

# Comparison of Postoperative Analgesic Efficacy of Different Methods After Cesarean-Section

## Sezaryen Sonrası Farklı Yöntemlerin Arasında Postoperatif Analjezik Etkinliğin Karşılaştırılması

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### ABSTRACT

**Objective:** In this research study, we compared postoperative analgesic effects of general anesthesia followed with transversus abdominis plane block (TAPB), epidural or spinal anesthesia and we aimed to figure out the efficacy of TAPB for the postoperative pain.

**Method:** After approval of the ethics committee (date: 03.25.2015; decision no: 142) for the study was obtained, the study population scheduled for elective cesarean operations was divided in three subgroups as spinal, epidural and general anesthesia. Group T consisted of 30 cases that underwent general anesthesia and TAP; Group E consisted of 32 cases that underwent epidural anesthesia; and Group S consisted of 30 cases that underwent spinal anesthesia. All cases received 75 mg IM diclofenac sodium after the operation. Data about the postoperative pain (the onset time of the pain, and the severity of the pain evaluated with VAS (Visual Analog Scale) and the need for adjuvant analgesics) were recorded. In addition, heart rate, blood pressure, peripheral oxygen saturation, respiration rates at postoperative 0., 1., 4., 6. and 12. hours and side effects seen were recorded. If the patient needed any additional postoperative analgesics, 50 mg tramadol was injected intravenously.

**Results:** There was no significant difference between the groups regarding postoperative analgesia need (Table II). The need for postoperative tramadol was minimum for patients in Group E and maximum for patients in Group S ( $p<0.05$ ). VAS scores at postoperative 0., 1. and 6. hours were significantly lower for patients in Group E ( $p<0.05$ ). Regarding the groups T and S, VAS scores at 6. hours were significantly lower in Group T when compared with Group S ( $p<0.05$ ).

**Conclusion:** We found that the efficacy of the epidural anesthesia was more prominent and the best method for decreasing postoperative consumption of tramadol. Epidural anesthesia increased the postoperative analgesic efficacy and decreased the tramadol consumption in patients undergoing TAP block. In order to increase the comfort of the mother and newborn, TAPB may be an option for patients who are not candidates for epidural anaesthesia.

**Keywords:** Postoperative analgesia, cesarean-section, epidural block, transversus abdominis plane block, spinal block

### Öz

**Amaç:** Bu çalışmada, sezaryen yapılan olgularda, genel anesteziye eklenen transversus abdominis plan bloğu (TAP) ile epidural anestezi ve spinal anestezinin postoperatif analjezik etkileri karşılaştırıldı. Sezaryen ameliyatı sonrası TAP bloğun etkinliği belirlenmeye çalışıldı.

**Yöntem:** Etik Kurul (25.03.2015/142) izni alındıktan sonra, elektif şartlarda sezaryen planlanan olgular, spinal anestezi, epidural anestezi ve genel anestezi olmak üzere 3 gruba ayrıldı. Bu araştırma, genel anesteziye eklenen TAP yapılan 30 olgu (Grup T) ile epidural anestezi yapılan 32 olgu (Grup E) ve spinal anestezi yapılan 30 olgu (Grup S) olmak üzere toplam 92 olgudan oluşmaktadır. Tüm olgulara ameliyat bitiminde diklofenak sodyum 75 mg IM uygulandı. Olguların postoperatif ağrılarının ne zaman başladığı ve Görsel Analog Skala (GAS)'ya göre hangi şiddette olduğu ve olguların ek analjezik gereksinimleri ile postoperatif 0. saat, 1. saat, 4. saat 6. saat ve 12. saatteki kalp atım hızı, kan basıncı, periferik O<sub>2</sub> saturasyonu, solunum sayıları ile görülen yan etkiler kaydedildi. Postoperatif dönemde olguların ek analjezik gereksinimleri olduğunda 50 mg tramadol IV uygulandı.

**Bulgular:** Postoperatif analjezik gereksinimi açısından gruplar arasında anlamlı bir fark bulunmadı (Tablo II). Grup T'de de Grup S'ye göre daha az tramadol tüketimi gerçekleşmiştir ( $p<0,05$ ). Olguların görsel ağrı skorları karşılaştırıldığında 0. saat, 1. saat ve 6. saatlerde GAS skorları Grup E'de Grup S ve Grup T'ye göre anlamlı düşük saptandı. 6. saat GAS değerleri karşılaştırıldığında da Grup T Grup S ye göre daha az ağrı gözlenmiştir ( $p<0.05$ ).

**Sonuç:** Çalışmamızda, epidural anestezinin postoperatif analjezik etkinliğinin daha belirgin olduğu ve postoperatif tramadol tüketimini azaltmada en etkin yöntem olduğu bulunmuştur. TAP blok uygulanan hastalarda da postoperatif analjezi etkinliği artmakta ve tramadol gereksinimi azalmaktadır. Epidural uygulanmayan olgularda etkin bir postoperatif analjezi sağlamak ve anne ile bebeğin konforunu arttırmak için TAP blok bir alternatif olarak kullanılabilir.

**Anahtar kelimeler:** Postoperatif analjezi, sezaryen, epidural blok, transversus abdominis plane blok, spinal blok

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## INTRODUCTION

There is a distinct increase in the number of cesarean sections performed in recent years worldwide <sup>(1)</sup>. Despite new analgesics and improvements in analgesia methods, most patients still feel uncomfortable due to postoperative pain. The pain after cesarean sections can be treated with intramuscular, intravenous analgesia and patient-controlled analgesia, as well as neuroaxial methods. Opioids, which are used commonly for the treatment of postoperative pain, have some maternal side effects, such as sedation, nausea, vomiting, respiration depression; besides opioids also have side effects for the newborn via breastfeeding <sup>(2,3)</sup>. Neuroaxial methods may cause some complications such as nausea, vomiting, hypotension, paralysis and meningitis <sup>(4)</sup>. Nonsteroidal antiinflammatory drugs-when used alone- may end up with insufficient postoperative analgesia <sup>(5)</sup>. Inadequate postoperative analgesia negatively affects maternal ambulation and breastfeeding.

Transversus abdominis plane block (TAP) is an analgesic method which is used for decreasing the need for systemic analgesia. During the passage of the needle through fascial sheath of the external and internal oblique muscles, two fascial "clicks" are felt and local anesthesia is performed between internal oblique and transversus abdominis muscles in order to block the anterior bundles of T9-L1 nerves. This method is known as TAP block <sup>(6)</sup>. The ultrasound guidance increases the safety of the procedure and also enables the clinician to perform this procedure easily. Recent data suggest that even one injection with TAP supplies efficient abdominal wall analgesia lasting up to 24 hours <sup>(7)</sup>.

In this study, we compared postoperative analgesic effects of general anesthesia followed with TAP and epidural and spinal anesthesia and aimed to figure out the efficacy of TAP block for the postoperative pain.

## MATERIAL and METHODS

After the research ethics committee approval of Manisa Celal Bayar University (03. 25.2015/142) was obtained, the study included 92 ASA I-II cases with 18-40 years of age which had elective cesarean-

sections at Manisa Celal Bayar University. Patients with coagulopathy, known allergies to the drugs to be used, infection at the place of operation, and non-volunteer patients were excluded from the study. The patients were informed about spinal, epidural and general anesthesia. If there was no contraindication for any of the particular anesthesia method, the patient has chosen the suitable one for herself. The patients who had general anesthesia were also informed about intravenous patient-controlled analgesia and TAP. Thirty volunteers who wanted to receive general anesthesia followed by TAP signed the informed consent and participated in the study (Group T). Thirty-two patients who had epidural anesthesia constituted Group E and 30 patients who had spinal anesthesia constituted Group S. All patients received 75 mg intramuscular diclofenac sodium at the end of the surgery.

Before the operation, administration of NaCl 0.9% solution via peripheral venous access was started. In Group E, epidural catheter was inserted into the L3-L4 or L4-L5 lumbar epidural space with patients in the sitting position, and after loss of resistance to saline technique under sterile conditions; 10 mL 5% bupivacaine with the addition of 5 mL 2% lidocaine and 75 µg fentanyl was delivered into the epidural space. In Group S, spinal anesthesia was performed at L3-L4 or L4-L5 interspace with the patient in the sitting position, using 25G Quincke needles (B. Braun, Melsungen, AG); 10 mg 5% hyperbaric bupivacaine and 15 µg fentanyl were applied intrathecally. In Group T, TAP block was performed at the end of the cesarean section. In order to ensure sterile conditions, the ultrasound probe was covered with a sterile nylon bag. The skin was cleaned with an antiseptic solution. Lateral abdominal wall muscles were identified with the help of the ultrasound using 7.5 MHz linear probe (Esaote My Lab 30cv, Florence-Italy). After visualisation of the external oblique, internal oblique and transversus abdominis muscles, a 22-gauge (22G) 100 mm nerve block needle (Pajunk, GmbH, Geisingen, Germany) was guided using the ultrasound probe. The passage of the needle was visualised when it was entering the plane between the external oblique and internal oblique muscles and then further between the internal oblique and transversus abdominis muscles. The position of the needle is confirmed via the negative aspiration, then

20 mL 0.25% bupivacain was injected to each side.

Data about the postoperative pain (the onset time of the pain, the severity of the pain evaluated with VAS -visual analog scale- and the need for adjuvant analgesics) were recorded. If a patient's pain score was higher than 4, 50 mg IV tramadol was administered for pain. In addition, heart rate, blood pressure, peripheric oxygen saturation, respiration rates at postoperative 0., 1., 4., 6. and 12. hours were recorded. Some side effects such as nausea, vomiting, urinary retention were also evaluated.

The sample size was calculated using power analysis. 85% power, effect size  $f=0.35$  ( $f$ =effect size),  $\alpha^2=0.05$ , and the minimum number of 30 people was assigned for each group. The data were evaluated using SPSS 15.0 statistical package program. All data were tested for normality using the Kolmogorov-Smirnov test. Descriptive statistics (frequency, means, standard deviation, median, percentages), analysis of variance (ANOVA), post- hoc Tukey HSD test, independent samples-t test, Mann-Whitney U test, Kruskal-Wallis analysis and chi-square test were used in the evaluation of the data. P value smaller than 0.05 was regarded as statistically significant.

For repetitive measurements Repeated Measures ANOVA test was used. When Mauchly's test of sphericity was used if the assumption of sphericity could not be achieved ( $p \leq 0.05$ ), then Greenhouse-Geisser p value in Tests of Within-Subjects Effects table was used. When the assumption was achieved ( $p > 0.05$ ), "Sphericity assumed" p value in Tests of Within-Subjects Effects was used.

## RESULTS

There was no significant difference between the groups regarding maternal age, height, body weight and body mass index ( $p > 0.05$ ) (Table I). The mean gestational age was  $38.17 \pm 1.99$  (range=30-41) weeks. Epidural anesthesia was performed in patients with greater gestational weeks ( $p < 0.05$ ) (Table I).

There was no significant difference between the groups regarding systolic and diastolic blood pressures at 0., 1., 4., 6., 12. hours. Systolic and diastolic blood pressures are shown in Figure 1 and 2. When each group was evaluated in terms of repetitive measurements, it was found that systolic blood pressure was statistically different in epidural, spinal and TAP group (p values were 0.007, 0.003 and 0.0003, respectively). Diastolic blood pressure decreased at a statistically significant level in the TAP group ( $p=0.005$ ), whereas there was no significant difference regarding diastolic blood pressure in epidural ( $p=0.147$ ) and spinal ( $p=0.462$ ) group in repetitive measurements. There was no significant difference between the groups regarding the need for postoperative analgesia (Table I). Postoperative need for tramadol was at a lowest level for patients in Group E and mostly for patients in Group S ( $p < 0.05$ ) (Table I).

VAS scores at postoperative 0., 1. and 6. hours were significantly lower for patients in Group E ( $p < 0.05$ ). In groups T and S, VAS scores at 6. hours were significantly lower in Group T when compared with Group S ( $p < 0.05$ ) (Table I). However VAS scores at 0. hour were significantly lower for patients in Group E ( $p < 0.05$ ). At 12. hours VAS scored were significantly lower in Groups T and S when compared with Group

**Table I. The distribution of the groups according to the age, height, weight, gestational weeks, tramadol consumption, VAS scores**

	Group E <sup>e</sup>	Group S <sup>s</sup>	Group T <sup>t</sup>	P
Age	28.3±5.5	27.5±5.4	28.1±6.0	0.823
Height (cm)	162.2±4.2	164.1±4.9	164.8±4.7	0.077
Weight (kg)	76.5±10.1	81.7±15.1	78.5±11.5	0.264
Gestational weeks	38.9±0.89*	37.7±2.3	37.8±2.1	0.028 e>s=t*
Postoperative tramadol consumption (mg)	0.03±0.18	1.13±1.89	0.97±1.35	0.005 e<s, e<t, s>t*
0. hr VAS	0.03±0.18	1.13±1.89	0.97±1.35	0.005 e<s, t, s=t
1. hr VAS	0.70±1.34	2.75±1.93	2.80±1.95	0.000 e<s, t, s=t*
4. hr VAS	1.20±1.88	1.97±1.94	2.0±2.05	0.204
6. hr VAS	0.60±0.96	1.53±1.50	0.77±1.07	0.007 s>e, s>t, e=t*
12. hr VAS	0.67±1.39	0.81±1.25	0.30±0.95	0.241
24. hr VAS	0.20±0.66	0.31±0.73	0.0±0.0	0.105

\*e=epidural, s=spinal, t=tap, according to posthoc tukey test  $p < 0.05$ , Values are expressed as mean±SD

E ( $p < 0.05$ ). At 24. hours VAS scores were significantly higher for patients in Group E ( $p < 0.05$ ) (Table II). None of the patients had side effects such as nausea vomiting or urinary retention.

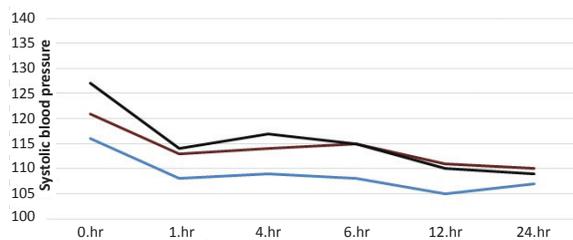


Figure 1. Systolic blood pressure at 0., 1., 4., 6., 12. and 24. hours

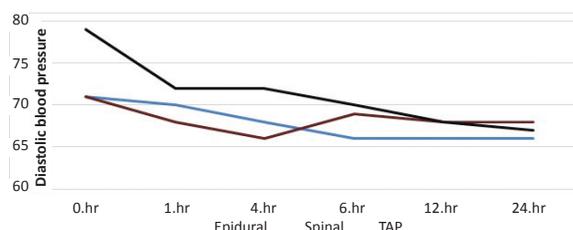


Figure 2. Diastolic blood pressures at 0., 1., 4., 6., 12. and 24. hours

Table II. At 1., 4., 6., 12., 24. hours VAS changes in groups

	Group E <sup>e</sup>	Group S <sup>s</sup>	Group T <sup>t</sup>	P
0. hr VAS	0.03±0.18	1.13±1.89	0.97±1.35	0.005
1. hr VAS changes	0.66±1.34	1.65±2.31	1.83±1.89	e<s,t,s=t 0.05
4. hr VAS changes	1.16±1.89	0.81±2.42	1.03±2.61	0.83
6. hr VAS changes	0.56±1.00	0.40±2.56	-0.20±1.74	0.26
12. hr VAS changes	0.63±1.40	-0.31±2.44	-0.66±1.58	0.02
24. hr VAS changes	0.16±0.64	-0.81±1.83	-0.96±1.35	e=s,t,e>t 0.004 e>s>t

\*hr=Hour, e=epidural, s=spinal, t=tap, according to posthoc Tukey test  $p < 0.05$ , Values are expressed as mean±SD

## DISCUSSION

Early maternal ambulation after the cesarean operation is necessary both for the newborn and the puerperant. This can be achieved only with sufficient postoperative analgesia. There are some differences of general and regional anesthesia techniques regarding the postoperative analgesia. In this study, we compared postoperative analgesic effects of general anesthesia followed with TAP and epidural and spinal anesthesia and aimed to figure out the efficacy of TAP block for the postoperative pain. There was no significant difference between the groups regarding

the need for postoperative analgesia. Postoperative need for tramadol was the lowest for patients in the epidural anesthesia group.

Regional anesthesia enables efficient postoperative analgesia, so the puerperant may be interested in her baby with comfort (5,8). However, the women receiving general anesthesia commonly face with postoperative pain. Therefore, in order to decrease the postoperative pain following general anesthesia, TAP or intravenous patient-controlled analgesia is performed. Intravenous patient-controlled analgesia is not preferred commonly, because opioids may also affect the newborn via breastfeeding (9). Recently, TAP block has been performed for postoperative analgesia following general anesthesia in abdominal surgeries. In this way, early ambulation is provided and maternal comfort is increased (7,8).

Spinal anesthesia generates complete motor and sensory block in a shorter time than epidural anesthesia does (10). This technique allows the application of only local anesthesia or both local anesthesia and opioids into the subarachnoid space (10). Postoperative analgesia created by the spinal anesthesia increases the comfort of the mother (8,10). However, duration of postoperative analgesia is shorter depending on the duration of the effect of the local anesthetic drug. In addition, spinal anesthesia has some side effects such as bradycardia, hypotension and postspinal headache (5,10).

Epidural anesthesia is a likely preferred method for cesarean operations, and it provides longer postoperative analgesia, despite its delayed onset of its effects. In recent years, TAP block has been a very preferable procedure as it provides long-lasting postoperative analgesia and decreases opioid usage (7,11-13). Tan et al. (14) compared two groups: one of them had received general anesthesia followed by TAP block, the other group had received only morphine infusion via PCA after cesarean-section. They found no significant difference between VAS scores between two groups, however morphine consumption was less than 25% for TAP group. Onishi et al. (15) compared patients with cesarean operations who had received combined spinal epidural anesthesia by dividing them in two groups: one of them had received bilateral TAP block followed by morphine infusion via

PCA and the other group had received only intravenous morphine infusion via PCA for postoperative analgesia. Similarly, they found that morphine consumption was less in TAP block group. Buluç et al. <sup>(16)</sup> compared the analgesic efficacy of the TAP block relative to the control group (0.9% NaCl) after caesarean section. They found TAP block performed with 0.25% 60 mL bupivacaine (30 mL on each side) significantly reduced postoperative pain in patients undergoing cesarean section. Jadon et al. <sup>(17)</sup> compared patients with cesarean operations who had received spinal anesthesia by dividing them in two groups. One group of patients had received bilateral TAP block with 0.375% ropivacaine and the other group had undergone bilateral TAP block with 20 mL saline for postoperative analgesia. All the patients received a standard spinal anaesthetic and diclofenac was administered for postoperative pain. Breakthrough pain was treated with tramadol. They found that the time to the first analgesic request was prolonged in the TAP group compared to the control group. Similarly, they found that tramadol consumption was less in the TAP group. But one patient in the TAP group had convulsions following injection of local anesthetic solution.

There are also some studies suggesting that postoperative analgesic consumption increases in case of TAP block <sup>(18,19)</sup>. Loane et al. <sup>(18)</sup> compared two groups undergoing cesarean operation under spinal anesthesia. One group had received 100 µg morphine through intrathecal route and local anesthesia and the other group had received only intrathecal local anesthesia and TAP block. Verbal response numerical scale (VRNS) scores at 2, 6, 10 and 24. hours were significantly higher in the TAP block group. Kanazi et al. <sup>(19)</sup> evaluated efficient postoperative analgesia in their study. First group had received spinal anesthesia followed by 20 mL normal saline. Second group had received TAP block with 15 mL of 0.5%, bupivacaine 4 mL and 100 µg epinephrine. The second group needed analgesics earlier and tramadol usage at 0 and 12. hours was significantly more frequent in this group compared to the first group <sup>(19)</sup>. In contrast, Eslamian et al. <sup>(20)</sup> found that VAS scores and incidence of postoperative cough were significantly lower in bilateral TAP block with 15 ml 0.25% bupivacaine in women who had general anesthesia. They suggested that the time to the first need for post-

operative analgesia was prolonged, and postoperative opioid consumption was lower in the TAP block group.

In our study, intergroup differences in VAS scores were not significant, however, VAS scores at 0, 1 and 6 hours were significantly lower in epidural anesthesia group. Lower VAS scores are consistent with less pain perception and higher requirement for efficient analgesia. In spinal anesthesia group, due to its shorter anesthetic effect, postoperative pain was felt earlier. Especially within the first postoperative 6 hours, epidural anesthesia enables more efficient analgesia compared to spinal anesthesia and TAP block. At postoperative 12. and 24.hours variations in VAS block were significantly lower for patients in the TAP block group. Because TAP block has a long-lasting analgesic effect. Additional analgesic need was not different between the groups. Analgesic effect of TAP block lasted longer than spinal anesthesia, for this reason we recommend use of TAP block rather than spinal anesthesia.

There were some limitations of this study. Firstly though at 24 postoperative hours the need for postoperative analgesia did not show any significant difference between the groups, which suggests that the duration of analgesic effect provided by TAP block may extend well beyond 24 postoperative hours. Secondly, level of sensory block was not evaluated when the patients needed additional analgesics.

In conclusion, epidural anesthesia provides more efficient postoperative analgesia and seems to be the most effective method for decreasing postoperative tramadol consumption. TAP block also provides effective and long-acting postoperative analgesia and reduces the need for tramadol. TAP block can be a good alternative procedure to increase postoperative comfort in patients for whom epidural anesthesia could not be performed.

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**Ethics Committee Approval:** T. C. Celal Bayar University Faculty of Medicine Local Ethics Committee approval was received (25.03.2015/20478486-142)

**Conflict of Interest:** None.

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**Informed Consent:** Written informed consent was obtained.

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