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Research

Evaluation of the Effectiveness of Transversus Abdominis Plane Block and Transversalis Fascia Plane Block in Postoperative Analgesia in Pediatric Patients Undergoing Lower Abdominal and Genitourinary Surgery: A Retrospective Study

Alt Abdominal ve Genitoüriner Cerrahi Geçiren Pediatrik Hastalarda Postoperatif Analjezide Transversus Abdominis Plane Bloğu ve Transversalis Fascia Plane Bloğunun Etkinliğinin Değerlendirilmesi: Retrospektif Çalışma

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ABSTRACT

Objective: Peripheral trunk blocks are used for multimodal analgesia in pediatric ambulatory surgery. In this study, we aimed to evaluate the efficacy of transversus abdominis plane block (TAPB) and transversalis fascia plane block (TFPB) for postoperative acute analgesia in lower abdominal and urogenital surgeries in pediatric patients.

Methods: In our study, patients aged 3-16 years, American Society of Anesthesiology I-III, who underwent lower abdominal-urogenital surgery and peripheral trunk blocks for postoperative analgesia were retrospectively reviewed. Pain scores in the first 6 hours (h) postoperatively, additional analgesia needs of patients, and complications were evaluated.

Results: Ninety-five patients who underwent TAPB and transversalis fascia plane block were evaluated. There was no statistically significant difference between the demographic data and operation time. The number of patients with a pain score >4 in the first 6 h was higher in the TAPB group ($p<0.05$). The additional analgesic requirement was lower in the TFPB group ($p<0.05$). There were no postoperative complications in either group.

Conclusion: Peripheral trunk blocks can be used as a part of multimodal analgesia for early postoperative discharge in pediatric surgeries.

Keywords: Peripheral trunk block, postoperative analgesia, pediatric ambulatory surgery

ÖZ

Amaç: Pediatrik günübirlik cerrahilerde multimodal analjezi amacıyla periferik gövde blokları kullanılmaktadır. Biz de çalışmamızda pediatrik hastaların alt batın ve ürogenital cerrahilerinde uygulanan transversus abdominis plane bloğu (TAPB) ile transversalis fascia plane (TFPB) bloğunun postoperatif akut dönemde analjezide etkinliğini değerlendirmeyi amaçladık.

Gereç ve Yöntem: Çalışmamızda 3-16 yaş arası, Amerikan Anesteziyoloji Derneği I-III, alt batın-ürogenital cerrahi geçiren ve postoperatif analjezi amacıyla periferik gövde blokları uygulanan hastalar retrospektif olarak incelendi. Postoperatif ilk 6 saatteki (s) ağrı skorları, hastaların ek analjezi ihtiyaçları ve komplikasyonlar değerlendirildi.

Bulgular: TAPB ve TFPB uygulanan 95 hasta değerlendirildi. Demografik verileri ve operasyon süreleri arasında istatistiksel anlamlı farklılık görülmedi. İlk 6 s'de ağrı skoru >4 olan hasta sayısı TAPB grubunda daha fazlaydı ($p<0,05$). Ek analjezik ihtiyacı TFPB grubunda daha düşüktü ($p<0,05$). Her iki grupta da postoperatif komplikasyon görülmedi.

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Sonuç: Pediatrik günübirlik cerrahilerde erken taburculuk amacıyla multimodal analjezinin bir parçası olarak periferik gövde blokları kullanılabilir.
Anahtar Kelimeler: Periferik gövde blokları, postoperatif analjezi, pediatrik günübirlik cerrahi

INTRODUCTION

A multimodal approach, including pharmacological agents and neuraxial and peripheral nerve blocks, should be used to reduce postoperative pain in pediatric surgeries (1). Although the caudal block is the gold standard, trunk blocks as part of multimodal analgesia have gained popularity in pediatric patients because of their more prolonged efficacy, less invasiveness, and lower complication rates (2). These blocks are preferred more frequently with the widespread use of ultrasonography (USG) (3). Transversus abdominis plane block (TAPB) and transversal fascia plane block (TFPB) may be preferred, especially in lower abdomen urogenital surgeries. TAPB is a block applied to the anatomical neurofascial space between the internal oblique and transversus abdominis muscle located in the anterolateral region of the abdomen, targeting the anterior branches of the T6-12 and L1 nerves (4,5). The transversalis fascia plan block is a newer block than the TAPB and is a posterior abdominal plan block targeting the T12 and L1 nerves between the transversus abdominis muscle and transversalis fascia (6). These blocks reduce the need for postoperative analgesia. TAPB is effective in open inguinal hernia operations in pediatric patients (5). TFPB also provides effective analgesia in the postoperative period after pediatric inguinal hernia operations and reduces postoperative anesthetic consumption (7). Thus, patient comfort is increased with effective analgesia and early mobilization and discharge (1,8). In particular, in pediatric ambulatory surgery patients, postoperative pain management is inadequate in most centers, and a multifaceted approach is required in pain management (1).

In our study, we compared the postoperative analgesic efficacy of TAPB and TFPB in pediatric patients undergoing lower abdominourogenital surgery.

METHODS

Our study was planned retrospectively on the basis of the Declaration of Helsinki principles, after University of Health Sciences Türkiye, Başakşehir Çam and Sakura City Hospital Ethics Committee approval (decision no: 252 date: 27.07.2022). Between 01.01.2022 and 01.06.2022, the files of patients aged 3-16 years, American Society of Anesthesiology (ASA) I-III class, who underwent lower abdominal and urogenital (undescended testis, inguinal hernia, appendectomy, hydrocele, testicular torsion) surgery under general anesthesia were reviewed. Pediatric patients who underwent TAPB or TFPB for postoperative analgesia were included in this study. Our study included 95 patients, as part of the TFPB group in patients who underwent TFPB and the TAPB group in patients who underwent TAPB. One hundred ten patients were evaluated in the study. Fifteen patients whose duration of operation was below 30 min were excluded, and 95 patients were divided into two groups as TAPB and TFPB (Figure 1). Preoperative demographic data, such as age, weight, and comorbidity, along with the ASA scores were also recorded.

All patients with open vascular access received lidocaine (1 mg/kg), fentanyl (1 mcg/kg), and propofol (2.5-3 mg/kg) for the induction of anesthesia. 0.6 mg/kg rocuronium was administered to patients who were intubated orotracheally, and if necessary, 0.2 mg/kg rocuronium was administered to patients who were ventilated with a laryngeal mask. Anesthesia induction was performed using sevoflurane in patients without intravenous access. Anesthesia induction was performed with sevofluorane in patients without intravenous access. 10 mg/kg paracetamol was used intravenously for analgesia during surgery. TAPB or TFPB (0.5 mL/kg of 0.25% bupivacaine) was performed for postoperative analgesia with in plane technique under USG guidance while under general anesthesia at the end of surgery. After the block, anesthesia maintenance was terminated, sugammadex (3-5 mg/kg) was administered,

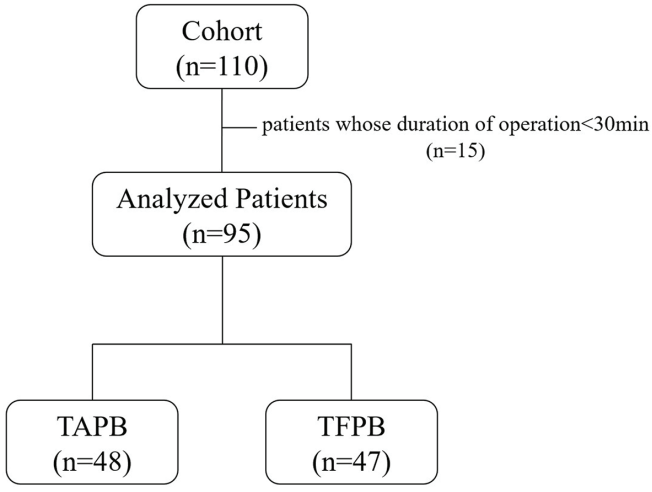

Figure 1. Consort flow diagram of study
TAPB: Transversus abdominis plane block, TFPB: Transversalis fascia plane block

and the patients were extubated when adequate respiration was achieved. Patients were followed up in the recovery room for 30 min after surgery. Patients with a modified aldrete score >9 were transferred from the recovery unit to the ward. In our hospital, pain scores (PS) of patients operated on in pediatric surgery are routinely measured when the patients are awakened and taken to the recovery unit (T1), at the 30th minute (T2) in the recovery unit, and at the 6th hour (h) (T3) in the ward, and these scores are recorded. The Faces, Legs, Activity, Cry, and Consolability for 0-5 year-olds; Modified Objective PS for 6-11-year-olds; and visual PS for those older than 12 years were used. If the PS was >4 according to these scores, 10 mg/kg paracetamol was administered iv. The need for additional analgesia and the presence of nausea and vomiting were recorded.

Demographic data, ASA scores, PSs at T1, T2, and T3, and postoperative complications were obtained from the documents and recorded. The primary outcome in the study was the number of patients with PS >4 in the first 6 h after surgery.

Statistical Analysis

In the analysis of the data, we used SPSS 20 for Windows (IBM Corp., Armonk, NY, USA), and the Kolmogorov-Smirnov test was used to evaluate the normal distribution of the data. The normally distributed variables are presented as the mean ± standard deviation, whereas the non-normally distributed variables are presented as the median (interquartile range: 25-75 percentiles). Categorical variables are presented as numbers and percentages. For the group comparison of normally distributed variables, Student's t-test and Mann-Whitney U tests were used for the intergroup comparison of non-normally distributed variables. For the intergroup comparison of the categorical variables, the chi-square and Fisher Exact tests were used. For the consideration of the statistically significant value, $p<0.05$ was accepted.

The estimated power of this study was 0.90 for the percentage of the number of patients with PS >4 in the first 6 h (for total patients in groups: 48 and 47, and for percentages of groups: 35.4% and 8.5%).

RESULTS

A total of 95 pediatric patients undergoing lower abdominal and urogenital surgery under general anesthesia were divided into two groups TFPB (n=47) and TAPB (n=48) (Figure 1). The median ages of patients for TAPB and TFPB were 7 and 6 years old respectively (Table 1). Among the surgical cases, inguinal hernia rates were the highest in both groups, although not statistically significant. The operation times were similar in both groups ($p>0.05$) (Table 1).

The postoperative pain scores and complications are shown in Table 2. The two groups showed no statistically significant difference when pain scores were evaluated at T2 and T3. At the T1 time point, the median pain score was lower in the TFPB group ($p<0.05$). The pain scores and additional analgesic requirements in the first 6 h were both higher in the TAPB group ($p<0.05$). There were no postoperative complications in either group (Table 2).

Table 1. Patients' and operations' characteristics

	TAPB (n=48)	TFPB (n=47)	p-value
Age, years	7 (4-13)	6 (4-9)	0.478
<5 years old	23 (47.9)	22 (46.8)	0.231
>6 and <12 years old	11 (22.9)	17 (36.2)	
≥12 years old	14 (29.2)	8 (17.0)	
Weight, kg	23 (17-44)	22 (17-38)	0.698
ASA	1 (1-1)	1 (1-1)	0.088
Duration of operation, hours	50 (40-59)	55 (40-60)	0.458
Surgical diagnosis, n (%)			
Inguinal hernia	31 (64.6)	23 (48.9)	0.234
Undescended testicle	6 (12.5)	12 (25.4)	
Appendectomy	5 (10.4)	3 (6.4)	
Hydrocele	5 (10.4)	5 (10.6)	
Testicular torsion	1 (2.1)	4 (8.5)	

ASA: American Society of Anesthesiology, TAPB: Transversus abdominis plane block, TFPB: Transversalis fascia plane block

Table 2. Comparison between postoperative pain scores of groups

	TAPB (n=48)	TFPB (n=47)	p-value
PS			
At the T1	1 (0-3)	0 (0-2)	**0.033**
At the T2	2 (0-5)	2 (0-3)	0.212
At the T3	2 (0-5)	1 (0-2)	0.069
PS-max in the first 6 h	3 (1-5)	2 (0-4)	**0.022**
The number of patients with PS >4 in the first 6 h, n (%)	17 (35.4)	4 (8.5)	**0.002**
Additional analgesic requirements, n (%)	19 (39.6)	4 (8.5)	**>0.001**
Complications, n (%)	0 (0.0)	0 (0.0)	NS

PS: Pain score, TAPB: Transversus abdominis plane block, TFPB: Transversalis fascia plane block

DISCUSSION

The aim of this retrospective study was to evaluate the efficacy of TFPB and TAPB in reducing postoperative acute pain scores in pediatric patients who underwent lower abdominal and urogenital surgery. Pain scores at first evaluation (T1) were significantly lower in the TFPB group compared to TAPB. The number of patients with pain scores >4 and additional analgesic requirements in the first 6 h was lower in the TFPB group ($p<0.05$).

Ambulatory surgery is becoming increasingly common in pediatric patients. Reduction of pain in patients is important before discharge (1,9). Studies have shown that blocks are an effective method for relieving postoperative pain and reducing the use of opioid analgesics. In particular, when combined with a multimodal technique, trunk blocks provide adequate analgesia in patients undergoing day surgery (1,8). Thus, the duration of hospitalization, risk of nosocomial infection, and healthcare costs are reduced with effective analgesia (1,10).

The incision in the abdominal wall causes parietal pain in inguinal hernia surgery. TAPB aims to block the neurofascial nerves between the internal oblique and transversus abdominis muscles along the TAP (4). In children undergoing elective inguinal hernia surgery, USG-guided TAPB has been shown to provide longer postoperative analgesia, have fewer side effects, and reduce the need for rescue analgesics compared with caudal block, which is considered the gold standard in analgesia (2,11). Abu Elyazed et al. (5) showed that TAPB, a part of multimodal analgesia, provides effective analgesia in pediatric inguinal hernia repair. In appendectomy cases in pediatric patients, it was shown that postoperative pain scores were lower in the group in which the TAPB was applied than in the control group (12). In another study, a TAPB applied in inguinal hernia operations in pediatric patients aged 4-7 years was more effective than wound site local anesthetic infiltration (13). In the TFPB, one of the trunk blocks, the nerves between the lumbar plexus and TAPB are targeted with a local anesthetic injected between the transversus abdominis muscle and its deeply folded transversalis fascia (5). TFPB has also been reported to provide effective postoperative analgesia in lower abdominal surgery in pediatric patients (14). Abdelbaser et al. (7) showed that TFPB contributed to postoperative analgesia in inguinal hernia cases in pediatric patients aged 1-5 years compared with the control group. Peksöz et al. (15) applied a TFPB for postoperative analgesia in 5 pediatric patients aged 4-7 who underwent ureteroneocystostomy. When pain scores were evaluated for 24 h postoperatively, they were shown to be below 4 and effective in analgesia (15).

López-González et al. (16) compared the efficacy of TFPB and TAPB for postoperative analgesia in patients undergoing unilateral inguinal herniorrhaphy. It has been shown that a higher sensory level was reached in patients who underwent TFPB; however, there was no difference in the need for additional analgesia (16). Because the patients were evaluated retrospectively, only pain assessments up to the 6th h were performed. Because it was a day surgery, 24 h analgesic requirement and pain assessment could not be performed. Our study showed that the number of patients with a maximum pain score of >4 in the first 6 h was found to be significantly less in the TFP group. No side effects were reported in our patients with both blocks, and the discharge of patients was not delayed.

TFPB, which is a newer method in this study, provides better analgesia than TFP. We believe that the similarity of pain scores at 30 min and 6 h was achieved with additional analgesics administered in the TAP group.

CONCLUSION

Outpatient surgery is becoming increasingly common in pediatric patients and affects the duration of discharge when pain management is inadequate. As a result of our findings, TFPB, a newer method, seems to be more effective than TAPB in pediatric patients undergoing lower abdominal and urogenital day surgery, and both blocks can be safely preferred for effective analgesia in the acute period.

ETHICS

Ethics Committee Approval: Our study was planned retrospectively on the basis of the Declaration of Helsinki principles, after University of Health Sciences Türkiye, Başakşehir Çam and Sakura City Hospital Ethics Committee approval (decision no: 252 date: 27.07.2022).

Informed Consent: Retrospective study.

Authorship Contributions

Surgical and Medical Practices: N.A., D.A., F.G.Ö., Concept: N.A., D.A., F.G.Ö., Design: N.A., D.A., Data Collection or Processing: N.A., D.A., Analysis or Interpretation: N.A., Literature Search: N.A., D.A., F.G.Ö., Writing: N.A., D.A., F.G.Ö.

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

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