperative period, it was found that group P (81.3±23.2 min) took a significantly shorter time than group C (113.2±39.4 min) (p=0.001) (Table 1). Postoperative analgesia needs developed in 18 (58%) patients in group P and in 8 (32%) patients in group C, and there was no statistical difference. In addition, there was no difference between the patients who received analgesia in the first 6 h [group P; 15 (48%); group C, 8 (32%)]. However, when the postoperative mean ± SD first analgesia times were compared, it was found that group C (93.8±54.2 min) needed analgesia in a shorter time than group P (196.7±166.9 min) (p=0.028) (Table 1).

The mean ± SD OPS scores of group P were evaluated at 30-60-90 min and 3-6-12 h postoperatively, and no statistical difference was found in mean ± SD OPS scores at the same time intervals. Mean ± SD MPOPS scores for group P and group C were also evaluated at the same time intervals. When the mean ± SD MPOPS scores of both groups at the 30th min (p=0.031), 90th min (p=0.043) and 6th hour (p=0.016) were compared, it

Table 1. Analysis of demographic and clinical characteristics of all patients and groups *p<0.05

	Total (n=56)	Group P (n=31)	Group C (n=25)	p
Age (year)	6.1±2.2	6.3±2.2	5.72±2.2	0.319
Weight (kg)	23.2±8.4	24.8±9	21.2±7.2	0.111
Anesthesia time (min)	51.1±9	50.8±7.4	51.5±10.8	0.773
Surgery time (min)	34.3±9.3	33±7.8	36±10.8	0.224
Complications (%)	7 (13%)	4 (13%)	3 (12%)	0.919
Postoperative first micturition time (min)	95.6±35.1	81.3±23.2	113.2±39.4	0.001*
Need for postoperative analgesia (%)	26 (46%)	18 (58%)	8 (32%)	0.064
Postoperative first analgesia administration time (min)	165±148.7	196.7±166.9	93.8±54.2	0.028*
Analgesia requirement in the first 6 hours postoperatively (%)	23 (41%)	15 (48%)	8 (32%)	0.215

was found that group C had higher MPOPS scores than group P (Table 2, Figure 1).

Discussion

The most common surgery performed by men in childhood is circumcision. Pain often develops in the postoperative period after circumcision surgery; it can cause many complications and problems such as bleeding, agitation, delay in mobilization, increased need for secondary surgery, prolonged hospitalization, and increased costs. Therefore, reducing pain circumcision surgery is very important (7).

It should not be forgotten that pediatric patients also feel pain in the postoperative period, at least as much as adults. There are many medical agents that can prevent or relieve pain in the postoperative period. Penile block or caudal block is one of the successfully applied methods for the prevention of pain in the postoperative period in penile surgical procedures that cover a large part of pediatric surgery (4).

In many studies, caudal and penile block applications have been compared for variables such as postoperative pain, complications, first micturition time, and effectiveness (1,3,4,6-13). Both techniques have potential complications. Penile block may cause local complications such as hematoma, edema, and absorption-related systemic side effects, whereas caudal block may cause complications such as nausea-vomiting, urinary retention, and motor block (1).

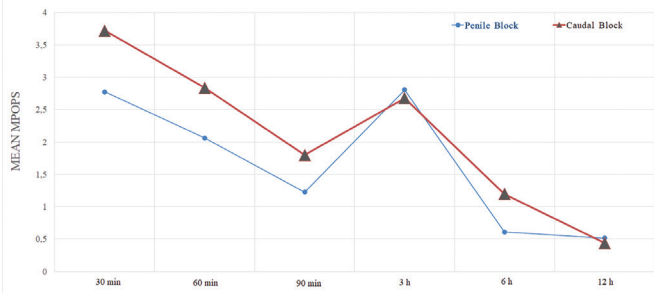

Figure 1. Comparison of postoperative MPOPS scores of the groups

MPOPS: Modified Pediatric Objective Pain Scale

In our study, nausea-vomiting developed in 2 patients in group C, agitation in 1 patient, nausea-vomiting in 2 patients in group P, severe headache in 1 patient, and agitation in 1 patient. All complications were found to be grade 1 according to the Clavien-Dindo classification, and we did not observe any difference between the two groups. Although the complications are similar in the comparison of the two groups in the literature (1,3,4,6-9), there are studies indicating that fewer complications developed in the penile block group (10,11). In addition, when the first micturition times in both groups were compared, it was determined that the patients who underwent caudal block urinated later than the patients who underwent penile block. Vater and Wandless (11) reported that patients with caudal block had delayed micturition, similar to our study. However, there are also studies stating that there is no statistical difference (4,6).

According to the results of our study, the need for analgesia developed in 26 (46%) patients. There was no difference between the two groups in terms of postoperative analgesia and the need for analgesia within the first 6 h. However, it was determined that the patients who underwent caudal block needed first analgesia in a shorter time than the patients who underwent penile block. When we look at the literature, there are publications stating that there is no difference between the two groups in terms of first analgesic need (7,9,11). There are also publications stating that patients who underwent caudal block needed analgesics after a longer period of time, which is inconsistent with our study (3,6,12). These incompatibilities may

Table 2. Comparison of postoperative pain scores of the groups *p<0.05

Pain follow-up scale	Time	Group P (n=31)	Gorup C (n=25)	p
OPS	30. min	3.1±0.9	3.3±1.1	0.468
	60. min	2.8±0.9	2.7±0.9	0.729
	90. min	2.3±0.6	2.4±0.8	0.562
	3. hour	2.6±1	2.6±0.6	0.935
	6. hour	1.7±0.6	1.9±0.7	0.356
	12. hour	1.7±0.7	1.4±0.5	0.078
MPOPS	30. min	2.8±1.4	3.7±1.8	0.031*
	60. min	2.1±1.8	2.8±1.4	0.078
	90. min	1.2±0.9	1.8±1.2	0.043*
	3. hour	2.81±2	2.7±1.4	0.783
	6. hour	0.6±0.9	1.2±0.9	0.016*
	12. hour	0.5±0.8	0.4±0.6	0.684

MPOPS: Modified Pediatric Objective Pain Scale, OPS: Observer pain score

be due to patient and parent anxiety. Studies have shown that both methods can be used effectively and safely in circumcision surgery (1,3,4,6-12).

Considering the postoperative MPOPS and OPS scores of the patients, we found that group C had a higher mean score than group P in the MPOPS scores in the 30th minutes, 90th minutes and in the 6th hour. There was no significant difference in the OPS scores in our study. Kazak Bengisun et al. (6) in their study using the Facial Pain Rating scale, OPS, and MPOPS scores, they reported that the caudal block group had lower scores in different time periods. In a similar study, patients with caudal block had lower scores in the FLACC scoring system (1). Yıldırım Güçlü al. (4) in their study using Face Scale, OPS, and MPOPS scores, they showed that there was no difference in the mean scores of both groups. Polat et al. (3) in their study with MPOPS and Ramsey Sedation scoring, Yıldırım Güçlü et al. (4) similarly reported that there was no difference between the two groups.

In the results of our study, we found that the patient group who underwent penile block required later analgesia, shorter first micturition times, and lower MPOPS score averages in certain periods compared with the patients who underwent caudal block. We observed that the two techniques used for circumcision surgery can be used safely and effectively, although the patient group with penile block appears to be superior to the patient group with caudal block.

In a meta-analysis that included randomized controlled studies and included 574 patients, it was revealed that the efficacy of both groups was similar and that although the patients in the caudal block group had longer analgesia, it was associated with prolonged urinary retention and gait delay (13).

Study Limitations

The limitations of our study can be considered as the fact that the anxiety levels of the patients and their parents before and after surgery can change the pain levels of the patients, and our study is retrospective. Although different pain scoring scales, such as MPOPS and OPS, are widely used, their accuracy is uncertain.

Conclusion

In conclusion, as a result, both methods can be used effectively and safely for appropriate pain control in patients who will undergo circumcision surgery. Both methods have advantages and disadvantages over each other. The choice of methods may vary with the experience of the surgeon and anesthetist.

Ethics

Ethics Committee Approval: The study was initiated with the approval of the University of Health Sciences Turkiye, Ankara Dışkapı Yıldırım Beyazıt Training and Research Hospital Ethics Committee (date: 18/07/2022, approval no: 142/02).

Informed Consent: Retrospective study.

Authorship Contributions

Surgical and Medical Practices: H.S., B.Y.E., G.K., A.E.D., A.L.S., Concept: H.S., B.Y.E., G.K., A.E.D., A.L.S., Design: H.S., B.Y.E., G.K., A.E.D., A.L.S., Data Collection or Processing: H.S., B.Y.E., H.M.D., G.K., A.E.D., Analysis or Interpretation: H.S., G.K., A.E.D., A.L.S., Literature Search: H.S., B.Y.E., H.M.D., G.K., A.E.D., A.L.S., Writing: H.S., B.Y.E., G.K., A.L.S.

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

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