ORIGINAL RESEARCH

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Comparison of the Effectiveness of Ultrasound-guided Transversalis Fascia Plane Block (TFPB) and Transversus Abdominis Plane Block (TAPB) on Postoperative Pain in Caesarean Section: A Prospective Randomized Study

Sezeryan Operasyonlarında Ultrasonografi Eşliğinde Transversalis Fasya Plan Bloğun (TFPB) ve Transversus Abdominis Plan Bloğun (TAPB) Postoperatif Ağrıda Etkinliğinin Karşılaştırılması: Prospektif Randomize Çalışma

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Abstract

Objective: Postoperative peripheral trunk blocks are used for multimodal analgesia in caesarean sections. This trial was planned to compare the efficacy of transversalis fascia plane block (TFPB) and transversus abdominis plane block (TAPB) in postoperative analgesia in patients undergoing caesarean section under spinal anaesthesia.

Method: In this prospective trial, ASA II-III risk group patients between the ages of 20-50 years who were scheduled for elective caesarean section under spinal anaesthesia were evaluated. Demographic data, duration of operation, presence of intraoperative and postoperative nausea & vomiting, pruritus, duration of first analgesia requirement, visual analogue scale (VAS) values for 24 hours postoperatively, paracetamol, diclofenac sodium, the total amount of non-steroidal anti-inflammatory drugs (NSAIDs) used were recorded.

Results: Patients were randomized into two groups: TFPB (75, 50%) and TAPB (75, 50%) groups. There was no significant difference in demographic data, comorbidity, ASA classification and operation times between the two groups (p>0.05). When the duration of the first postoperative analgesia requirement was evaluated, it was higher in the TFPB group (p<0.05). The 24-hour pain scores (VAS 6th hour and

Öz

Amaç: Sezeryanlarda multimodal analjezi amacıyla postoperatif periferik gövde blokları kullanılmaktadır. Bu araştırma spinal anestezi altında sezeryan operasyonu olan hastalarda transversalis fasya plan blok (TFPB) ve transversus abdominis plan bloğunun (TAPB) postoperatif analjezide etkinliğini karşılaştırmak amacıyla planlandı.

Yöntem: Prospektif tasarıma sahip bu araştırmada spinal anestezi altında elektif sezeryan operasyonu planlanan 20-50 yaş aralığında ASA II-III risk grubundaki hastalar değerlendirildi. Demografik verileri, operasyon süreleri, intraoperatif ve postoperatif bulantı & kusma, kaşıntı varlığı, ilk analjezi gereksinim süresi, postoperatif 24 saat boyunca görsel analog ölçeği (VAS) değerleri, parasetamol, diclofenac sodyum, toplam kullanılan Steroid olmayan anti-enflamatuvar ilaçlar (NSAII) miktarı kaydedildi.

Bulgular: Hastalar TFPB (75, %50) ve TAPB (75, %50) grubu olmak üzere iki gruba randomize edildi. İki grup arasında demografik veriler, komorbidite, ASA sınıflaması ve operasyon sürelerinde anlamlı farklılık görülmedi (p>0,05). Hastaların postoperatif ilk analjezi ihtiyaç süreleri değerlendirildiğinde TFPB grubunda daha yüksekti (p<0,05). Yirmi dört saat boyunca ağrı skorları (VAS 6. saat ve vas 12. saat) TFPB grubunda daha düşüktü (p<0,05). Kullanılan parasetamol, diklofenak ve toplam

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Abstract

VAS 12th hour) were lower in the TFPB group (p<0.05). The amounts of paracetamol, diclofenac and total NSAIDs were higher in the TAPB group (p<0.05).

Conclusion: USG-guided bilateral TFPB is more effective than TABP for postoperative analgesia in caesarean sections.

Keywords: Caesarean section, nerve block, obstetrical anesthesia, postoperative pain, spinal anaesthesia

Öz

kullanılan NSAII miktarına bakıldığında ise TAPB grubunda daha fazlaydı (p<0,05).

Sonuç: Sezeryanlarda USG eşliğinde bilateral uygulanan TFPB, postoperatif analjezide TABP'den daha etkindir.

Anahtar kelimeler: Sezaryen, sinir bloğu, spinal anestezi, obstetrik anestezi, postoperatif ağrı

Introduction

Spinal anaesthesia is more frequently preferred in caesareans due to its advantages, such as early postoperative mobilization and pain control. Despite this, patients need postoperative analgesics (1). Pain delays recovery in the mother, may cause depression, disrupts mother-baby bonding, decreases the amount of milk and may even become chronic (2,3). In the enhanced recovery after surgical protocol used for early discharge in caesarean sections, effective pain management is essential and multimodal analgesia is recommended (4). For this purpose, peripheral nerve blocks can be applied to reduce side effects such as constipation, urinary retention, respiratory depression and pruritus due to opioid consumption (5-11). For this purpose, ilioinguinal nerve block after abdominal wall incision, abdominal wall blocks, TFPB, TAPB, quadratus lumborum block, and lumbar erector spinae plane (ESP) block have been tried. Unlike QLB and ESP block, TFPB and TAPB can be applied in the supine position without changing the patient's position. Transversalis fascia plane block (TFPB) and transversus abdominis plane block (TFPB) among peripheral nerve blocks are effective in cesareans. TAPB provides analgesia after caesarean section by targeting the T6-L1 nerve roots involving the anterior abdominal wall and skin (12-14). TFPB blocks the proximal branches of the T12 and L1 nerves between the transversalis abdominal muscle and the transversal fascia (15). Although both blocks block the T12-L1 nerves, TFPB is located more posteriorly than TAPB. That is why we think their activities are different.

In this trial, we aimed to compare the analgesic efficacy of TFPB and TAPB in patients undergoing caesarean section under spinal anaesthesia.

Materials and Methods

This prospective, randomized trial was conducted at University of Health Sciences Turkey, Başakşehir Çam and Sakura City Hospital by the Declaration of Helsinki. After ethics committee approval (decision no: 2022-74, date: 09.03.2022) and written informed consent was obtained from all patients, the trial was conducted according to consolidated standards of reporting trials guidelines.

Patients aged 20-50 years with ASA II-III and elective caesarean section under spinal anaesthesia were included in the trial. Patients with body mass index (BMI) >40 kg/m^2, bupivacaine allergy, preference for general anaesthesia, coagulopathy and local infection were excluded. Type I error level (alpha level) was set at 0.1, and the number of patients per group was set to at least 70 to achieve 90% statistical power. After accounting for the missing data, a total of 150 patients were divided into two groups using the closed envelope method:

Transversal fascia plane block (TFPB group) and transversus abdominis plane block (TAPB group) (Figure 1). Demographic data (age, weight, height, BMI, comorbidity) and ASA scores were recorded. Patients were taken to the operating room, and routine hemodynamic monitoring with electrocardiography, non-invasive blood pressure

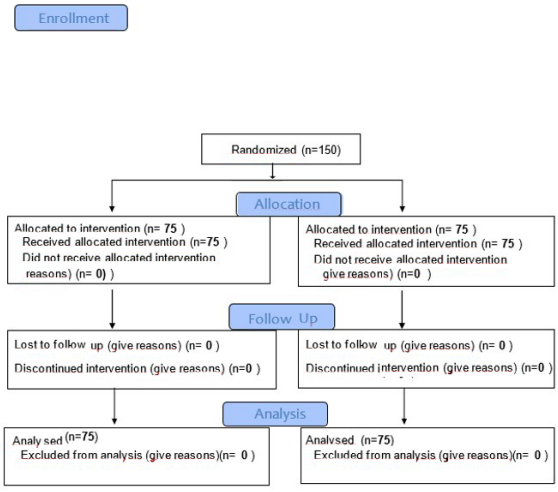

Figure 1. Consort diagram of study

and pulse oximetry (SpO_2) were performed. Peripheral vascular access was established, and intravenous (iv) hydration was initiated. In the sitting position, 10 mg hyperbaric bupivacaine and 20 micrograms fentanyl were administered into the subarachnoid space with a 25 gauge Quincke spinal needle at the L3-L4 or L4-L5 level. The patient was given a supine position with a 15° left inclination. A 20% decrease in systolic blood pressure or less than 90 mmHg was considered hypotension. Patients who developed hypotension received 5-10 mg ephedrine iv, and 250 mL iv bolus crystalloid fluid was given. Those with a peak heart rate below 50/min were considered bradycardic, and 1 mg atropine iv was administered. Ondansetron 4 mg iv for those with nausea and vomiting, increased to 8 mg if necessary. When the sensory block level reached T4 after spinal anaesthesia, surgery was initiated, and the baby was delivered through a horizontal (pfannenstiel) incision just above the pubis. At the end of the surgery, a bilateral block was performed with a 100-120 mm block needle using the in-plane technique under aseptic conditions under USG guidance. 20 mL of 0.25% bupivacaine was applied to the transverse fascia plane between the internal oblique muscle and the transversus abdominis muscle for TAPB and under the fascia where the internal oblique and transversus abdominis muscles meet by visualizing the external-internal oblique and transversus abdominis muscles, quadratus lumborum muscle for TFPB. Sensory block level was evaluated after body blocks. Somatic pain is described as sharp localized Pfannenstiel incision pain. Visceral pain occurs due to uterine contractions, widespread pain is felt in the abdomen.

After the procedure, the patients were followed up for 30 minutes in the recovery unit, and their pain was evaluated with a visual analogue scale (VAS), and VAS was accepted as time 0 (T1). Patients with a modified aldrete score > nine were discharged to the ward. Once on the ward, patients were routinely administered 75 mg diclofenac sodium intramuscularly and 4 mg iv ondansetron in patients with nausea and vomiting. Those with VAS >4 were first given 1 gr paracetamol iv and 75 mg diclofenac sodium iv if the pain did not disappear.

VAS values, time to first analgesic requirement, analgesic requirements, nausea & vomiting and pruritus were evaluated for 24 hours postoperatively [6^{th} hour (T2), 12^{th} hour (T3), 24^{th} hour (T4)].

Statistical Analysis

Analyses were performed using NCSS 11 (Number Cruncher Statistical System, 2017 Statistical Software). In our study, frequency and percentage values were given for the variables. Mean, standard deviation, median, minimum and maximum values were given for continuous variables. The regular distribution test of continuous variables was performed with the Kolmogorov-Smirnov test. Chi-square analysis was used for the relationships between categorical variables. When appropriate, categorical variables were assessed with Fisher's Exact test and Fisher-Freeman-Halton test. An independent sample t-test was used to compare two groups in continuous independent variables with normal distribution. The Mann-Whitney U test was used to compare two independent groups for the variables that did not meet the assumption of normal distribution. For independent variables that did not have a normal distribution, Wilcox's sign-rank test was used to compare the two groups. $P<0.05$ was considered statistically significant.

Results

In the study, a total of 150 patients who underwent caesarean section under spinal anaesthesia were divided into two groups TFPB (75, 50%) and TAPB (75, 50%) (Figure 1). There was no significant difference between the two groups when demographic data, ASA and operation time were evaluated. The mean ages for TFPB and TAPB were (29.2±5.3, and 29.4±5.6) and BMI was (28.5±3.6 29.9±4.2). Comorbidities were similar in both groups ($p>0.05$) (Table 1).

The postoperative VAS values of the patients between the two groups are shown in Figure 2. Since the patients were under spinal anaesthesia, they had no pain at the T1 time point (T1: 0). The median value of VAS at T2 and T3 time points was lower in the TFPB group. 24. VAS values at the hour were similar in both groups (Figure 2).

The duration of the first analgesic requirement was longer in the TFPB group than in the TAPB group (6.67±0.32 hours vs 4.9±0.26 hours, $p<0.01$). When the 24-hour analgesia needs were compared, it was seen that the analgesic need was less in the TFPB group ($p<0.05$). Intraoperative or postoperative nausea & vomiting was similar in both groups (Table 2). No postoperative surgical or block-related complications were observed in any of the patients.

Discussion

The study observed that the initial analgesic requirement duration was longer in the patient group who underwent TFPB for multimodal analgesia in caesarean sections

Table 1. Demographic data, ASA and operation times

	TFPB group	TAPB group	p
Age, year	29.2±5.3	29.4±5.6	0.49
Kilogram, kg	75±10.2	79.4±11.1	0.49
Height, cm	160.8±6.6	161.2±5.6	0.72
BMI	28.5±3.6	29.9±4.2	0.08
Comorbidity			0.29
HT	1 (1.5)	0 (0)	
DM	2 (3)	4 (6)	
Asthma	2 (3)	0 (0)	
Hypothyroid	1 (1.5)	3 (4.5)	
Other	0 (0)	2 (3)	
ASA II/III	72/3	72/3	1
Operation time, minutes	69.5±15.1	82.4±21.8	0.24

p<0.05 shows statistical significance. Categorical variables were shown as numbers (%). Numerical variables with normal distribution were shown as mean § standard deviation.
ASA: American Society of Anaesthesiology, HT: Hypertension, DM: Diabetes mellitus, TFPB: Transversalis fascia plane block, TAPB: Transversus abdominis plane block, BMI: Body mass index

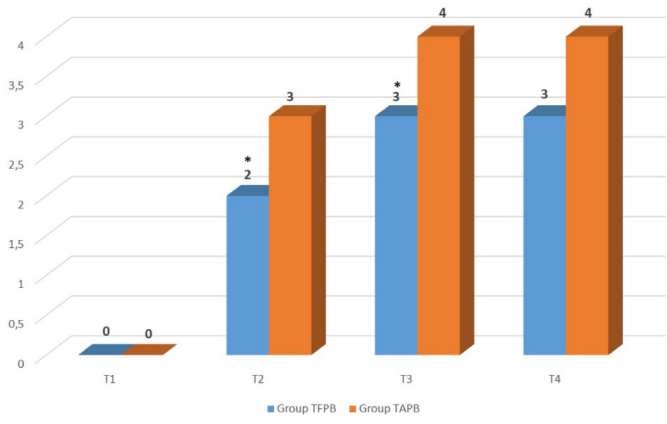

Figure 2. VAS values at different time points

VAS: Visual analogue scale, TFPB: Transversalis fascia plane block, TAPB: Transversus abdominis plane block

compared to TAPB. Patients who underwent TAP block had higher 24-hour VAS values and analgesia needs.

In the caesarean section, postoperative pain due to pfannenstiel incision is caused by somatic and visceral pain involving the peritoneum, uterus and abdominal wall. For this purpose, blockade of the T12 and L1 nerves for somatic pain and non-steroidal analgesics and opioids for visceral pain can be used as part of multimodal analgesia regimens (16,17). Among peripheral body blocks, TFP block is effective in iliac bone graft, caesarean section and inguinal hernia repairs (18-20). Especially in caesarean sections, TFPB application reduces the need for postoperative analgesia (13,21-24). Rahimzadeh et al. (25) also showed that a TAP block performed after a caesarean section decreased morphine consumption and increased patient satisfaction. In another study, TAP block was found to reduce opioid consumption despite inadequate block at T12-L1 after abdominal surgery (24). In a study comparing TAP and TFP block in elective caesarean section, a total

Table 2. Duration of first analgesic requirement and evaluation of analgesics used and side effects

	TFPB group	TAPB group	p
Time of first analgesic requirement, hours	6.67±0.32	4.9±0.26	0.01*
1 g paracetamol need	0.6±0.09	1.5±0.09	0.00*
75 mg diclofenac sodium need	1.3±0.08	1.5±0.06	0.01*
Total number of NSAIs	1.9±0.11	3.1±0.13	0.00*
Nausea & vomiting	2 (2.7)	3 (4)	0.65
Itching	3 (4)	3 (4)	1

*p<0.05 shows statistical significance. Categorical variables were shown as numbers (%). Numerical variables with normal distribution were shown as mean § standard deviation. NSAIs: Non-steroidal anti-inflammatory drugs, TFPB: Transversalis fascia plane block, TAPB: Transversus abdominis plane block

of 15 mL of 0.25% bupivacaine was administered, and postoperative analgesia needs were found to be similar (26).

In this retrospective study by López-González et al. (26), 30 mL of 0.25% bupivacaine was administered for TAP and TFP block in inguinal hernia operations. Postoperative additional analgesia needs were similar in both groups (27). When the literature is reviewed, it is seen that the drugs, doses and volumes administered for TAP and TFP block are different in other studies. Tulgar and Serifsoy (10) applied 20 mL (a mixture of 10 mL bupivacaine 0.5%, 5 mL lidocaine 2% and 5 mL isotonic NaCl) for TFP block in caesarean sections (11). Kanazi et al. (27) administered 20 mL per side containing 0.375% bupivacaine for the TAP block (28). In our study, a total volume of 40 mL was administered as 1 mg/kg bupivacaine. Pain scores were low, and the amount of postoperative analgesia used was less in patients who underwent TFPB compared to TAPB. In both groups, VAS median values were four and below 4 for 24 hours. We think we got better results because of the volume used and the amount of bupivacaine applied.

Postoperative nausea & vomiting was found to be similar in patients who underwent TAP or TFP block in inguinal hernias (27). In the study by Baaj et al. (24), in which TAP block was compared with iv morphine, postoperative nausea & vomiting were observed less in the TAP block group (25). In another study, it was observed that postoperative nausea & vomiting was similar in the patient group treated with intrathecal morphine and the patient group treated with TAP block (29). In our study, the block was applied to avoid opioid consumption for analgesia, and NSAIs were used for analgesia. Therefore, similar results were obtained in both groups.

Study Limitations

Our study has some limitations in addition to its strengths, such as having a prospective design and having the same physician blocking all patients, thus minimizing practice-related differences. These limitations include the single centre, limited time interval for postoperative Evaluation of the patients, application of the block while under the influence of spinal anaesthesia and inability to perform sensory block examination. Although trunk blocks are effective in relieving postoperative pain, their long-term postoperative efficacy is not clear. To increase the power of the results of this block, studies with larger sample sizes, multicenter studies and studies in which continuous analgesia can be provided by catheter placement are needed.

Conclusion

When trunk block was applied for postoperative analgesia in patients undergoing caesarean section, TFPB was more effective on pain than TAPB. In addition, TFPB administration decreased the need for analgesia compared to TAPB. It was observed that both methods were safe in caesarean section operations, and peripheral trunk blocks could be safely preferred for multimodal analgesia, especially for somatic pain. Since only one study in the literature compares the efficacy of TFPB and TAPB in caesarean sections, we think this study will contribute to the literature.

Ethics

Ethics Committee Approval: This prospective, randomized trial was conducted at University of Health Sciences Turkey, Başakşehir Çam and Sakura City Hospital by the Declaration of Helsinki (decision no: 2022-74, date: 09.03.2022).

Informed Consent: Written informed consent was obtained from all patients.

Peer-review: Internally peer-reviewed.

Authorship Contributions

Concept: D.A., N.A., F.G.Ö., Design: D.A., N.A., F.G.Ö., Data Collection or Processing: D.A., İ.P., Analysis or Interpretation: D.A., İ.P., Drafting Manuscript: D.A., N.A., F.G.Ö., İ.P., Writing: D.A., N.A., F.G.Ö., İ.P., Critical Revision of Manuscript: D.A., N.A., Final Approval and Accountability: D.A., N.A., F.G.Ö., İ.P., Technical or Material Support: D.A., İ.P.

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