

The effect of TAP block use in postoperative analgesic in cesarean section

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Abstract. – OBJECTIVE: TAP (transversus abdominis plane) block is an important parameter of multimodal analgesia in the control of postoperative pain in cesarean section cases. In our study, we aimed to compare the analgesic consumption, patient satisfaction rate, vital signs, and visual analog scale (VAS) scores of ASA II patients with and without TAP block in cesarean surgery.

PATIENTS AND METHODS: This study was designed as a retrospective review of prospectively collected data and an open-label and randomized clinical trial. The files of 180 patients who underwent elementary cesarean section between January 2019 and December 2019 were analyzed. The ASA score, anesthesia method, age, weight, height, parity, TAP block application, VAS score, analgesia duration, the additional analgesic requirement for maintenance, patient satisfaction, postoperative nausea, vomiting, urinary retention, and other complications were recorded. The 180 patients included in the study were divided into 6 groups: Group 1 - General anesthesia, Group 2 - General anesthesia + TAP block, Group 3 - Spinal anesthesia, Group 4 - Spinal anesthesia + TAP block, Group 5 - Epidural anesthesia, and Group 6 - Epidural anesthesia + TAP block.

RESULTS: There was no significant difference between the groups in terms of demographic variables. The VAS scores of the first 24 hours were significantly different for Group 1. VAS scores in the 1st and 3rd hours were significantly higher in Group 1 than in the other groups. The groups without TAP block had significantly higher VAS scores at the 12th hour. Furthermore, the VAS score in Group 6 at 24 hours was significantly the lowest, and the earliest analgesic requirement was in Group 1. When the number of analgesic needs of the patients in 24 hours was examined, Group 1 was found to be significantly the highest, and Group 6 was significantly the lowest of all groups.

CONCLUSIONS: The epidural anesthesia + TAP block Group had the lowest VAS score, the fewest analgesic requirements, the longest analgesia length, and the highest patient satisfaction.

Key Words:

Anesthesia, TAP block, Obstetric, Surgery, Cesarean.

Introduction

In the world, one-fourth of deliveries are performed by cesarean section¹. Insufficient pain control after cesarean section may cause undesirable conditions such as chronic pain, postpartum depression, delay in mobilization, delayed lactation, and later formation of the bond between mother and baby. The analgesic to be used after cesarean section should be sufficiently effective, should not affect the mother's ability to take care of her baby, and the transition to breast milk should be minimal². In addition to being effective in providing analgesia, opioid agents administered systemically or neuroaxially are difficult to use due to serious side effects such as nausea, vomiting, constipation, and respiratory depression³.

After cesarean section, somatic pain originating from the abdominal wall incision and visceral pain due to the uterus occur. Most of the disturbing pain is from the abdominal wall, which is of somatic origin. Therefore, transversus abdominis plane block (TAP), which causes the block of nerves innervating these regions, is used in postcesarean pain relief. The anterior lateral wall of the abdomen is innervated by the thoracolumbar nerves T7-L1. These nerves are located within the fascia that passes between the transverse abdominis and internal oblique muscles. TAP block is a nerve blockade that gives local anesthetic into this fascia. It was coined by Rafi⁴ in 2001 and was developed in 2007 with the use of ultrasound. Today, ultrasound-guided TAP block administration is commonly used because it is easy to apply and has few side effects⁵. The majority of clinicians prefer epidural anesthesia

to spinal anesthesia due to its ability to provide more stable hemodynamics, as well as better postoperative analgesia⁶. Although epidural anesthesia is the gold standard, spinal, epidural, and general anesthesia can be preferred in cesarean as well⁷.

In this study, we aimed to compare analgesic consumption, patient satisfaction rate, vital signs, and visual analog scale (VAS) scores of patients with and without TAP block.

Patients and Methods

This study was designed as a retrospective review of prospectively collected data and an open-label and randomized clinical trial. Our study was conducted retrospectively after obtaining the approval of the Harran University's Clinical Research Ethics Committee (09/09/2019 and 19/10/48 decision). All of the patients participating in the study were adults and written informed consent was obtained from all patients. The C-section files of 180 patients who underwent surgery with elective conditions between October 2018 and July 2019 were examined. ASA score, anesthesia method, age, weight, height, parity, whether TAP block was administered, VAS score, duration of analgesia, how many hours additional analgesic needed, patient satisfaction, postoperative nausea, vomiting, urinary retention, and other complications were recorded. ASA III, ASA IV, and ASA V, patients under 18 years of age, patients with preeclampsia, eclampsia, percreata, and accreta complications, and emergency patients were excluded from the study. After excluding patients, 180 participants were included in the study, and these patients were divided into six groups.

Group 1 (n = 30): General anesthesia;

Group 2 (n = 30): General anesthesia + TAP block;

Group 3 (n = 30): Spinal anesthesia;

Group 4 (n = 30): Spinal anesthesia + TAP block;

Group 5 (n = 30): Epidural anesthesia;

Group 6 (n = 30): Epidural anesthesia + TAP block.

After monitoring patients, spinal anesthesia with 2-2.2 ml 0.5% heavy bupivacaine (Marcaine®, Astra-Zeneca, Istanbul, Turkey) from the L3-5 range was administered, epidural anesthesia with 14 ml isobaric bupivacaine (Marcaine®, Astra-Zeneca, Turkey) + 1 ml, i.e., 50 mcg fentanyl (Talinat® 0.5 mg 10 ml amp, VEM İlaç, Turkey) + 0.3 ml, i.e., 3 mg morphine (Morphine® HCL amp; 0.01 g, Galen İlaç, Turkey) was administered at the L3-5 level as approximately 15-16 ml of solution. General anesthesia was achieved with propofol, fentanyl, and rocuronium. TAP

block administration was performed bilaterally in the operating room following the end of the procedure, with the guidance of ultrasonography. A total of 20 ml of 0.25% bupivacaine (Marcaine®, Astra-Zeneca, Turkey) and 10 ml of lidocaine were administered bilaterally. Before starting the surgery, the 0th, 5th, 15th, and 30th minute systolic, diastolic, mean arterial pressures, and pulse values were recorded. Additionally, 1-, 3-, 6-, 12- and 24-hour VAS scores were evaluated to determine the analgesic requirement. VAS is created by patients marking on a horizontal line, with 0 representing no pain and 10 representing the most severe pain. Likert scale records were used to evaluate the patient satisfaction rate. The first postoperative analgesia requirement was recorded by looking at the service follow-up forms at how many hours and within 24 hours.

Statistical Analysis

Statistical analyses were conducted using SPSS for Windows, Version 23.0 (IBM Corp., Armonk, NY, USA). Continuous variables are expressed as the mean±standard deviation (SD); categorical variables are expressed as frequencies and percentages. The normal distribution of data was determined using histograms, the Kolmogorov-Smirnov test, and the Shapiro-Wilk test. The groups were compared using the Kruskal-Wallis H test.

Results

A total of 180 patients were included in the study. When we look at the demographic data of the study, the mean age of the patients was 31.6 ± 6.5 years, the mean weight was 79.6 ± 14.7 kg, the mean height was 162.5 ± 15.9 cm, and the mean parity was 4.42 ± 2.3 . There was no significant difference between the groups in terms of demographic data (Table I).

The 30-minute systolic and diastolic blood pressure was lower in Group 3 than in Groups 5 and 6. A significant difference was found between the groups ($p=0.03$; $p=0.016$). No significant difference was found in other hours ($p>0.05$). VAS scores in the first 24 hours were significantly higher in Group 1 ($p=0.00$). VAS scores in the 1st and 3rd hours were significantly higher in Group 1 ($p=0.00$; $p=0.00$). VAS scores in the 6th hour were significantly higher in Group 1 than in Group 2, Group 4 and Group 6 ($p=0.00$). In Group 3, VAS scores in the 6th hour were higher than those in Group 2 ($p=0.00$), and those in Group 5 were higher than those in Group 6 ($p=0.00$). VAS scores

Table I. Descriptive statistics of groups.

| | Group 1 (n=30) | Group 2 (n=30) | Group 3 (n=30) | Group 4 (n=30) | Group 5 (n=30) | Group 6 (n=30) |
|--------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Age | 31.3±6.5 | 32.8±5.9 | 31.3±5.1 | 32.6±9.4 | 31.1±5.9 | 30.1±5.0 |
| Weight | 76.8±8.6 | 77.9±8.8 | 80.3±9.8 | 81.4±18.0 | 84.0±24.3 | 77.2±11.1 |
| Height | 163.7±4.3 | 165.3±4.2 | 164.9±4.4 | 159.6±3.1 | 158.7±22.8 | 162.7±5.5 |
| Parity | 4.4 ±2.3 | 5.0±2.6 | 4.6±2.1 | 3.8±2.7 | 4.3±2.29 | 4.2±1.9 |

in the 12th hour were significantly higher than those in the groups without TAP blockade ($p=0.00$). Group 6 VAS scores in the 24th hour were significantly the lowest ($p=0.00$) (Table II, Figure 1-2).

Likert scale scoring was used for patient satisfaction. A significant difference was found

between Group 1 and all other groups ($p=0.00$). The lowest score was found in Group 1. The highest patient satisfaction score was determined in Group 6. Patient satisfaction was higher in Group 2 than in Groups 3 and 5 ($p=0.00$; $p=0.00$).

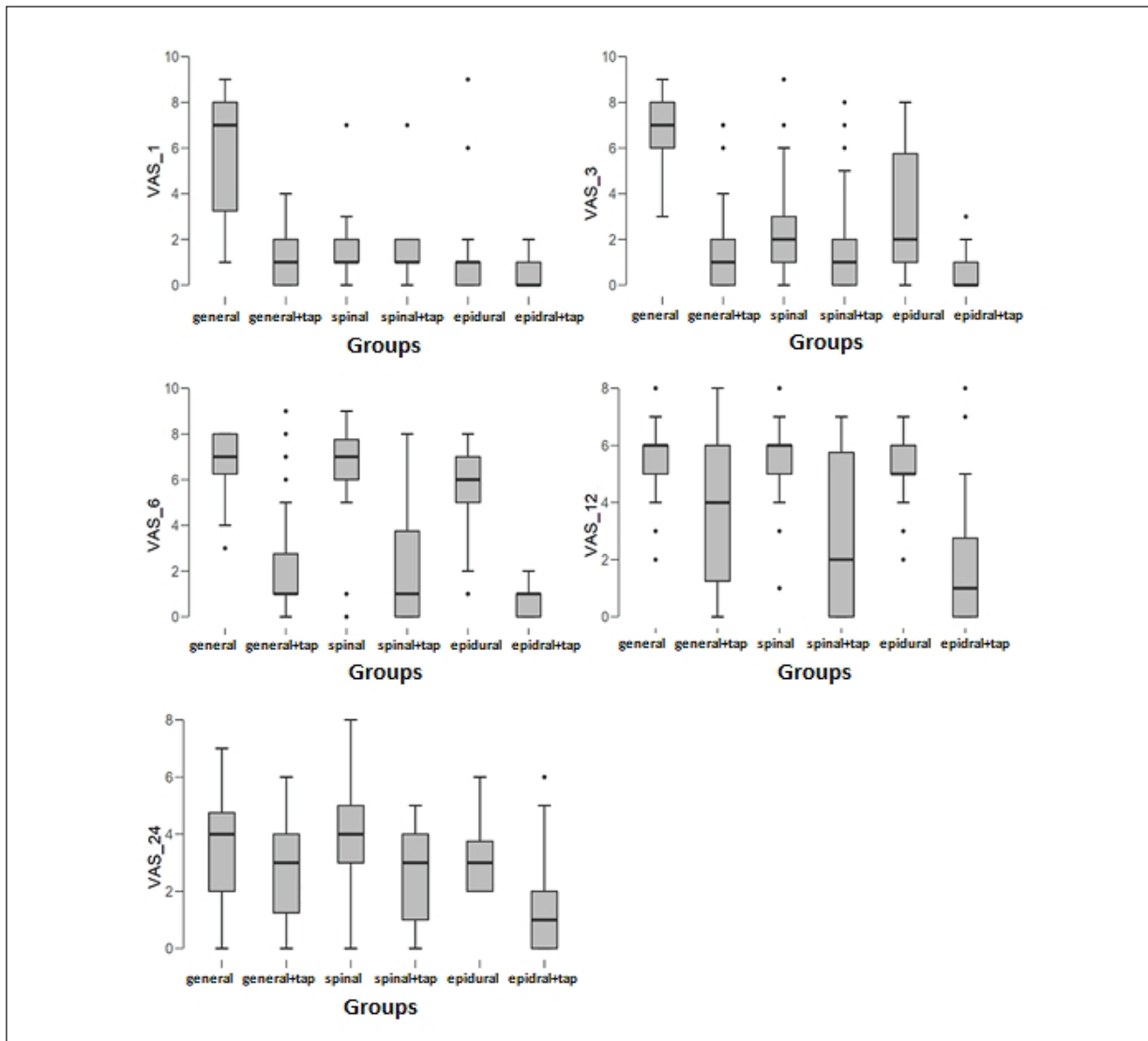


Figure 1. VAS scores across groups.

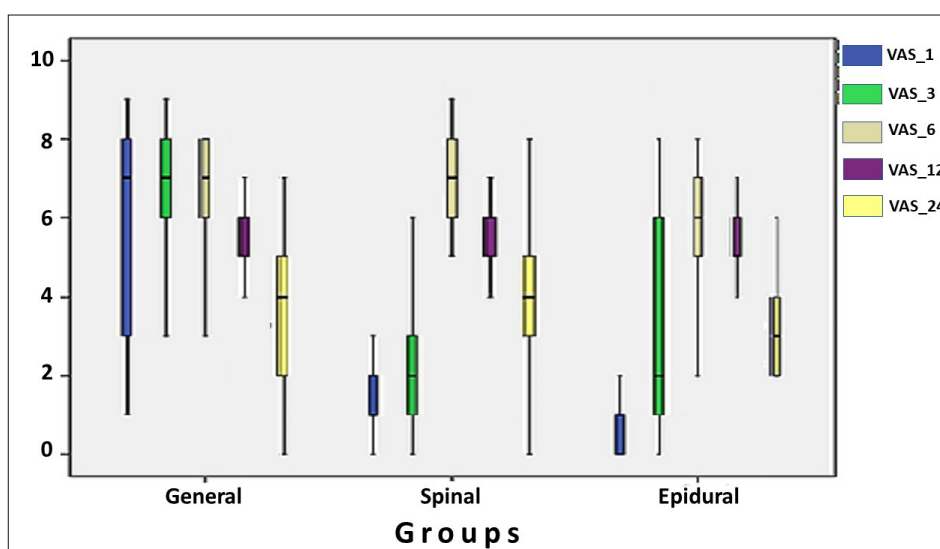


Figure 2. VAS score graphic.

The earliest analgesic requirement was determined in Group 1 compared with the TAP block groups ($p=0.00$). Analgesic requirements were needed in Group 4 for a longer duration than in Group 5 ($p=0.00$). Group 1 was significantly the highest in terms of analgesic needs at 24 hours ($p=0.00$); on the other hand, Group 6 was significantly the lowest ($p=0.00$).

Postoperative nausea was detected more frequently in Group 3 ($n=16$) than in Group 1, Group 2 and Group 5. Most postoperative nausea was detected in Group 3 compared with the other groups ($p=0.00$). Additionally, there was no significant difference between Group 3 and Group 4 ($p=0.98$). The presence of postoperative vomiting was statistically significant between Group 4 and Group 1 and between Group 2 and Group 3 ($p=0.04$). No significant difference was found between the other groups. There was no significant difference between Group 5 and Group 6 in terms of urinary retention ($p=0.72$). Group 5 showed the highest rate of urinary retention. No significant difference was found between the groups in terms of other complications ($p>0.05$) (Table III, Figure 3).

Discussion

Pain after cesarean section is a challenging situation for clinicians. It is important for patient satisfaction and comfort. In addition, the drug given to the mother should not cause side effects in the baby. Although neuraxial opioids are effective, their side effects limit their use. As part

of multimodal analgesia, TAP reduces the need for block opioids and causes fewer side effects⁸.

In this study, patient satisfaction and analgesic duration differed according to the anesthesia method chosen. There are many studies in literature showing the analgesic effect and duration of TAP block in cesarean section. According to these studies⁹, TAP block is superior in terms of analgesic efficacy and duration, but there is no study comparing analgesic duration, patient satisfaction rates, vital findings, and VAS scores of patients who have previously undergone TAP block with spinal, epidural, and general anesthesia techniques. According to our study, US-guided TAP block has been shown³ to be effective for acute postoperative pain duration.

Based on our study, VAS scores at the 3rd, 6th, 12th, and 24th hour were the lowest in Group 6. Additionally, the highest value in terms of patient satisfaction was determined in Group 6, as well as the longest analgesia duration and the lowest analgesic requirement within 24 hours. This suggests that Group 6 might be superior to the other groups. The 1st and 3rd-hour, VAS scores were significantly higher in Group 1 across the groups. The earliest analgesic requirement was determined in Group 1 as well. This suggests that general anesthesia is not sufficient for postoperative pain in the acute period, and additional analgesics are needed. Post cesarean pain is caused by mechanical irritation of the wound site and stimulation in the T6 and L1 dermatomes in the anterior branches of the spinal nerve. US-guided TAP block achieves a lon-

Table II. VAS scores across groups.

| | VAS_1 | | | VAS_3 | | | VAS_6 | | | VAS_12 | | | VAS_24 | | |
|----------------|---------|--------|----------|---------|--------|----------|---------|--------|----------|---------|--------|----------|---------|--------|----------|
| | general | spinal | epidural | general | spinal | epidural | general | spinal | epidural | general | spinal | epidural | general | spinal | epidural |
| Valid | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| Missing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mean | 6.033 | 1.567 | 1.067 | 6.833 | 2.867 | 3.067 | 6.833 | 6.400 | 5.633 | 5.533 | 5.467 | 5.167 | 3.633 | 4.067 | 3.033 |
| Std. Deviation | 2.671 | 1.331 | 1.893 | 1.315 | 2.374 | 2.677 | 1.206 | 1.940 | 1.921 | 1.224 | 1.717 | 1.147 | 1.810 | 1.760 | 0.999 |
| Minimum | 1.000 | 0.000 | 0.000 | 3.000 | 0.000 | 0.000 | 3.000 | 0.000 | 1.000 | 2.000 | 1.000 | 2.000 | 0.000 | 0.000 | 2.000 |
| Maximum | 9.000 | 7.000 | 9.000 | 9.000 | 9.000 | 8.000 | 8.000 | 9.000 | 8.000 | 8.000 | 8.000 | 7.000 | 7.000 | 8.000 | 6.000 |

Table III. Post-surgery variables (analgesia duration, patient satisfaction, post-surgery complications).

| | Analgesia Duration | | | Patient Satisfaction | | | Other Complications | | | Post-Nausea | | | Post-Vomiting | | |
|----------------|--------------------|--------|----------|----------------------|--------|----------|---------------------|--------|----------|-------------|--------|----------|---------------|--------|----------|
| | general | spinal | epidural | general | spinal | epidural | general | spinal | epidural | general | spinal | epidural | general | spinal | epidural |
| Valid | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| Missing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mean | 1.567 | 4.767 | 4.400 | 2.233 | 2.900 | 3.000 | 2.000 | 2.000 | 1.767 | 2.000 | 1.467 | 1.900 | 2.000 | 1.933 | 1.767 |
| Std. Deviation | 0.817 | 4.133 | 1.773 | 0.568 | 0.607 | 0.643 | 0.000 | 0.000 | 0.430 | 0.000 | 0.507 | 0.305 | 0.000 | 0.254 | 0.430 |
| Minimum | 1.000 | 0.000 | 1.000 | 1.000 | 2.000 | 2.000 | 2.000 | 2.000 | 1.000 | 2.000 | 1.000 | 1.000 | 2.000 | 1.000 | 1.000 |
| Maximum | 4.000 | 24.000 | 9.000 | 3.000 | 4.000 | 4.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 |

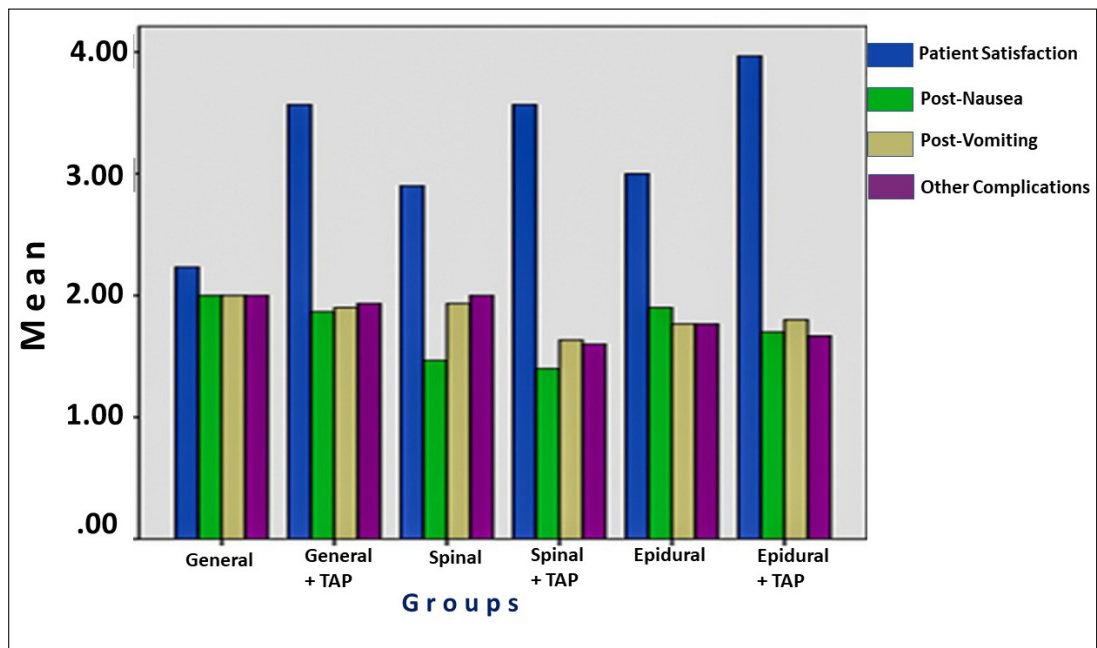


Figure 3. Means across groups.

ger-lasting and more effective sensory block¹⁰. In our study, across Group 1, Group 2, Group 4, and Group 6, the 12th-hour VAS scores were significantly higher than those of the groups without TAP block. Carney et al¹¹ reported that TAP block not only blocks distal sensory efferent but also affects the paravertebral space more proximally. In a study by Borglum et al¹², TAP block (30 ml 0.375% ropivacaine), which was bilaterally performed by magnetic resonance imaging, spread to the paravertebral T6-T12 regions. This spread did not vary between 30 and 180 minutes. As a result, more effective and long-lasting analgesia is achieved thanks to the involvement of more dermatomes¹⁰, which is supported in this study.

The earliest analgesic requirement was determined in Group 1 compared with the TAP block groups. Moreover, there was no significant difference between Group 5 and Group 6. The 24-hour VAS score was significantly the lowest in Group 6. Abdallah et al¹³ showed that the TAP post-analgesia duration was extended up to 24 hours in a systematic review and meta-analysis conducted in Canada. In their study, Mishriky et al¹⁴ showed that TAP block increased patient satisfaction and decreased pain scores. These two studies^{13,14} are compatible with our results. The earliest analgesic requirement was determined in Group 1 compared with the TAP block groups. It was determined that Group 6 did not need analgesics

longer than Group 2. It was observed that Group 4 did not need analgesics longer than Group 5.

The post-surgery complications of TAP block are not entirely clear. To date, there have been several reports case^{8,15-17} showing that several TAP blocks have toxic effects. Jadon et al⁸ stated that it may cause local anesthetic toxicity due to decreased protein binding and increased free drug amount during pregnancy. In addition, increased distribution of the drug in the body may cause toxicity due to increased distension of the vena cava and increased cardiac output. Weiss et al¹⁵ reported tremors in two cases after US-guided TAP block administration. In the first case, 40 ml levobupivacaine 3.75 mg/mL was used; in the second case, 40 ml 7.5 mg/ml ropivacaine was used. Griffiths et al¹⁶ reported systemic toxicity, such as numbness, impaired speech, and metallic taste, in 2 of 30 patients after using 2.5 mg/kg ropivacaine. Meanwhile, Lancaster and Chadwick¹⁷ reported liver damage after TAP block with USG. The patient was followed-up in the Intensive Care Unit for 7 days.

In our study, no seizure or local anesthesia toxicity was detected. Postoperative nausea, vomiting, and urinary retention were detected as complications. Postoperative nausea was more common in Group 3 (n=16) than in Group 1, Group 2, and Group 5. Most postoperative nausea was detected in Group 4 compared with Group

1, Group 2, Group 5, and Group 6. Postoperative vomiting was detected more frequently in Group 4. Urine retention was detected mostly in Group 5. A Likert scale was used for patient satisfaction. The lowest satisfaction was in Group 1, whereas, Group 6 had the highest patient satisfaction score. Patient satisfaction was higher in Group 2 than in Groups 3 and 5.

A study conducted by Abdallah et al¹³ suggests that the use of TAP block in patients contraindicated (such as allergy, or peptic ulcer) to use non-steroid analgesics in a multimodal pain management strategy might be advantageous. Belavy et al¹⁸ performed TAP block in all patients who underwent cesarean section with spinal anesthesia in their placebo-controlled study. The placebo control group received 40 mL of saline solution, and the other group received 40 mL of 0.5% ropivacaine. Patient satisfaction was higher in the ropivacaine group and lower in the VAS score than in the placebo group. Similar results were found in our study.

In the study of Onishi et al¹⁹, 94 patients underwent surgery with epidural anesthesia. TAP block was administered to 54 patients. Three milligrams of morphine diluted to the other group was administered to the epidural space. They reported¹⁸ that patient satisfaction was significantly higher in the EA + TAP block group, and the need for additional analgesics was low. They reported low patient satisfaction and high VAS scores only in the group receiving epidural morphine. Similar results were found in our study. It was determined that there was more patient satisfaction, lower VAS score, longer analgesia duration, and less analgesic requirement in Group 6 than in Group 5.

Limitations

Our study was carried out only in pregnant women and included patients in a certain age range. Similar studies can be conducted both in a wider age range and in different patient groups. Since the patient population we worked with is different in terms of education levels, working with a patient group with a similar education level will provide more reliable data to evaluate patient satisfaction in a healthier way.

Conclusions

Epidural anesthesia is the gold standard in cesarean surgeries. Low VAS scores, less analgesic

requirement, longer analgesia maintenance, and high patient satisfaction are crucial for epidural anesthesia. As shown in our study results and other sources, we believe that TAP block usage in patients without contraindications would achieve a longer analgesic duration, less analgesic requirement, and a faster attachment between mother and baby for breastfeeding. TAP block usage would help lower the VAS score and increase patient satisfaction.

Conflict of Interest

The Authors declare that they have no conflict of interests.

Ethics Approval

The study received the approval of the Harran University's Clinical Research Ethics Committee (09/09/2019 and 19/10/48 decision).

Informed Consent

Informed consent was obtained from all individual participants included in the study.

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