ORİJİNAL ARAŞTIRMA ORIGINAL RESEARCH

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Comparison of Postoperative Analgesic Efficacy Between Ultrasonography-Guided Quadratus Lumborum and Transversus Abdominis Plane Blocks in Infants Undergoing Inguinal Hernia Surgery: Randomized Controlled Trial

Kasık Fıtığı Ameliyatı Olan İnfantlarda Ultrasonografi Eşliğinde Yapılan Quadratus Lumborum Bloğu ve Transversus Abdominis Plan Bloğunun Postoperatif Analjezik Etkinliğinin Karşılaştırılması: Randomize Kontrollü Bir Çalışma

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ABSTRACT Objective: We compared the analgesic efficacy of ultrasonography (USG)-guided quadratus lumborum (QL) and transversus abdominis plane (TAP) blocks in infants undergoing elective unilateral inguinal hernia surgery (IHS). **Material and Methods:** This single-center, randomized, single-blind, 2-arm clinical trial included 60 infants undergoing elective IHS (aged 1 month to 1 year) with ASA I–II. The patients were randomized into QL block (Group A) and TAP block (Group B) groups. For both groups, 0.3 mL/kg of 0.25% bupivacaine was injected under USG guidance. Age, sex, weight, anesthesia duration (min), surgery duration (min), and recovery duration (min) were recorded. The heart rate (HR) was recorded at baseline, after anesthesia induction, and at 15 and 30 min after the blocks. Postoperatively, patients were evaluated based on their Face, Legs, Activity, Cry, and Consolability (FLACC) scores at 0, 1, 2, 6, 12, and 24 h. We also recorded the first analgesic duration, analgesic requirement, rescue analgesic requirement, and complications. The primary outcome of the study was FLACC score. **Results:** Sixty patients completed the study protocol. There were no significant differences between the groups in terms of age, sex, weight, anesthesia duration, surgery duration, recovery duration, or FLACC score or HR in the first 24 h postoperatively. The analgesic requirement, first analgesic requirement time, and rescue analgesic requirement were not significantly different between the groups ($p>0.05$ for all comparisons). **Conclusions:** QL and TAP blocks showed similar analgesic efficacy in infants undergoing IHS.

Keywords: Anesthesia, conduction; ultrasound; interventional; pediatric patients; quadratus lumborum; transversus abdominis plane block

ÖZET Amaç: Bu çalışmada, elektif tek taraflı kasık fıtığı cerrahisi uygulanan infantlarda ultrasonografi (USG) kılavuzluğunda quadratus lumborum (QL) bloğu ve transversus abdominis plan (TAP) bloğunun analjezik etkinliğini karşılaştırmayı amaçladık. **Gereç ve Yöntemler:** Bu çalışma, ASA I-II durumu olan ve elektif kasık fıtığı cerrahisi uygulanan 60 infant hastanın (yaş aralığı 1 ay ila 1 yıl) dâhil edildiği tek merkezli, randomize, tek kör, 2 kollu klinik bir çalışmadır. Hastalar QL (Grup A) ve TAP blok (Grup B) gruplarına randomize edildi. Her iki gruba da USG eşliğinde %0,25 (0,3 mL/kg) bupivakain enjekte edildi. Yaş, cinsiyet, kilo, anestezi süresi (dk), ameliyat süresi (dk) ve derlenme süreleri (dk) kaydedildi. Kalp atım hızları (KH) bazal, anestezi sonrası, 15 ve 30. dk bloklar için kaydedildi. Ameliyat sonrası hastalar 0, 1, 2, 6. 12 ve 24. saatlerde Yüz, Bacaklar, Hareket, Ağlama, Avutabilme Davranışsal [Face, Legs, Activity, Cry, and Consolability (FLACC)] Skalası ile değerlendirildi. İlk analjezik ihtiyacı süresi, analjezik gereksinimleri, kurtarıcı analjezik gereksinimleri ve komplikasyonları kaydedildi. Çalışmanın birincil sonucu, FLACC skorlarının karşılaştırılması idi. **Bulgular:** Altmış hasta çalışma protokolünü tamamladı. Gruplar arasında yaş, cinsiyet, ağırlık, anestezi süresi, ameliyat süresi ve derlenme süresi ilk 24 saatteki FLACC skorları ve KH açısından anlamlı bir farklılık gözlenmedi. Analjezik gereksinimi, ilk analjezik gereksinimi ve kurtarma analjezik gereksinimleri gruplar arasında istatistiksel olarak anlamlı fark gözlenmedi (tüm karşılaştırmalar için $p>0,05$). **Sonuç:** Kasık fıtığı cerrahisi uygulanan infantlarda QL bloğu ve TAP bloğu benzer analjezik etkinlik gösterdi.

Anahtar Kelimeler: Anestezi; konduksiyon; ultrason; girişimsel; pediatrik hastalar; quadratus lumborum; transversus abdominis plan bloğu

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Postoperative pain is associated with an increased stress response and adverse clinical outcomes. Recently, the use of regional anesthesia techniques has improved pain control.[1] Previous studies reported that regional anesthesia techniques (neuroaxial or peripheral blocks) provide adequate pain control during lower abdominal surgery.[2] These techniques have distinct advantages and disadvantages.

The major disadvantages of systemic opioid use are nausea, vomiting, and prolonged ventilation time. Therefore, opioids should be used cautiously and other pain management techniques should be preferred. The use of neuroaxial blocks is limited due to certain contraindications. Abdominal blocks have gained popularity in recent years. A recent meta-analysis reported that, compared to caudal blocks, abdominal wall blocks are noninvasive and lead to less motor blockade in pediatric genitourinary surgery.[3]

Pain perception and activation of pain-related peripheral receptors, pathways, and cortical centers begin at 24 weeks of gestation.[4] Therefore, effective perioperative and postoperative pain control is important in operations performed during the neonatal period. However, in newborns and infants, certain physiological differences from adults complicate the use of systemic analgesics, particularly opioids. Insufficient development of liver enzyme systems for conjugation, a low glomerular filtration rate, increased total and extracellular fluid volumes, and changes in drug pharmacodynamics and pharmacokinetics lead to prolonged drug effects and an increased risk of postoperative apnea.[5]

The use of regional anesthesia reduces adverse drug events and provides effective and safe analgesia in infants. Reducing the need for intraoperative anesthetics minimizes the risk of anesthesia-related neurotoxicity. However, due to limited experience and the risk of systemic toxicity caused by the increase in free local anesthetic fractions, the use of regional anesthesia in infants is limited.[6] In 2010, L'Association Des Anesthésistes-Réanimateurs Pédiatriques d'Expression Française stated that the complication rates in children were 6-fold higher with central blocks than peripheral blocks. The widespread use of ultrasonography (USG) has led to an increase in the use of peripheral nerve blocks in children.[7]

There is a paucity of randomized controlled trials (RCTs) that compare different pain management techniques.[8] To the best of our knowledge, no previous study has compared a quadratus lumborum (QL) block with a transversus abdominis plane (TAP) block in infants. The aim of the present study was to compare the analgesic efficacy of USG-guided QL and TAP blocks in infants undergoing inguinal hernia surgery (IHS). The primary outcome of the study was the Face, Legs, Activity, Cry, and Consolability (FLACC) score.

MATERIAL AND METHODS

This study was conducted in accordance with CONSORT guidelines and the 2008 Declaration of Helsinki, and was approved by our institutional Ethics Committee (Sağlık Bilimleri University Şişli Hamidiye Etfal Training and Research Hospital Health Application and Research Center, date: February 16, 2021, no: 3144, clinical trials registration number: NCT04927624). The study duration was 6 months. Written consent was obtained from the parents of patients before the procedure.

SAMPLE SIZE CALCULATION

The sample size was calculated using power analysis and G*Power (version 3.1.7; Franz Faul, Christian-Albrechts-Universität Kiel, Kiel, Germany). The independent sample t-test was used to compare the study groups. We selected a type I error (α) of 5%, small Cohen's standardized effect size of 0.20, distribution ratio of 1, and power of 80%, which correlated with type II error (β) of 20%. Based on these parameters, a sample size of 60 patients was calculated (2 equal groups with 30 patients each).

ELIGIBILITY CRITERIA

We enrolled pediatric patients aged between 1 month and 1 year, who were planned to undergo elective unilateral inguinal surgery and were ASA I–II. We excluded patients who underwent emergency surgery (e.g., due to intestinal obstruction), did not give informed consent, or had a history of prematurity, growth abnormality, bupivacaine allergy, active in-

fection at the site of block, bleeding disorders, prolonged opioid use, mental retardation (e.g., due to a chromosomal anomaly), or abdominal wall, spinal, or colon anomalies.

ALLOCATION

Patients were allocated to the groups by a computer program. The surgeon and anesthesiologist who collect the data were blinded to the block technique. All blocks were performed by the same anesthesiologist.

INTERVENTIONS

A standard anesthetic regimen was administered to the patients without premedication. The patients underwent intraoperative monitoring of oxygen saturation, electrocardiography, and end-tidal carbon dioxide measurement. The heart rate (HR) was recorded before anesthesia induction and considered the initial value.

A face mask was used for pre-oxygenation. For anesthesia induction, 8% sevoflurane was administered via a face mask. Saline was infused through a peripheral intravenous 24-26-gauge catheter. A laryngeal mask, sized according to the patient's weight, was placed. General anesthesia was maintained using sevoflurane insufflated with a mixture of oxygen and air (50%/50%). The HR was recorded at baseline, every 15 min thereafter, and after recovery from anesthesia.

The patients were randomized into Group A (QL block; n=30) and Group B (TAP block; n=30).

GROUP A (USG-GUIDED QL BLOCK)

After the insertion of a laryngeal mask airway, the patients were placed in a lateral decubitus position. The abdominal wall was disinfected with 5% povidone-iodine and a sterile cover was placed. The procedure was performed under USG guidance (Esaote Mylab Five; Esaote SpA, Genoa, Italy). A linear probe (12L-RS/6-18 MHz) was covered with a sterile sheath and placed transverse to the abdominal flank between the iliac crest and costal margin. After imaging the external and internal oblique and transversus abdominis muscles, the probe was advanced posteriorly to visualize the QL, psoas major, and erector spinae muscles. A short bevel cannula (SonoTAP cannula, 22 G, 50 mm; B-Braun Sonoplex, Melsungen, Germany) was advanced to the middle layer of the thoracolumbar fascia (TLF) between the QL and erector spinae muscles using an in-plane technique under real-time USG guidance. Then, 1 mL of 0.9% saline was injected to determine the tip location, followed by 0.3 mL/kg of 0.25% bupivacaine. The injection site was confirmed by USG.

GROUP B (USG-GUIDED TAP BLOCK)

After insertion of a laryngeal mask airway, the patients were placed in the supine position. The abdominal wall was disinfected with 5% povidone-iodine and a sterile cover was placed. The procedure was performed under USG guidance (Esaote My Lab Five; Esaote SpA). A linear probe (12L-RS/6-18 MHz) was covered with a sterile sheath and placed on the anterior abdominal wall, with the medial head of the probe placed at the level of the umbilicus, to achieve optimal visualization of the rectus abdominis muscle. After the rectus abdominus muscle was identified, the probe was advanced laterally toward the area between the iliac crest and subcostal margin. The three layers of the lateral abdominal wall (external oblique, internal oblique, and transversus abdominis muscles) and peritoneal cavity were visualized.

A short bevel cannula (SonoTAP cannula, 22 G, 50 mm; B-Braun Sonoplex) was advanced from the anterolateral to the medial direction under real-time USG guidance. Then, 1 mL of 0.9% saline was injected between the aponeuroses of the internal oblique and transversus abdominis muscles to confirm the tip's location, followed by injection of 0.3 mL/kg of 0.25% bupivacaine. The injection location was confirmed by USG. The dark shadow between the internal oblique and transverse abdominis muscles was visualized.

We recorded the age, sex, weight, anesthesia duration (from anesthesia induction to extubation; min), surgery duration (from surgical incision to end of wound saturation; min), and recovery duration (from cessation of sevoflurane to patient referral to the recovery room; min).

The HR was recorded at baseline, after anesthesia induction, and after 15 and 30 mins of block. The

FLACC score was evaluated at 0, 1, 2, 6, 12, and 24 h of surgery.

Oral intake was allowed for the patients 2 h after surgery. For a FLACC score ≥4 in the first 2 hours postoperatively, a rescue analgesic (10 mg/kg of paracetamol, IV.) was administered. An additional dose of ibuprofen was administered after the first two hours if the FLACC score remained ≥4.

We also recorded the analgesia duration, analgesic requirement, rescue analgesic requirement, and complications. The investigator who collected the data was blind to the type of regional anesthesia administered.

STATISTICAL ANALYSIS

SPSS software (version 22.0; IBM Corp., Armonk, NY, USA) was used for statistical analysis. Descriptive analyses were reported as the mean with standard deviation or frequency with ratio, minimum, and maximum values. The Shapiro-Wilk test showed that the data were normally distributed; therefore, parametric tests were used for statistical analysis. Student's t-test was used to compare the two groups. Pearson's chi-square test was used to compare the categorical data. $p<0.05$ was considered to indicate statistical significance.

RESULTS

Figure 1 presents the CONSORT diagram for the study. In total, 60 participants, with a mean age of 5.42±2.499 months, completed the study. No statistically significant differences were observed in the age, sex, and weight distribution between the groups ($p>0.05$ for all comparisons; Table 1). For all study participants, the mean anesthesia, surgery, and recovery durations were 44.05±11.67, 32.18±10.88, and 6.13±2.48 min, respectively, with no significant differences between the groups ($p>0.05$ for all comparisons; Table 1).

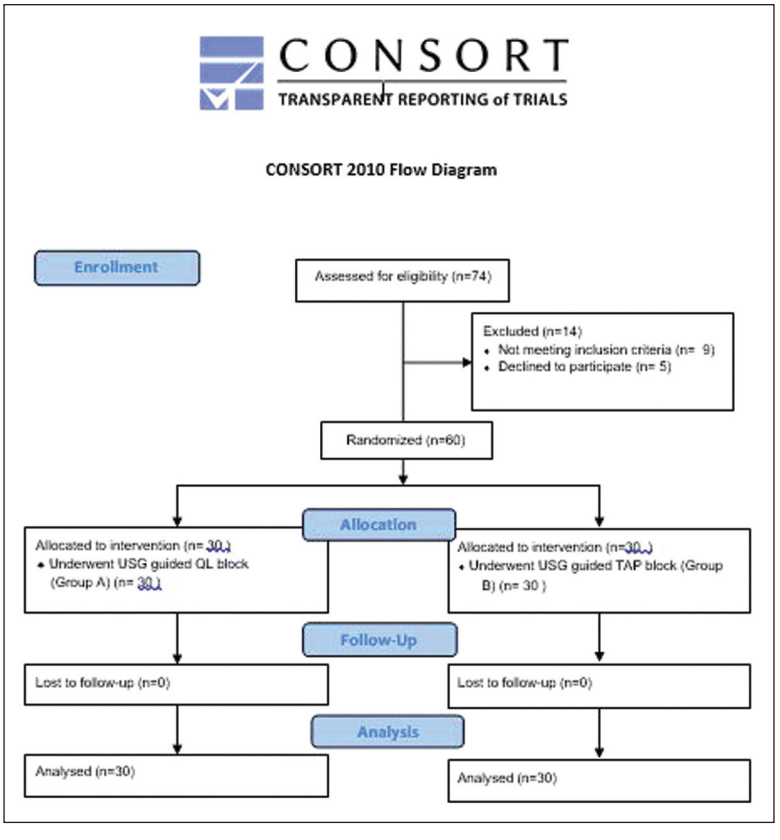

FIGURE 1: CONSORT diagram of the comparison of the postoperative analgesic efficacy of ultrasonography-guided quadratus lumborum (Group A) and transversus abdominis plane (Group B) blocks in infants undergoing inguinal hernia surgery. USG: Ultrasonography; QL: Guided quadratus lumborum; TAP: Transversus abdominis plane.

TABLE 1: Demographic data and operative parameters for infants who underwent ultrasonography-guided quadratus lumborum (Group A) and transversus abdominis plane (Group B) blocks for inguinal hernia surgery.

Characteristics	Total (n=60)	Group A (n=30)	Group B (n=30)	p value
Age				
Minimum-maximum (median)	1-11 (5)	2-11 (5)	1-10 (5)	0.501[a]
Mean±SD	5.42±2.49	5.20±2.52	5.63±2.49	
Gender				
Male	40 (66.7%)	20 (66.7%)	20 (66.7%)	1.000[b]
Female	20 (33.3%)	10 (33.3%)	10 (33.3%)	
Weight				
Minimum-maximum (median)	3.4-10 (7.225)	4.5-10 (7)	3.4-10 (7.450)	0.784[a]
Mean±SD	7.257±1.69	7.1960±1.63	7.318±1.77	
Anesthesia duration (min)				
Minimum-maximum (median)	25-80 (41.5)	25-80 (40)	26-61 (42.5)	0.638[a]
Mean±SD	44.05±11.67	44.77±14.75	44.77±14.75	
Surgery duration (min)				
Minimum-maximum (median)	15-60 (30)	15-60 (29)	15-50 (30)	0.664[a]
Mean±SD	32.18±10.88	32.8±13.7	31.57±7.24	
Recovery duration (min)				
Minimum-maximum (median)	1-18 (6)	1-18 (5)	3-10 (6)	0.681[a]
Mean±SD	6.13±2.48	6.27±3.16	6±1.57	

[a]Independent student t-test; [b]Pearson χ^2 test; SD: Standard deviation.

The HR (baseline, after anesthesia, and at 15 and 30 min after the block) did not significantly differ between the groups. The FLACC score was not significantly different between the groups at 24 h postoperatively (p>0.05 for all comparisons; Table 2). The analgesic requirement duration was 10.0±3.46 and 9.75±3.10 min for Groups A and B, respectively (p=0.910). In total, 3 (10.0%) and 8 (26.7%) patients in Groups A and B, respectively, required analgesics. Although the analgesic requirement was higher in Group B than Group A, the difference was not statistically significant (p=0.095). In addition, 1/30 (3.3%) and 2/30 (6.7%) patients in groups A and B, respectively, required rescue analgesics (p=0.554; Table 3).

DISCUSSION

In this study, we found that USG-guided QL and TAP blocks had similar efficacy with no complications. Both techniques were effective for analgesia in infants undergoing unilateral IHS.

QL and TAP blocks are well-established anesthesia techniques. In a QL block, the TLF and overlying nerves are targeted. The QL block acts by affecting the nerves overlying the TLF or diffusion of the local anesthetic agents from the TLF to the paravertebral space.[9] There are four main types of QL block; we used a type 2 QL block in the present study.

Local anesthetic toxicity, damage to the underlying organs (particularly kidneys), and femoral nerve injury are the major complications of a QL block. The use of a QL block has previously been reported in pediatric patients undergoing lower abdominal surgery. A meta-analysis by Zhao et al. included seven RCTs (346 patients) that evaluated the use of a QL block in pediatric patients who underwent lower abdominal surgery, and found significantly reduced pain scores at 2, 4, and 12 h after the QL block.[8] The satisfaction of patients and side effect profile were similar to other techniques. A QL block significantly reduces the rescue analgesic re-

TABLE 2: Comparison of heart rate and the Face, Legs, Activity, Cry, and Consolability score between our quadratus lumborum block (Group A) and transversus abdominis plane block (Group B) groups.

Characteristics	Total (n=60)	Group A (n=30)	Group B (n=30)	p value
Basal HR Minimum-maximum (median) Mean±SD	123-149 (140)	130-148 (140)	123-149 (139)	0.534[a]
	139.97±4.92	140.37±4.56	139.57±5.30	
Post anesthesia HR				
Minimum-maximum (median)	114-140 (129)	114-140 (129)	120-135 (128)	0.818[a]
Mean±SD	127.70±5.55	127.87±6.38	127.53±4.68	
HR at 15.th min of block				
Minimum-maximum (median)	106-135 (119)	106-130 (118)	111-135 (119)	0.052[a]
Mean±SD	119.07±5.86	117.60±6.30	120.53±5.07	
HR at 30.th min of block				
Minimum-maximum (median)	104-131 (115)	104-131 (113.5)	109-129 (117.5)	0.107[a]
Mean±SD	115.5±6.08	114.23±6.94	114.23±6.94	
FLACC score 0.th hour				
Minimum-maximum (median)	0-5(0)	0-4 (0)	0-5 (0)	0.351[a]
Mean±SD	0.5±1.09	0.37±0.85	0.63±1.29	
FLACC score 1.th hour				
Minimum-maximum (median)	0-2 (0)	0-2 (0)	0-2 (0)	0.597[a]
Mean±SD	0.52±0.725	0.47±0.681	0.57±0.774	
FLACC score 2.th hour0-5 (0)				
Minimum-maximum (median)	0-5 (0)	0-2 (0)	0-5 (0)	0.333[a]
Mean±SD	0.58±0.926	0.47±0.681	0.70±1.119	
FLACC score 6.th hour				
Minimum-maximum (median)	0-5 (0)	0-4 (0)	0-5 (0)	0.522[a]
Mean±SD	0.70±1.197	0.60±0.968	0.80±1.40	
FLACC score 12.th hour				
Minimum-maximum (median)	0-4 (0)	0-4 (0)	0-4 (0)	0.781[a]
Mean±SD	0.72±1.379	0.67±1.373	0.77±1.406	
FLACC score 24.th hour				
Minimum-maximum (median)	0-2 (0)	0-2 (0)	0-2 (0)	0.610[a]
Mean±SD	0.23±0.500	0.20±0.484	0.27±0.521	

[a]Independent student t-test; [b]Pearson χ^2 test; HR: Heart rate; SD: Standard deviation; FLACC: Face, Legs, Activity, Cry, and Consolability.

TABLE 3: Comparison of analgesic requirement, first analgesic requirement time, and rescue analgesic requirement between the quadratus lumborum block (Group A) and transversus abdominis plane block (Group B) groups.

Characteristics	Total (n=60)	Group A (n=30)	Group B (n=30)	p value
Analgesic requirement				
Absent	49 (81.7%)	27 (90.0%)	22 (73.3%)	0.095[b]
Present	11 (18.3%)	3 (10.0%)	8 (26.7%)	
First analgesic requirement (min)				
Minimum-maximum (median)	6-12 (12)	6-12 (12)	6-12 (12)	0.910[a]
Mean±SD	9.82±3.02	10.0±3.46	9.75±3.10	
Rescue analgesic requirement				
Absent	57 (95.2%)	29 (96.7%)	28 (93.3%)	0.554[b]
Present	3 (5.0%)	1 (3.3%)	2 (6.7%)	

[a]Independent sample t-test; [b]Pearson χ^2 test; SD: Standard deviation.

quirement in the first 24 h postoperatively compared to caudal blocks. Öksüz et al. also compared a QL block and caudal block for 52 patients undergoing IHS and orchiopexy (aged 1-7 years).[10] Compared to a caudal block, the QL block resulted in a lower FLACC score, lower analgesic requirement, and higher parental satisfaction score.

A TAP block is also a well-established technique for regional anesthesia. The anesthetic is injected into the fascial area that separates the transversus abdominis and internal oblique muscles.[11] Previous comparative studies have reported that a TAP block also requires caudal blocks. A meta-analysis by Desai et al. included 23 trials with 1,399 patients to compare caudal analgesia and abdominal wall blocks.[3] The abdominal wall blocks included ilioinguinal-iliohypogastric (II-IH) and TAP blocks. The results showed that the abdominal wall blocks were similar to caudal analgesia in terms of 2-h postoperative analgesia and the need for rescue analgesics. However, abdominal wall blocks were associated with a reduced duration of postoperative motor blockade and micturition. Baeriswyl et al. included 10 studies that included 195 children and 310 adults to compare epidural analgesia and TAP blocks.[12] The TAP block was equally effective to epidural analgesia in children and adults. In addition, the TAP block was associated with a reduced length of hospital stay and hypotensive episodes.

However, a limited number of studies have compared QL and TAP blocks. Öksüz et al. included 50 patients aged 1-7 years and demonstrated a lower FLACC score in the first 24 h after a QL block compared to a TAP block.[1] QL block was associated with a significantly reduced analgesic requirement for 24 h postoperatively and a higher satisfaction score. The aforementioned advantages of QL blocks were confirmed in our study, but the effects of QL blocks were similar to those of TAP blocks. İpek et al. compared TAP, QL, and caudal epidural blocks in 94 patients aged between 6 months and 14 years.[13] The results showed that, compared to a caudal block, TAP block was associated with greater analgesic use and QL block was associated with a significantly reduced hospital stay. It is possible that abdominal wall blocks have similar effectiveness in reducing postoperative pain. Aksu et al. compared erector spinae plane and QL blocks for lower abdominal surgery in 60 patients aged 1-7 years, and found a similar FLACC score, analgesic requirement, and time to first postoperative analgesic requirement between the groups.[14]

To the best of our knowledge, no previous study has compared the use of QL and TAP blocks in infants, although there are a few case reports and a single retrospective case series. QL and rectus sheath blocks were successfully applied to a 5-month-old baby with pulmonary hypertension who underwent laparoscopic cholecystectomy.[15] Further, a TAP block provided safe and effective analgesia in a 2-month-old premature baby with jejunal atresia.[16] In addition, Kendigelen et al. reported their experience of a successful TAP block in 34 patients aged 2-88 days. Our study is the first RCT to compare QL and TAP blocks in infants.[17]

In the present study, none of our patients had regional anesthesia failure or complications. However, long-term follow-up was not performed and complications were only recorded for 24 h postoperatively. The blocks were administered under USG guidance by an experienced team. USG guidance while administering blocks increases procedural success and decreases complications.[18] In the present study, USG guidance improved the efficacy of the blocks and minimized the failure rate.

The main limitation of our study was the use of a low effect size (i.e., 0.2). However, inguinal surgery is a relatively rare procedure in infants. Therefore, we believe that the study is adequately powered. The main strengths of our study are that a single anesthesiologist administered the blocks and the investigator collecting the data was blinded to the block type. No patient was lost to follow up and there were no significant differences in the demographic characteristics between the 2 groups. We did not evaluate other abdominal wall or caudal block techniques, use a placebo control, or compare different doses of local anesthetics.

CONCLUSION

In this RCT, USG-guided QL and TAP blocks showed similar analgesic efficacy in infants who underwent IHS; therefore, both techniques can be used to reduce postoperative pain in infants.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Pınar Sayın, Hacer Şebnem Türk, Surhan Çınar;* ***Design:*** *Pınar Sayın, Hacer Şebnem Türk, Surhan Çınar;* ***Control/Supervision:*** *Pınar Sayın, Hacer Şebnem Türk, Mustafa Altınay;* ***Data Collection and/or Processing:*** *Pınar Sayın, Hacer Şebnem Türk, Surhan Çınar;* ***Analysis and/or Interpretation:*** *Mustafa Altınay, Melis Türkel Özkan, Serkan İslamoğlu;* ***Literature Review:*** *Mustafa Altınay, Surhan Çına;* ***Writing the Article:*** *Pınar Sayın, Melis Türkel Özkan, Serkan İslamoğlu;* ***Critical Review:*** *Pınar Sayın, Surhan Çınar;* ***References and Fundings:*** *Mustafa Altınay;* ***Materials:*** *Pınar Sayın, Hacer Şebnem Türk, Mustafa Altınay, Surhan Çınar.*

REFERENCES

1. Öksüz G, Bilal B, Gürkan Y, Urfalioğlu A, Arslan M, Gişi G, et al. Quadratus lumborum block versus transversus abdominis plane block in children undergoing low abdominal surgery: a randomized controlled trial. Reg Anesth Pain Med. 2017;42(5):674-9. [Crossref] [PubMed]
2. Anand KJ, Carr DB. The neuroanatomy, neurophysiology, and neurochemistry of pain, stress, and analgesia in newborns and children. Pediatr Clin North Am. 1989;36(4):795-822. [Crossref] [PubMed]
3. Desai N, Chan E, El-Boghdadly K, Albrecht E. Caudal analgesia versus abdominal wall blocks for pediatric genitourinary surgery: systematic review and meta-analysis. Reg Anesth Pain Med. 2020;45(11):924-33. [Crossref] [PubMed]
4. Boretsky KR. A review of regional anesthesia in infants. Paediatr Drugs. 2019;21(6):439-49. [Crossref] [PubMed]
5. Monahan A, Deer J, Robles A, Traylor P. Regional anesthesia in babies and children. Int Anesthesiol Clin. 2019;57(4):e1-e23. [Crossref] [PubMed]
6. Relland LM, Neel ML, Gehred A, Maitre NL. Regional anesthesia in neonates and infants outside the immediate perioperative period: a systematic review of studies with efficacy and safety considerations. Paediatr Anaesth. 2021;31(2):132-44. [Crossref] [PubMed]
7. Ecoffey C, Lacroix F, Giaufré E, Orliaguet G, Courrèges P; Association des Anesthésistes Réanimateurs Pédiatriques d'Expression Française (ADARPEF). Epidemiology and morbidity of regional anesthesia in children: a follow-up one-year prospective survey of the French-Language Society of Paediatric Anaesthesiologists (ADARPEF). Paediatr Anaesth. 2010;20(12):1061-9. [Crossref] [PubMed]
8. Zhao WL, Li SD, Wu B, Zhou ZF. Quadratus lumborum block is an effective postoperative analgesic technique in pediatric patients undergoing lower abdominal surgery: a meta-analysis. Pain Physician. 2021;24(5):E555-63. [Crossref] [PubMed]
9. Walter CM, Abbasian N, Olbrecht VA. Trends in pediatric pain: thinking beyond opioids. Anesthesiol Clin. 2020;38(3):663-78. [Crossref] [PubMed]
10. Öksüz G, Arslan M, Urfalıoğlu A, Güler AG, Tekşen Ş, Bilal B, et al. Comparison of quadratus lumborum block and caudal block for postoperative analgesia in pediatric patients undergoing inguinal hernia repair and orchiopexy surgeries: a randomized controlled trial. Reg Anesth Pain Med. 2020;45(3):187-91. [Crossref] [PubMed]
11. Sola C, Menacé C, Bringuier S, Saour AC, Raux O, Mathieu O, et al. Transversus abdominal plane block in children: efficacy and safety: a randomized clinical study and pharmacokinetic profile. Anesth Analg. 2019;128(6):1234-41. [Crossref] [PubMed]
12. Baeriswyl M, Zeiter F, Piubellini D, Kirkham KR, Albrecht E. The analgesic efficacy of transverse abdominis plane block versus epidural analgesia: a systematic review with meta-analysis. Medicine (Baltimore). 2018;97(26):e11261. [Crossref] [PubMed] [PMC]
13. İpek CB, Kara D, Yılmaz S, Yeşiltaş S, Esen A, Dooply SSSL, et al. Comparison of ultrasound-guided transversus abdominis plane block, quadratus lumborum block, and caudal epidural block for perioperative analgesia in pediatric lower abdominal surgery. Turk J Med Sci. 2019;49(5):1395-402. [Crossref] [PubMed] [PMC]
14. Aksu C, Şen MC, Akay MA, Baydemir C, Gürkan Y. Erector spinae plane block vs quadratus lumborum block for pediatric lower abdominal surgery: a double blinded, prospective, and randomized trial. J Clin Anesth. 2019;57:24-8. [Crossref] [PubMed]
15. Falciola V, Boretsky K. Quadratus lumborum and rectus sheath blocks in an infant with severe pulmonary hypertension undergoing laparoscopic cholecystectomy. J Clin Anesth. 2020;64:109831. [Crossref] [PubMed]
16. Tekin M, Gurkan Y, Solak M, Toker K. Ultrasound-guided bilateral transversus abdominis plane block in a 2-month-old infant. J Anesth. 2009;23(4):643-4. [Crossref] [PubMed]
17. Kendigelen P, Tütüncü C, Ashyralyyeva G, Ozcan R, Emre S, Altindas F, et al. Transversus abdominis plane (TAP) block for postoperative analgesia in neonates and young infants: retrospective analysis of a case series. TAP blocks in neonates and young infants. Minerva Anestesiol. 2017;83(3):282 -7. [Crossref] [PubMed]
18. Long JB, Birmingham PK, De Oliveira GS Jr, Schaldenbrand KM, Suresh S. Transversus abdominis plane block in children: a multicenter safety analysis of 1994 cases from the PRAN (Pediatric Regional Anesthesia Network) database. Anesth Analg. 2014;119(2):395-9. [Crossref] [PubMed]