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The effect of ultrasound guided transversus abdominis plane block for caesarean delivery on postoperative analgesic consumption

Kadir Hakan CANSIZ (*), Ahmet Ertürk YEDEKÇİ (**), Hüseyin ŞEN (**), Sezai ÖZKAN (**), Güner DAĞLI (**)

ÖZET

Sezaryende Ultrason Eşliğinde Yapılan Transversus Abdominis Plan Bloğun Postoperatif Analjezik Tüketimine Etkisi

Bu çalışmada, sezaryende ultrason (US) eşliğinde yapılan Transversus Abdominis Plan (TAP) bloğun postoperatif analjezik tüketimine ve analjezinin kalitesine etkisinin araştırılması amaçlanmıştır. Çalışmaya, spinal aneztezi altında elektif sezaryen operasyonu planlanan ASA I-II 70 olgu alındı. Olgular rasgele 2 gruba ayrıldı: Grup T (TAP blok grubu) (n:35) ve Grup K (Kontrol grubu) (n:35). Cerrahinin bitiminde Grup T'ye TAP blok, bilateral olarak, tek tarafa 20 ml olacak şekilde % 0,25'lik levobupivakain enjeksiyonu ile yapıldı. Tüm olgulara, Hasta Kontrollü Analjezi (HKA) cihazı yardımıyla, postoperatif 24 saat i.v. tramadol ile analjezi uygulandı. Olgular postoperatif 1, 4, 6, 12, 18 ve 24. saatlerde hemodinamik parametreler, Numerical Rating Scala (NRS) (istirahatte ve öksürükle ağrı skoru), sedasyon skoru, saatlik ve total tramadol miktarı, HKA istek/alım sayıları, ek analjezik gereksinimi, ilk analjezik ihtiyaç zamanı, bulantı-kusma ve yan etkiler açısından takip edilerek kaydedildi. Postoperatif 24. saatte hasta memnuniyeti sorgulandı. Grup T'de Grup K'ya göre istirahat halinde (NRSi) ve öksürme ile ağrı skorları (NRSö) postoperatif tüm takiplerde (1, 4, 6, 12, 18 ve 24. saatlerde) anlamlı olarak düşüktü ($p<0.05$). Olguların postoperatif HKA cihazı ile analjezik talep sayıları, tramadol tüketimleri, ek analjezik ihtiyacı olan hasta sayısı ve uygulanan ek analjezik miktarı Grup T'de Grup K'ya göre anlamlı derecede düşük bulundu ($p<0.05$). İlk analjezik ihtiyaç zamanı Grup T'de Grup K'ya göre uzamıştı ($p<0.05$). Hasta memnuniyeti, Grup T'de Grup K'ya göre anlamlı derecede yüksekti ($p<0.05$). Postoperatif analjezi amacıyla güvenilir ve etkin bir analjezik teknik olduğunu düşündüğümüz TAP bloğun sezaryen sonrası analjezide tercih edilebileceği kanaatindeyiz.

Anahtar Kelimeler: *TAP Blok, Postoperatif Ağrı, Sezaryen, Levobupivakain*

SUMMARY

In our study we evaluated the postoperative analgesic consumption and analgesic efficacy of ultrasound guided transversus abdominis plane (USG-TAP) block in patients undergoing caesarean section (CS).

Seventy ASA I-II patients undergoing CS following spinal anaesthesia were included in our study. The patients were divided into two groups randomly: Group T (TAP Block group) (n:35) and Group C (Control group) (n:35). At the end of the surgery. Group T patients received USG-TAP block using 20 ml of 0.25% levobubivacaine. All participants received standart analgesic regime of tramadol via intravenous patient controlled analgesia (IV-PCA). Patients were assessed at 1, 4, 6, 12, 18 and 24 h after TAP block for hemodynamic parameters, verbal numerical rating pain scores (VNRS) (pain at rest and coughing), total amount of IV-PCA tramadol demand and consumption, time to first rescue analgesia, total amount of rescue analgesic demands, sedation, nausea, vomitting and satisfaction by a blinded investigator. The VRNS scores both at rest and coughing were found significantly lower in TAP block group with levobupivacaine compared to control group at all check points. Total amount of IV-PCA tramadol demand and consumption, number of rescue analgesic demands and consumption were significantly lower in TAP block group. Time to first rescue analgesia was longer in TAP group. Patient satisfaction was significantly higher in TAP group. In our study USG-TAP block provided effective postoperative analgesia and we consider this technique as a safe and effective method for postoperative pain control after caesarean delivery.

Key words: *TAP Block, Postoperative pain, Caesarean delivery, Patient controlled analgesia, Levobupivakain*

*Elazig Military Hospital, Department of Anesthesiology, Elazig, Turkey.
**Gulhane Military Medical Academy, Haydarpasa Training Hospital, Department of Anesthesiology, Istanbul, Turkey.

Reprint request: Kadir Hakan Cansız
Elazig Military Hospital,
Department of Anesthesiology, Elazig, Turkey.
e-mail: khcansiz@gata.edu.tr

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Introduction

Postoperative intolerable and uncontrolled pain is the main reason of prolonged recovery period, deterioration of life quality and development of additional complications. Postoperative pain reduces the mobility of the woman and moreover makes breastfeeding and taking care of the baby difficult (1). Safe and effective analgesia generated by different methods increase patient satisfaction (2). A significant part of the pain experienced after CS originates from the somatosensory pain of the incision site of the abdominal tissues (3). Traditional pain management include the use of opioid as analgesic drugs (4). Opioid consumption following CS have negative effects on the newborns (5). Therefore alternative analgesic regimens and techniques after CS are the most evaluated subjects. Blockade of the sensory nerves of the abdominal wall after the anterior abdominal incision reduces opioids consumption (6,7). TAP block is an effective analgesia technique providing enough pain palliatin in lower abdominal surgery (8). Ultrasound guidance in the implementation process of the TAP block improves the security and efficiency of the technique (9). In our study we performed USG-TAP block after caesarean delivery under spinal anaesthesia and evaluated the efficacy and effect of this technique on analgesic consumption.

Material And Method

After approval by the ethics committee and written informed consent, we studied 70 ASA physical status I-II subjects who can declare their pain using VNRS undergoing elective caesarean delivery at term under standart spinal anaesthesia in a prospective clinical trial. Exclusion criteria were as follows: relevant drug allergy, coagulopathy, psychiyatric disorder, regular opioid use, alcohol or drug abuse, previous abdominal operations, contraindication to neuroaxial anaesthesia. Patients were allocated into two groups with a randomized sequence: one group to undergo USG-TAP block with 20 ml of 0.25% levobupivacaine (TAP block group, n:35) and the other group to reveive standart care (control group, n:35). All the participants were informed about VNRS (0= no pain, 10= the severest pain imaginable) and IV-PCA device (Abbott Pain Manager, Abbott Laboratories, Chicago, IL, ABD). No premedication was given before the initiation of surgery. Noninvasive blood pressure, electrocardiography, pulse oximetry were applied. Standart spinal anaesthesia was realized at sitting position from the L3-4 or L4-5 segment with 11 mg hyperbaric bupivacaine. Surgery was initiated when sensory block level reached T10. Following the delivery 10 units of oxytocin IV bolus, 10 units of oxytocin IV, and 0.2 mg methylergonovine IM was applied. At the end of the surgery using ultrasound (SonoSite M-Turbo Ultrasound System), USG -TAP block was performed by introdu-

cing 100 mm long 22 G short-bevel needle (Pajunk SonoPlex Stim cannula, Geisingen, Germany) through the Petit triangle formed by crista iliaca, latissimus dorsi muscle and external oblique muscle. 20 ml of 0.25% levobupivacaine was injected after negative aspiration (figure 1). In the recovery room all the patients received IV tramadol PCA set at 20mg bolus, 15

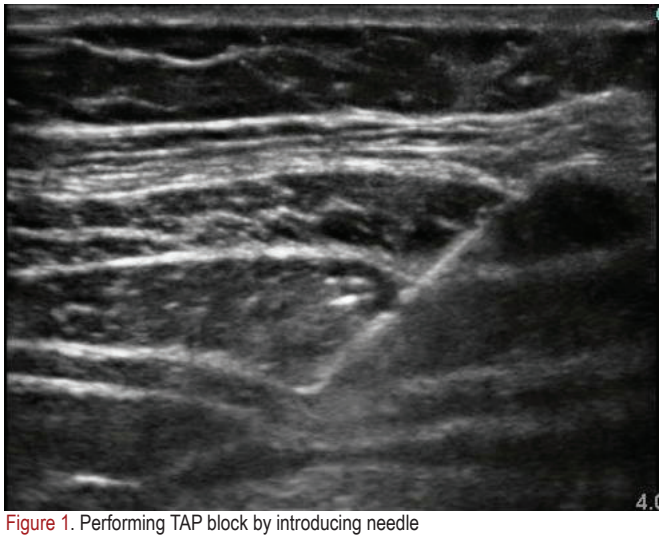

Figure 1. Performing TAP block by introducing needle

minutes lock out, 150 mg for 4 hours maximum dose. Patients were evaluated by pinprick test for the sensory block level. The time between the intratechal injection and the first time pain was felt called anaesthesia time. At 1, 4, 6, 12, 18 and 24 h after TAP block the data were downloaded from the PCA device and patients were assessed for haemodynamic parameters (heart rate (HR), mean arterial pressure (MAP), SpO2, respiratory rate), verbal numerical rating pain scores (VNRS) (pain at rest and coughing), total amount of IV-PCA tramadol demand and consumption, time to first rescue analgesia, total amount of rescue analgesic demands, side effects like sedation, nausea, vomitting, rash, hypotension, bradycardia, respiratory depression, dizziness, headache and satisfaction by a blinded investigator. If her pain scoe was ≥ 4 additional mg 20 IV tramadol was given for rescue analgesia. Regression time of sensory block to L1, maximum level of sensory block was recorded. Sedation score was assigned using 4-point scale (1: awake and alert, 2: slightly drowsy, easily roused, 3: drowsy, 4: somnolent). Nausea and vomiting was rated with 3-point categorical scale (0: none, 1: nausea without vomitting, 2: both nausea and vomiitting). If the heart rate was < 50 beats/min it was rconsidered as bradycardia. If respiratory rate was < 8 or SpO2 was < 90% it was considered as respiratory depression. Patients received naloxone (0.1 mg at every 2-3 minutes until a response was achieved) if 0.5 mg IV atropine and oxygen support was applied for bradycardia and respiratory depression were failed. Regression of mean arterial blood pressure below 20% of the baseline preoperative value was considered as hypotension and 5 mg iv ephedrine was administered. If the nausea and vomiting score was > 2, 4 mg IV ondansetron was administered. In case of prurutis IV 1 mg pheniramine maleate was implemented. The statistical analysis of the data obtained in this study was performed using SPSS version 15 for Windows (Statistical Package for Social Sciences). Frequency, percentage, mean and standard deviation were given for descriptive statistics. Between the two groups of discrete variables, the Chi-Square test was used for comparison. Normal distributions of continuous variables were analyzed with the Kolmogorov-Smirnov test. Student's t test was used for normally distributed parameters and the Mann-Whitney U test for non-normal distributed parameters with comparisons. In all tests, data with a p <0.05 were considered statistically significant.

Results

The demographic data of 70 patients who participated in the study were compared. There was no statistically significant difference between the groups in terms of age, height, body weight, gestational age, operation time and ASA physical status (p> 0.05) (Table 1). There was no statistically significant difference between the groups in terms of maximum sensory block levels, maximum time to regression of sensory block level to L1 segment, nausea, vomiting, sedation, respiratory rate and SpO2, mean arterial pressure and heart rate at 1, 4, 6, 12, 18 and 24 hours (p> 0.05). VNRS values both at rest

Table 1. Demographic data and clinical characteristics

	Control (n=35)	TAP (n=35)	p
Age (year)	30,6 ± 4,6	31,1 ± 3,6	0.63
Height (cm)	163,3 ± 6,2	162,7 ± 5,2	0.64
Weight (kg)	79,7 ± 9,5	76,0 ± 12,3	0.68
Gestation (week)	38,7 ± 1,0	38,6 ± 0,9	0.81
ASA physical status (I/II)	32/3	33/2	0.64
Operation time (min)	54,5 ± 15,0	50,5 ± 12,7	0,23

and coughing were significantly lower in TAP block group than the control group at 1, 4, 6, 12, 18 and 24 hours (p <0.05). Patients postoperative tramadol consumption was significantly lower in TAP block group than the control group at 1, 4, 6, 12, 18 and 24 hours (p <0.05) (Table 2). The time to first tanalgesic demand via IV-PCA was shorter in control group. Tramadol demand and consumption via IV-PCA was significantly lower in TAP block group than the control group at 1, 4, 6, 12, 18 and 24 hours (p <0.05). Patient satisfaction with pain relief was significantly higher in TAP block group than the control group

Table 2. Tramadol consumption of the groups

Tramadol Consumption	Control (n=35)	TAP (n=35)	p
1. hour	30,85 ± 24,99	0	0.00
4. hour	92,57 ± 29,11	41,71 ± 36,52	0.00
6. hour	58,28 ± 36,52	24,57 ± 25,78	0.00
12. hour	62,85 ± 32,47	44,00 ± 42,16	0.04
18. hour	47,42 ± 39,15	32,00 ± 40,34	0.11
24. hour	21,14 ± 19,67	14,28 ± 29,30	0.26

(p <0.05). (Table 3). In our study, no complication relevant to TAP block was observed.

Table 3. Time to first rescue analgesia and postoperative analgesic requirements and satisfaction scores

	Control (n=35)	TAP (n=35)	p
Time to first rescue analgesia (min)	52,8 ± 39,6	192,0 ± 82,8	0,00
Numer of patients requiring postoperative analgesics	29 (%82)	9 (%25)	0.00
Total analgesic consumption (mg)	28,00 ± 16,94	5,71 ± 10,37	0.00
Patient satisfaction	8,40 ± 1,35	9,69 ± 0,63	0.00

Discussion

Mothers desire to breastfeed and participate in taking care of their babies as soon as possible. The first few hours following the labor is very important for emotional communication between the mother and her baby. Early ambulation for taking care of her baby is desired for every mother. But the pain felt after the delivery delays early ambulation and breastfeeding. By effective and safe postoperative analgesia this undesired condition can be prevented (10). Today, IV-PCA opioid treatment after cesarean delivery is still the most commonly used and effective method for pain relief. However, opioid use have side effects such as prurutis, nausea, vomiting, constipation, sedation, respiratory depression and addiction potential is another undesired concern about its use. For reduction and elimination of these side effects to minimize the opioid dose is the strategy (11). An important issue in the choice of analgesic drug and technique after caesarean delivery is excretion into breast milk and affecting mothers and newborns. Opioids are excreted into human milk and they have the potential side effects in the newborn (12). All these issues makes analgesia technique and drug use after caesarean delivery more complex and important. Effective regional analgesic techniques used in the control of postoperative pain not only reduces the intensity of pain and the incidence of side effects but also increases the patient comfort and satisfaction (13). Transversus abdominis plane block is a simple and reliable analgesic technique for abdominal surgeries that has been reported as a very effective and well tolerated postoperative pain control aplication (6,7,14-16). The clear visualization of anatomy by widespread use of ultrasound makes TAP block safe and effective method for multimodal postoperative analgesia technique following abdominal surgery. Many studies demonstares the superiority of TAP block to standard medical therapy in postoperative pain control (14-16). Ultrasound guided TAP block technique was first defined by Hebbard et al. (15). They have concluded that USG-TAP block had less potential complications and a very effective alternative analgesia technique compared to epidural analgesia for pain relief. Studies demonstrated that if epidural analgesia is contraindicated, USG-TAP block in conjunction with IV-PCA can be used safely as multimodal analgesia. Baaja et al. (17) performed USG-TAP block with 20 mL of 0.25% bupivacaine to their 40 patients who underwent cesarean delivery. They stated that the 24-hour morphine consumption in the TAP block group was significantly reduced than the control group and concluded that TAP block provides superior analgesia than IV / PO medications. Similarly Belavy et al. (18) performed USG-TAP block with 20 mL of 0.5% ropivacaine to their 47 patients after elective caesarean delivery (TAP block group (n: 23) and control group (n:24)). They have also stated that TAP block provides superior analgesia than IV / PO medications. McDonnell et al. (19) performed USG-TAP block on 50 patients of caesarean section and Carney et al. (20) performed USG-TAP block on 50 patients who underwent total abdominal hysterectomy. They have also concluded that TAP block provides superior analgesia. Puddy et al. (21) and Griffiths et al. (22) performed USG-TAP block respectively to 48 cases of cesarean section and 65 cases of gynecological tumor surgery. In contrast to the previous studies they stated that TAP block could not provide better pain control compared to IV / PO medication and as a result claimed that bilateral TAP block had no benefit on multimodal analgesia in elective caesarean delivery and gynecological tumor surgery. In our study we found out that VNRS values both at rest and coughing and tramadol consumption were significantly lower in TAP block group than the control group. Moreover patient satisfaction with pain relief was significantly higher. As a result we conclude that TAP block provides superior analgesia. There are increasing clinical indications for TAP blocks. TAP block is performed for postoperative analgesia after after obstetric, gynecologic, urologic and lower abdominal surgery (16,23,24). Bharti et al. (25) studied the effects of TAP block on 40 patients who underwent colorectal surgery. In their study all patients received IV morphin for standart treatment and TAP group (n = 20) received bilateral 0.25% bupivacaine for TAP block where the control group received saline. They stated that the 24 hour morphine consumption was significantly lower in TAP group. On the other hand the VNRS scores both at rest and coughing were lower in the TAP group. El-Dawlatly et al. (26) studied TAP block on 42 cases of laparoscopic cholecystectomy under general anesthesia. Hivel et al. (27) studied TAP block on 30 patients of inferior epigastric perforator flap for breast reconstruction. McDonnell et al. (23) studied TAP block on a study including 32 patients for bowel resection surgery. Both three studies stated that TAP block provides superior analgesia. Many other studies demonstrates less postoperative opioid requirement, lower pain scores and decreased opioid-related side effects about TAP block implementation(16,23,26,27). In our study we concluded similar conclusions with these data of the studies.

Conclusion

We concluded that USG bilateral TAP block reduces VNRS scores and opioid consumption, delays the first rescue analgesic requirement and reduces cumulative analgesic consumption in the postoperative period. More over TAP block implementation has no negative effect on postoperative nausea, vomiting, sedation and hemodynamic parameters. All these results improve patient satisfaction. USG-TAP block provided effective postoperative analgesia for patients undergoing caeserean delivery under spinal anaesthesia and we consider this technique improves patient satisfaction as a safe and effective method for postoperative pain control after caesarean delivery.

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