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POSTOPERATIVE ANALGESIA FOLLOWING PEDIATRIC INGUINAL HERNIA REPAIR: TRANSVERSUS ABDOMINIS PLANE BLOCK OR CAUDAL EPIDURAL BLOCK

PEDİATRİK İNGUİNAL HERNİ ONARIMI SONRASI POSTOPERATİF ANALJEZİ: TRANSVERS ABDOMİNİS PLAN BLOĞU VEYA CAUDAL EPİDURAL BLOK

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ABSTRACT

AIM: Transversus abdominis plane (TAP) block under ultrasonography and caudal epidural block are techniques used to provide postoperative analgesia in children. The aim of this study was to compare the effect of these two analgesic techniques in pediatric inguinal hernia operations.

MATERIAL AND METHOD: The study included 64 patients aged 4-12 years who underwent surgery for unilateral inguinal hernia. Caudal epidural block was applied to 33 patients (Group C) and TAP block to 31 (Group T). Routine follow-up of postoperative pain for pediatric patients was made with the Wong-Baker faces pain rating scale. A record was made for each patient of the time of requirement for additional analgesia, complications during the intervention and side-effects.

RESULTS: In the evaluation of the faces pain rating scale, the scores of Group C were found to be significantly lower than those of Group T at 6, 8, and 12 hours postoperatively (p=0.04, p=0.03, p=0.03). The duration of postoperative analgesia was found to be mean 248.78±85.01 mins for Group T, and 329.94 ±105.96 mins for Group C (p= 0.001). The time of first requirement for additional analgesia was mean 13±4.8 hours in Group C, and 8±3.5 hours in Group T (p=0.02).

CONCLUSION: The application of caudal block provided more effective postoperative analgesia than TAP block applied under ultrasonography guidance in pediatric inguinal hernia repair.

Keywords: Transversus abdominis plane block, Caudal epidural block, Pediatric inguinal hernia, Postoperative analgesia

ÖZET

AMAÇ: Çocuklarda inguinal herni sonrası postoperatif analjeziyi sağlamak için ultrasonografi eşliğinde transversus abdominis plan (TAP) bloğu ve kaudal epidural blok kullanılabilir. Bu çalışmanın amacı, bu iki tekniğin pediatrik inguinal herni sonrası analjezi üzerindeki etkisini karşılaştırmaktır.

GEREÇ VE YÖNTEM: Çalışmaya, tek taraflı inguinal herni nedeniyle ameliyat edilen 4-12 yaş arasındaki 64 hasta dahil edildi. 33 hastaya kaudal epidural blok (Grup C) ve 31 hastaya TAP blok (Grup T) uygulandı. Çocuk hastalar için postoperatif ağrının rutin takibi Wong-Baker yüz ağrı derecelendirme skalası ile yapıldı. Her hasta için ek analjezi ihtiyacı, işlem sırasındaki komplikasyonlar ve yan etkiler kayıt altına alındı.

BULGULAR: Wong-Baker skalasına göre postoperatif 6., 8. ve 12. saatlerde grup C değerleri Grup T' ye göre anlamlı düşük bulundu (p=0.04, p=0.03, p=0.03). Postoperatif analjezi süresi Grup T için ortalama 248.78±85.01 dk ve Grup C için 329.94 ±105.96 dk idi (p= 0.001). Ek analjezi için ilk gereksinim süresi C grubunda 13±4.8, T grubunda 8±3.5 saat idi (p=0.02).

SONUÇ: Pediatrik inguinal herni onarımında kaudal epidural blok, ultrasonografi eşliğinde uygulanan TAP bloktan daha etkili postoperatif analjezi sağlamıştır.

Anahtar Kelimeler: Transvers abdominis plan blok, Kaudal epidural blok, Pediatrik inguinal herni, Postoperatif analjezi

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INTRODUCTION

Inguinal hernia surgery comprises approximately 10 % of pediatric day-cases (1). Chronic pain, which can form because of insufficient pain control in the postoperative period, is a significant problem in these patients (2). Although recent studies have shown that regional anaesthesia can be used in postoperative pain management in children, there is extremely little experience related to regional anaesthesia in childhood (3).

Transversus Abdominis Plane (TAP) block is a block in which local anaesthetic agents are applied to the anatomic neurofascial cavity between the transversus abdominis and internal oblique muscles that are located in the anterolateral region of the abdomen. This block was first described by Rafi et al in 2001 (4). Performing TAP block under ultrasonography guidance in recent years has increased the efficacy and reliability of this application and it is often used for postoperative pain control in lower abdomen surgery (5,6).

Caudal epidural block is a regional anaesthesia technique widely used in pediatric patients. With local anaesthetic applied in a single injection, analgesia can be provided between the thoracic 10 and sacral 5 dermatomes (7). As the most frequently applied method, caudal block constitutes only 2.5 % of neuroaxial blocks (8).

The aim of this study was to compare the effect of TAP block applied under ultrasonography and caudal epidural block on postoperative analgesia in pediatric inguinal hernia operations.

MATERIAL AND METHOD

Approval for the study was granted by the Local Ethics Committee (Decision number: 2018-KAEK-189_2018.02.21-3). The retrospective study included 64 patients, aged 4-12 years, who underwent unilateral inguinal hernia surgery. Caudal epidural block was applied to 33 patients (Group C) and TAP block to 31 (Group T). In both groups, following general anaesthesia induction, a Proseal ® laryngeal mask airway (LMA) was applied. After proper cleaning of the area, an appropriate image was obtained by placing the USG linear probe in the in-plane position (high-frequency ultrasound [Esaote MyLab5 LA523E probe] 6-13 MHz linear probe and 50-100mm needle [Stimuplex A, B: Braun, Melsungen, Germany]) over the mid-axillary line between the iliac crest and the subcostal area. The block needle was placed into the anatomic cavity between the internal oblique muscle and the transverse abdominis muscle. First a hypoechoic fusiform image was obtained by administering 0.2-0.4 ml saline, then after negative aspiration, 2mg/kg 0.25% bupivacaine was administered not exceeding 20 mL in volume (0.2-0.5 ml/kg).

In the application of caudal block, the LMA was applied, then the patient was positioned left-lateral, the caudal epidural space was entered with a pediatric caudal needle, and 0.25 % bupivacaine was administered at a volume of 0.5 ml/kg.

For all the pediatric patients, routine postoperative pain follow-up was made using the Wong-Baker faces pain rating scale. When the grading of the facial expressions was > 4, iv paracetamol was administered to the patient. The time of requirement for additional analgesia, complications during the intervention and side-effects were recorded.

Statistical Analysis

Data obtained in the study were analyzed statistically using the Statistical Package for the Social Sciences software package (SPSS Ver. 20.0, IBM). Conformity of the data to normal distribution was assessed using the Kolmogorov-Simirnov test. The independent samples t-test was used to analyze normally distributed quantitative data. Data not showing normal distribution and non-parametric data were evaluated using the Mann-Whitney U test. The chi-square ($\chi 2$) test was used to compare qualitative data. A value of $p<0.05$ was accepted as statistically significant.

RESULTS

The study included 64 patients aged 4-12 years, comprising 30 males and 34 females. Caudal block was applied to 33 patients and TAP block to 31. Surgery was performed because of right-side inguinal hernia in 42 patients and left-side inguinal hernia in 22. No significant difference was determined between the groups in respect of demographic data **(Table 1).**

No difference was determined between the groups in respect of the faces pain rating scale values in the first 6 hours. At the 6th, 8th and 12th hours, the values of the caudal block group were determined to be significantly lower than those of the TAP group **(Figure 1)** (p=0.04, p=0.03, p=0.03).

A statistically significant difference was determined between the groups in respect of the duration of analgesia (p=0.001). The need for additional analgesia was mean 13±4.8 hours in Group C and 8±3.5 hours in Group T (p=0.02) **(Table 2).**

Table 1: Demographic data

	GROUP T (n=31)	GROUP C (n=33)	p
Age (years)	8.74 ± 2.24	8.57 ± 2.10	0.374
Weight (kg)	24.3 ± 5.32	23.5 ± 4.27	0,127
Gender (female /male)	16/15*	18/15	0,204

Statistical analyse; Mann- whitney-U *; Chi Sguare Datas are presented as n or mean ± SD.
T: Transversus abdominis plane block, C: Caudal epidural block

Table 2: The duration of postoperative analgesia and the time of the need for additional analgesia

	GROUP T (n=31)	GROUP C (n=33)	p
Duration of postoperative analgesia (minutes)	248.78±85.01	329.94 ±105.96	0.001
Time of first need for analgesia (hours)	8.32 ±3.5	13.45 ±4.8	0.02

Statistical analyse; Mann- whitney-U and independent sample T test. Datas are presented as mean ± SD.
T: Transversus abdominis plane block, C: Caudal epidural block

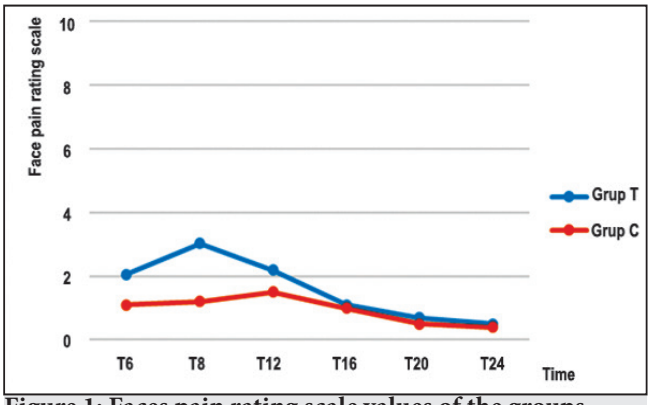

Figure 1: Faces pain rating scale values of the groups

No complications were observed in the TAP block group. In the caudal block group, complications were seen of dura penetration in 1 patient and vessel puncture in 2 patients.

DISCUSSION

Inguinal hernia operations are generally performed as day-cases in the pediatric population. The postoperative analgesia method to be selected for this patient group must be less invasive, allowing for recovery in a short time with the development of fewer complications.

TAP block has been defined as an effective component of multimodal postoperative analgesia for several pediatric surgical procedures. TAP block is applied with the injection of local anaesthesia between the internal oblique and transverse abdominis muscles. By affecting the ventral ramus of the thoracolumbar nerve, the skin, muscle and parietal peritoneum of the anterior abdominal wall are blocked. Thus, effective analgesia is provided, especially for lower abdominal, gynaecological and urological procedures (9). Caudal epidural block is made by applying local anaesthetic agent to the sacral canal passing the sacrococcygeal ligament, and is an often preferred regional anaesthesia method in pediatric lower extremity, pelvic and below the umbilicus surgical procedures (10).

In a study by Kendigelen et al, the applications were compared of TAP block and wound-site infiltration block in children aged 6-8 years. It was reported that TAP block provided effective analgesia in inguinal hernia operations, and the VAS pain scores were significantly lower in the TAP group than in the wound-site infiltration block group (2). In another study, the postoperative analgesic efficacy of hypogastric nerve block and caudal block were compared in children aged 1-6 years who underwent inguinal surgery, and nerve block applied under ultrasonography guidance was reported to be as effective as caudal block (11). In the current study, the faces pain rating scale values of the group applied with TAP block were higher than those of the caudal block group.

Sethi et al. (12) compared caudal block and TAP block applied under ultrasonography in a prospective study and the postoperative duration of analgesis was significantly longer in the caudal group (362 mins) than in the TAP group (210 mins). The duration of postoperative analgesia in the current study was found to be similar to the findings of that study.

In a study that evaluated 5536 pediatric urology cases applied with caudal block, it was reported that the caudal block minimised the need for additional analgesia, and enabled an earlier start to oral intake and earlier discharge (13). The side-effects and analgesic efficacy of caudal and non-caudal techniques were compared in a meta-analysis, and it was emphasized that in both the early and late stages, caudal analgesia was better, but there was a need for a higher volume of local anaesthetic and there was a significant risk of urinary retention and motor block (14). Consistent with these findings in literature, the need for additional anaesthesia in the current study patients was significantly later in the caudal group than in the TAP group. Sethi et al reported that there was no significant difference in the incidence of postoperative pain in the first 6 hours. Moreover, unlike the current study, in the evaluation made after 6 hours, the level of pain was significantly lower in the TAP block group (12). In the current study, the pain values in the caudal block group at 6, 8 and 12 hours were significantly lower than those of the TAP group. These results show that even when TAP block is applied by an experienced doctor, as it is still a relatively new application, there may still be insufficient block compared to a caudal block.

Akin et al. (13) determined vessel punction as a complication of caudal block in 276 (4.98%) patients. This rate was found to be 0.88% in a series of 2262 cases by Begeç et al (15). The more serious complication of dura punction was reported by Akın et al to have been seen in 4 (0.07%) patients (13). Gavrilovska- Brzanov compared the application of caudal block and wound-site infiltration block in children undergoing inguinal surgery, and reported a significant difference in side-effects. In the caudal block group, the incidence of nausea was 14.29%, delirium 3.5%, and a need for urinary catheterisation 3.5%, while it was emphasised that no side-effects were seen in the other wound-site infiltration block group (16).

Long et al. (17) reported a complication rate of 0.3% (aspiration of blood and peritoneal puncture) in 1994 pediatric patients applied with TAP block. In the current study, there were no side-effects or complications in the TAP block group, while in the caudal block group, dura penetration was seen in one patient and vessel punction in two patients. Since the first applications, TAP block under ultrasonography guidance has been an extremely safe block.

This study, which compares two different analgesia techniques in the frequent inguinal hernia surgery in pediatric age group, will undoubtedly contribute. However, retrospective method of the study, the inability to evaluate patient or family satisfaction are significant limitations. It is also clear that higher number of patients are needed in terms of evaluating the effectiveness and complications of the TAP block.

As a result, TAP blocks can be preferred for postoperative analgesia with easy to apply and cause more rare serious complications. However, it was observed that caudal block provides much more effective postoperative analgesia than the TAP block in the repair of pediatric inguinal hernia.

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