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Original Article ANESTHESIOLOGY & REANIMATION

The efficacy of transversus abdominis plane block for post operative analgesia after cesarean section performed under general anesthesia

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ABSTRACT

OBJECTIVE: Several methods are performed to control the pain after ceserean operations. Recently, the transverse abdominis plane block (TAP) has been proposed to compensate for the problems developed by preexisting methods. We compared the analgesic efficacy of the TAP block after caesarean section in a prospective, randomized, doble-blinded controlled trial.

METHODS: Thirty patients undergoing cesarean sections under general anesthesia are divided into two groups. Patients in Group T (n=15) whom TAP Block with USG guidence has been performed with 0.25% bupivacaine totally 60 ml. In Group C (n=15) 0.9% NaCl totally 60 ml (30 ml at each side) were given to the patients with USG guidence. Postoperative demand of meperidine using a patient-controlled analgesia device were recorded.

RESULTS: First time on the need for analgesia were significantly higher in control group (Group C). Total dose of meperidine, tenoxicam, paracetemol used for analgesia was significantly higher in Group C. The outset times of breastfeeding and mobilization does not change between the groups.

CONCLUSION: The USG-TAP block with 0.25% bupivacaine 60 ml (30 ml on each side) significantly reduced postoperative pain in patients undergoing cesarean section. We think that TAP block is a comfortable and feasible method which reduces postoperative analgesia need and does not lead any serious complications.

Keywords: Bupivacaine; cesarean section; ultrasound; postoperative pain; transverse abdominis plane block.

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Postoperative pain, has been one of the main interests of anesthesiologists because of reducing patients comfort and it's potential for causing harmful effects since the beginning of practice. Cesarean section is one of the most commonly performed surgical procedures. It is estimated that 15 % of births worldwide and 21.1 % of those in the developed world occur by cesarean section [1]. Inadequate postoperative pain relief after Cesarean section can negatively impact mobilization, breastfeeding, and even emotional bind between mother and the infant, while effective analgesia improves the amount of breastfeeding and infant weight gain [2,3]. Different methods are used for postoperative pain management during 24 hours in cesarean section [4,5]. The optimum form of postoperative analgesia is not known.

Rafi first described the TAP block in 2001 [6]. He portrayed it as a refined abdominal field block, with a targeted single shot anesthetic delivery into the TAP, a site which relevant nerve branches are located in. Eventough it has been just a decade since its discovery; TAP

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block is used in several types of surgical procedures with various modifications. It has been shown to be effective in cesarean section and after hysterectomy, open prostatectomy, laparoscopic cholecystectomy, and appendectomy [7, 8]. In this study we aimed to eveluate the post operative analgesic effiacy of TAP block in patients whom are having cesarean section under general anesthesia.

MATERIALS AND METHODS

Following institutional Ethics Commitee approval (No: 2015-56,1707317) and informed patient consent; patients undergoing cesarean section were chosen with randomized double blinded by closed loop envelope technique. 30 ASA I – II patients undergoing elective Cesarean section, were included in our study. Exclusion criteria were blood coagulation pathologies, allergies against amino-amide local anaesthetics, or inability to understand the study protocol

No premedication was used before operation, administration of Nacl 0.9 % solution via a peripheral venous access was started. Standard monitoring (pulse oximetry, electrocardiogram, and non-invasive arterial pressure) was performed, and general anaesthesia was induced with propofol 2-2.5 mg/kg and rocuronium 0.6 mg/kg. Subsequently, the trachea was intubated and general anaesthesia was continued with 1 MAC sevoflurane in 50% air/O_2. The lungs were mechanically ventilated using a pressure-controlled mode to maintain Et CO_2 between 4.7 and 5.3 kPa.

Patients were divided with double-bilinded tecnique into two groups before the induction of anesthesia, both groups were visuilazed with ultrasound (Famio 8, Toshiba Ootawarashi, Japan) at the end of the surgery before the recovery from anesthesia. The probe was placed in the area between costal margin, iliac crest and midaxillary line. Once the external oblique abdominis muscle (EOAM), internal oblique abdominis muscle (IOAM), and transversus abdominis muscle (TAM) were visualized at the level of the anterior axillary line between the 12th rib and the iliac crest (Fig. 1), the puncture area and the ultrasound probe were prepared in a sterile manner. Then the block was performed with a 0.91x100 mm, 20 Gauge (Stimuplex D Braun) needle and an injection line realizing an 'in-plane' ultrasound-guided technique as illustrated in Figure 1. Once the tip of the needle was placed in the space between the IOAM and TAM and negative aspiration. After negative aspiration 2 ml of Nacl 0.9 % was given between I.O.M and T.A.M

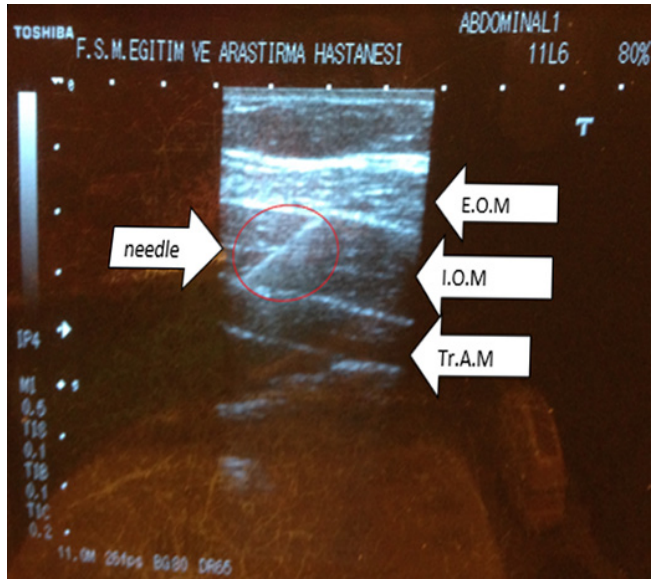

FIGURE 1. Ultrasound image during initial injection, image of the needle and the muscle layers.
E.O.M: External Oblique Muscle; I.O.M: Internal Oblique Muscle; Tr.A.M:Transversus Abdominis Muscle.

to verify the location of the needle. In TAP Group 30 ml 0.25 % bubivacaine was administered under direct ultrasonographic guidance. The contralateral block was performed equally. In control group 30 ml Nacl 0.9% was given between I.O.M and T.A.M at both sides.

During operations heart rates and systolic/diastolic mean arterial pressures were recorded at 15 min time intervals. Before the end of the surgery all patients were given 1mg/kg meperidine I.V bolus for analgesia. After the end of the operation at the time of 0, 5, 15, 30. minutes and 1, 2, 4, 12. and 24. hours pain score has been rated with visual analog scale (VAS) and verbal descriptor scales (VDS). Sedation level has been evaluated with modified ramsay scale. Nausea, vomiting mobilization time, breastfeeding time, patient satisfaction and duration of surgery was also recorded.

After operation, the patients were transferred to the recovery room, where the analgesia was maintained using a patient-controlled analgesia (PCA). The correct use of the device was exactly explained during the patient's informed consent. The patients stayed for 2 h in the recovery room and were then transferred to the ward. During the 2 h in the recovery room and subsequent 24 h on the ward, the total amount of meperidine administration was recorded.

All the patients were attached to the PCA pump including meperidine 10 mg meperidine bolus and 15

minutes of lock out time aiming post operative analgesia control. Instead of using PCA if VAS score still remains bigger than three (VAS>3)1 gr paracetamol I.V was given. If VAS score still remains bigger than three (VAS>3) tenoxicam 20 mg I.V was given to the patient. If VAS score still remains bigger than three (VAS>3) 0.5 mg/kg meperidine IV has been given to the patient as the last option. During 24 hours in both groups the need of analgesia has been compared.

24 hours after the injection, both sites of the TAP block injections were inspected to detect side-effects such as haematomas or infection.

When evaluating the results obtained in this study, IBM SPSS Statistics 22 program was used for statistical analysis. We use the Shapiro Wilks test when evaluating distrubition suitability of the parameters. Data are presented as mean (SD), number (%), or ratio as appropriate. After testing for normal distribution were compared with student T test, and groups with anormal distrubition were compared using a Mann –Whitney U-test. Paired Sample t test was used for intra-group comparison of quantitative data showing normal distribution and Wilcoxon Signed Ranks test was used for intra-group comparison of parameters without normal distribution.

Fisher's exact test was used during the comparison of qualitative data. P-values of 0.05 were considered significant.

RESULTS

With 15 patients per group, a total of 30 patients were entered into the study. There was no statistically significant difference among two groups in terms of age, weight, height, body mass index (BMI), ASA physical status and additional diseases like hypertension, diabetes mellitus or history of abdominal surgery, and operation time (Table 1).

There was no statistical difference in mean arterial pressures beetween two groups. In group T; according to baseline, there was no significant change after induction 1st, 5th and 10th minute. The decrease in 1st minute was significant (p=0.017). There is a significant decrease in all postoperative measurement times compared to baseline.(p<0.05, p<0.01) In group C; according to baseline, there is a significant decrease in all postoperative measurement times. (p<0.05, p<0.01)

In TAP Group no patient needed extra analgesic requirements. But in control group 11 patient needed extra tenoxicam 20 mg i.v bolus for analgesia requirement. Among these 11 patients whom has taken extra paracetamaol 6 of them needed 1 gr paracetamol i.v for further analgesia and finally among these 6 patients 3 of them needed 50 mg meperidine bolus for further analgesia.

VAS in group C was significantly higher than TAP group at postoperative 1., 5. and 15. minutes. (p=0.001; p<0.01) (p=0.004; p<0.01) (p=0.012; p<0.05). There was no difference in the further time periods. In group T; according to postoperative 1st minute, there is a significant decrease after 15th minute postoperative measurement times. (p<0.05, p<0.01) In group C; there is a significant decrease in all postoperative measurement times compared to postoperative 1st minute. (p<0.01) (Table 2)

VDS in group C is significantly higher than group T at post operative 1, 5, 15, 30, 60. minutes. (p=0.001; p<0.01). (p=0.001; p<0.01). (p=0.012; p<0.05). (p=0.001; p<0.01). (p=0.047; p<0.05).There was no

Table 1. Evaluation of the demographic characteristics between the groups

	TAP Group Med±SS	Control Group Med±SS	Total Med±SS	p
Age (year)	30.27±4.79	28.8±4.13	29.53±4.45	[1]0.376
BMI (kg/m^2)	30.08±4.16	30.62±6.4	30.35±5.31	[1]0.786
Operation time (min)	50.2±11.72	38.0±10.82	44.1±12.7	[1]0.006**
ASA, n (%)				
1	11 (73.3)	12 (80)	23 (76.7)	[2]1.000
2	4 (26.7)	3 (20)	7 (23.3)	
Additional Diseases, n (%)	4 (26.7)	3 (20)	7 (23.3)	[2]1.000

[1]Student t Test; [2]Fisher's Exact Test; **p<0.01.

difference in the further time periods. In group T; there is significant decrease in all postoperative measurement times compared to postoperative 1st minute (p<0.01). In group C; according to postoperative 1st minute, there is a significate decrease after 15th minute postoperative measurement times (p<0.05, p<0.01) (Table 3).

Total dose of meperidine that is used in PCA for postoperative analgesia is higher in group C than group T statistically. (p=0.001; p<0.01). (Fig. 2)

The need of analgesia for the first time is longer in group T than group S. (p=0.003; p<0.01).

There is no significant difference beetween groups in breastfeeding and mobilization times and also there is no significant diference in patient satisfaction and nausea or vomitting ratios.

Table 2. Visual Analog Scale (VAS) Variation

VAS	Group T Mean±SS (Median)	Group C Mean±SS (Median)	p
Postop 1st min	2.27±0.88 (3)	5.2±1.82 (6)	0.001**
Postop 5th min	2.27±0.88 (3)	4.13±1.88 (3) ‡	0.004**
Postop 15th min	1.93±1.1 (2) †	3.33±1.59 (3) ‡	0.012*
Postop 30th min	1.93±1.1 (2) †	2.53±0.83 (3) ‡	0.096
Postop 1st hr	1.8±1.01 (2) ‡	2.07±1.44 (2) ‡	0.829
Postop 2nd hr	1.4±1.18 (1) ‡	1.4±0.91 (2) ‡	0.914
Postop 4th hr	1.13±0.99 (1) ‡	1.27±0.88 (1) ‡	0.583
Postop 6th hr	1.13±1.13 (1) ‡	1.07±0.7 (1) ‡	0.983
Postop 12th hr	0.73±0.96 (0) ‡	0.73±0.59 (1) ‡	0.634
Postop 24th hr	0.47±0.64 (0) ‡	0.6±0.51 (1) ‡	0.396

Mann Whitney U Test; †‡Wicoxon Sign Test; *p<0.05; **p<0.01; † when evaluating in-group p<0.05; ‡ when evaluating in-group p<0.01.

Table 3. Verbal Descriptor Scale (VDS) Variation

VDS	Group T Mean±SS (Median)	Group C Mean±SS (Median)	p
Postop 1st min	1.33±0.49 (1)	2.53±0.64 (3)	0.001**
Postop 5th min	1±0.38 (1) †	2.33±0.72 (2)	0.001**
Postop 15th min	0.93±0.46 (1) †	2.07±0.96 (2) †	0.001**
Postop 30th min	0.93±0.46 (1) †	1.93±0.88 (2) †	0.001**
Postop 1st hr	0.93±0.46 (1) †	1.4±0.74 (1) ‡	0.047*
Postop 2nd hr	0.8±0.56 (1) ‡	1.13±0.64 (1) ‡	0.140
Postop 4th hr	0.73±0.46 (1) ‡	0.93±0.59 (1) ‡	0.339
Postop 6th hr	0.73±0.59 (1) ‡	0.8±0.56 (1) ‡	0.732
Postop 12th hr	0.6±0.63 (1) ‡	0.47±0.52 (0) ‡	0.604
Postop 24th hr	0.27±0.46 (0) ‡	0.4±0.51 (0) ‡	0.446

Mann Whitney U Test; †‡Wicoxon Sign Test; *p<0.05; **p<0.01; † when evaluating in-group p<0.05; ‡ when evaluating in-group p<0.01.

DISCUSSION

In this study, we have compared the analgesic effect by performing the USG-TAP block through injecting 0.25% bupivacaine and 0.9 % NaCl, 30 ml each for the left and the right, at a total of 60 ml, after a cesarean section performed under general anesthesia. Our study demonstrated that in elective cesarean section performed under general anesthesia with a pfannenstiel incision, TAP block with 60 mL 0.25% bupivacaine (30 mL in each side) could decrease 24 h postoperative pain intensity and analgesic consumption.

The time to first analgesic requirement was longer in parturients who received the TAP block. The use of meperidine for postoperative analgesia was higher in the control group. There hasn't been any need of extra analgesia in TAP group. There wasn't a significant difference in patient satisfaction in both groups. The pain and discomfort after cesarean section has negative effect on early ambulation and breast feeding, which can result in postoperative complications and the mother's discomfort [9]. So, providing effective and safe postoperative analgesia can prevent these morbidities.

Ripoles et al. [10] found in their multicenter review study that TAP block reduces the need for analgesia and VAS in post operative 24 hours. In our study we found similar results that TAP block reduces meperidine consumption and reduces VAS after cesarean section.

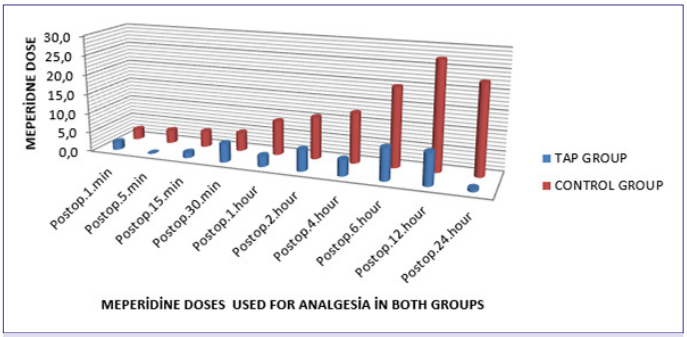

Figure 2. The meperidine dose variation between the groups

Mcdonnel et al. [11] performed bilateral TAP block using 1.5 mg/kg ropivacaine (to a maximal dose of 150 mg) or saline on each side at fifty patients after ceserean section. Patients undergoing TAP block with ropivacaine had reduced 48 h morphine requirements, and a longer time to first PCA morphine request.

Abdallah et al. [12] found in their multicenter review which consists of five studies and 312 patinets that, TAP block constitutes an effective analgesic option for postoperative analgesia after ceserean section performed under spinal anaesthesia when spinal morphine is not used.

There are varieties between the choice of local anesthetic and consantiration, tecniques of TAP block. But there isn't enough evidence which tecnique or concentration is superior to the other [13].

McMorrow et al. [14] found in their study that spinal morphine (but not TAP block) improved analgesia after Cesarean section. The addition of TAP block with bupivacaine to spinal morphine did not further improve analgesia. Intratechal morphine has advantages comparing to TAP block but it has also strong disadvantages postoperative nausea and vomitting (PONV) are some of these complications. At 30% of patients who has intratechal morphine has obvious pruritus. But respiratuar depression is the most serious side effect of ıntratechal morphine [15]. In the study in which Kanazi et al. [16] compared TAP block with intratechal morphine at 57 patients, had been found that at %46 of patinetns had PONV and %39 of them had severe itching which has been treated with medical intervention. Kanzai et al. used 0.2 mg morphine in this study but none of their patients had respiratuar depression.

On the contrary there are studies claim that TAP Block provides better analgesia when added to the ıntratechal morphine. Mirza et al. [17] has chosen TAP block for supportive analgesic method in cases who are having cesarean section with spinal anesthesia (bupivacaine 12 mg, fentanyl 10 μg, morhine 200 μg). They found that TAP block provides extra analgesia in all cases postoperative 10-19 hours. They think that providing extra analgesia for so long time is a consequence of local anesthetic spreading to the paravertebral space.

Epidural anesthesia is still the gold standart technique in postoperative analgesia at cesarean sections. Yoko Onoshi et al. [18] compared TAP block with epidural anesthesia at 94 patients whom had ceserean seciton with combined spinal-epidural anesthesia. In epidural group morphine (2 mg) was administered to the epidural space close to the end of surgery. In TAP group 20 mL of either 0.375% ropivacaine or 0.3 % levobupivacaine was infused to both sides of the transversus abdominis plane after surgery. All patients were placed on a patient-controlled i.v. analgesia regimen with morphine after surgery. The median time to the first morphine request was longer (555 min vs 215 min), and the median cumulative morphine consumption within 24 h was lower (5.3 mg vs 7.7 mg) in the TAP group than in the control group.

There is no published case report about local anestetic toxicitiy in TAP block. We didnt see any sign of local anesthetic toxicitiy in our patients too. There are two published liver laceration related to the tap block one of these laserations ocurred in USG guided TAP block [19, 20].

There are two published case reports abot seizures related with TAP block. İn first case seizure thought to be a conclusion of intramuscular enjection of local anesthetic. In second case the reason was the seconder plasma absorbation of the local anesthetic solution. We didn't have any of these complications in our study.

CONCLUSION

As a result; TAPblock is a effective and reliable method, which is accepted in many centers world wide and reduces the need for postoperative analgesia. It is easy to use and does not lead any serious complications. In the future in cases where epidural analgesia is restricted TAP block can be an important alternative.

We think that, not only with the aid of TAP catheters but also posiple development of new block tecniques; TAP block will play an important role in multimodal analgesia management.

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