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ORIGINAL RESEARCH

Ultrasound guided erector spinae plane block versus transversus abdominis plane block for postoperative analgesia in patient undergoing cesarean section: A randomized controlled study

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ABSTRACT:

Background: This study compared the analgesic efficacy of the bilateral erector spinae plane (ESP) with that of the bilateral transversus abdominis (TAP) postoperative delivery with selected surgery.

Methods: Sixty mothers scheduled for caesarean section under random surgery were randomly assigned to receive an ESP block or a TAP block. The ESP group received USG guided block with 20 mL 0.2% of ropivacaine at the T9 level corresponding to T10 transverse process e at the end of surgery. The TAP group received an ultrasound-guided TAP block containing 20 mL of 0.2% ropivacaine at the end of delivery. The main effect was the duration of analgesia achieved by each block. Measures of the second outcome were postoperative pain severity, complete diclofenac use, patient satisfaction.

Results: The median duration (interquartile) block was longer in the ESP group than in the TAP group (12 hours [10-14] vs 8 hours [8-10], $p < 0.0001$). In the first 24 hours, the median rate of analog pain observed at rest was lower in the ESP group. Intermediate diclofenac use in the first 24 hours was significantly higher in the TAP group than in the ESP group (125 mg [100-150] vs 100 mg [75-100, $p = 0.003$]).

Conclusion: Compared with the TAP block, ESP block provides effective pain relief, has a long lasting analgesic action, increases duration of first analgesic need, is associated with minimal diclofenac use, and can be used in multimodal analgesia and opioid -sparing medication after surgery.

Keywords: Erector Spinae Plane Block, Transversus Abdominis Plane Block, Cesarean, Analgesia, Diclofenac.

Introduction

Relieving postpartum pain after a caesarean section is challenging because it needs to provide maternal satisfaction while not causing any harm to the baby.[1] Spinal anesthesia is a well-known technique used in surgical surgery because it provides a more efficient and faster sensor and is easier to perform professionally. Other advantages are that there is no risk of intubation failure or craving for stomach contents and there is no need to use antidepressants. However, despite these benefits, spinal anesthesia does not provide relief from postoperative pain.[2] A variety of techniques are used to relieve post-operative pain after undergoing surgery under the spinal cord, including intrathecal and / or systemic opioids, abdominal muscles, and truncal blocks such as the transversus abdominis plane (TAP) block with

parental analgesics and erector spinae (ESP) block. [3,4] The TAP block has gained popularity as an effective analgesia for obstetricians and works by blocking the anterior cruciate ligament of the anterior abdominal wall after distributing a local anesthetic agent in a neurofascial plane between the internal oblique and transversus abdominis muscle. , thus relieving surgical pain.[5] Recent literature has shown that the ESP block acts as a useful component of a multimodal regimen to reduce pain after a variety of operations, including surgical delivery, by blocking both the dorsal and ventral branches of the thoracic and abdominal nerve; therefore, it provides both somatic and visceral analgesia.[4,6]

We thought that the two-way ESP block would provide more pain relief and longer duration than the TAP block after special births and could be used as part of a multimodal opioid-sparing analgesia strategy. The purpose of this study was to compare the analgesic efficacy of a two-year ESP block with that of a two-year TAP block after childbirth selected under spinal anesthesia. The main outcome of the study was the period of analgesia provided by these two types of obstruction.

METHODS:

This is a prospective, randomized, clinical trial approved by institutional ethics review board. Informed written consent was obtained from all study participants. Prospective participants are scheduled for caesarean section under spinal anesthesia. The research design complies with the applicable CONSORT guidelines.

Sixty 18–40-year-old women with the American Society of Anesthesiologists status II who underwent a caesarean section with Pfannenstiel surgery under intrathecal anesthesia were included in the study. The conditions of discharge were as follows: local infection; hepatic, renal, or heart disease; blood disorders; known anaphylaxis for any drug used in the trial; and contraindication to regional anesthesia.

Women were randomly assigned random numbers to either the ESP team or the TAP group using randomly generated computer numbers placed in separate light envelopes that the research investigator opened just before he or she made the block. All blocks are performed by the same anesthesiologist. Active data collectors are blinded to randomization until the test is completed.

As a general hospital practice, pre-anesthetic testing was performed, 4 mg of ondansetron and 40 mg of pantoprazole injected intravenously (IV) as an hour before surgery, and 10 mL / kg of lactate solution as preloading. All study participants received a standard spinal anesthetic that included 10-12 mg of 0.5% of hyperbaric bupivacaine. The mother was then quickly moved to a lower position with a 15 ° left inclination and fitted with a nasal oxygen tube. After confirmation of adequate level of anesthesia, cesarean delivery is performed with continuous hemodynamic monitoring of blood pressure and heart rate. When systolic blood pressure drops to 20% below baseline or below 90 mmHg, 5 mg of ephedrine is injected IV. In addition, if the heart rate drops to 50 bpm or less, 0.5 mg of atropine is injected IV. After delivery, 10 U of oxytocin was injected with IV injection.

At the end of delivery, women assigned to the ESP group receive a bilateral USG guided ESP block. The woman was positioned into a side position to receive the block. After sterilization of the skin at the ninth dorsal spine level that corresponds to 10th thoracic transverse process, the linear ultrasound probe (Philips) is placed 3 cm lateral to the spinous process to visualize the trapezius and erector spinae muscle. A 25-G short bevel needle (Spinocan, B. Braun,

Melsungen AG, Germany) was inserted into the cranial-caudal area using the airway system until it came in contact with the opposite process. The needle tip was confirmed to be properly placed with a 1 mL injection of saline and a linear fluid detection spread between the erector spinae muscle and the flexible process. After a wish to exclude intravenous piercing, 20 mL of 0.2% ropivacaine was injected. The same intervention is performed on the other side of the back.

The women in the TAP group received a bilateral TAP block in the that region. According to the procedure used in our center, the linear probe (Phillips) was inserted intersected on the anterolateral abdominal wall in the midaxillary line between the costal margin and the iliac crest to identify three muscle layers, namely, the outer oblique, the internal oblique, and transversus abdominis. The 22-G short-bevel needle was introduced using an in-flight method to access the TAP between the internal oblique muscles and the transversus abdominis. After a wish to exclude intravenous piercing, 20 mL of 0.2% ropivacaine was injected. The procedure is repeated on the contralateral side. All women were instructed to report any symptoms of local anesthetic poisoning, such as perioral or tongue numbness, visual or auditory disturbances, dizziness, or tinnitus.

Spinal level was assessed and recorded before any type of block was treated. At the end of the delivery, the women were referred to a post-operative neurologist for regular follow-up and then to the maternity ward where they had modified Aldrete ≥9 results. At the maternity ward, they received an IV dose of paracetamol 1 g at 8 hours and IV ketorolac 30 mg at 12 hours for postoperative analgesia, according to the obstetrician's protocol. Women also received postoperative analgesia with intravenous diclofenac using patient-controlled analgesia (PCA) (concentration 4mg / mL) at a dose of 20 mg, 10 minutes of fasting time, and an hour limit. 1 of 50 mg, excluding back dose.

Postoperative pain was assessed on an analog scale (VAS) pain scale (range, 0–10; 0, no pain; 10, acute pain) at rest and after movement. Medium blood pressure and heart rate were measured on arrival at the postoperative anesthesia (0 time) and at 2, 4, 6, 12, and 24, 36, 48 hours after surgery. The duration of the block (defined as the interval between blocking time and the initial application period for analgesia) and the complete use of diclofenac were recorded 24 hours after surgery and taken from an electronic memory on a patient-controlled analgesia device. Patient satisfaction was assessed on a four-point scale (1, very good; 2, good; 3, good; 4, poor). Any side effects or problems are recorded.

The primary study result was the period of analgesia achieved for each type of block. The second outcome was postoperative pain severity assessed by VAS pain scores at rest and after movement at 2, 4, 6, 12, 24, 36 and 48 hours, complete diclofenac use, patient satisfaction, and any side effects or complications.

Statistical Analysis

Based on previous studies the duration of both blocks, [14,15] the smallest sample size in each group was 27 patients for a power level of 0.80, an alpha level of 0.05 (two tails) and an effect size of 0.78 lengths. of time (mean ± SD in the TAP block group and the ESP group are 8 ± 4 and 12 ± 6, respectively). The calculated sample size was increased by 10% to 30 per group to allow for quitters. Data collected were sorted, indexed, and mathematically analyzed using SPSS software statistical computer package version 18 (IBM Corp., USA). Numerical variables, such as age and weight, were generally distributed and summarized as a

standard deviation ±. Independent t-tests were used to compare the values between the two groups. Some variables have not been generally distributed and are expressed as interquartile range (IQR); The Mann – Whitney Test was used as a test of value. Mixed line models were used to calculate repeated steps for VAS scores. A fixed effect model was used in the group and a random effect model was used to adjust the repeated measurements over time. Event time variables were assessed using the Kaplan-Meier method, and Log-level assessments were used to compare groups. Quality data was presented as a number and percentage, and double chi tests were used to determine value. A two-dimensional p value of <0.05 was considered statistically significant.

Results

VARIABLE	**ESP (n=30)**	**TAP (n=30)**	**P value**
Age	28.4±5.5	29.8±6.5	0.3
Body Weight	76.2±9.1	74.9±10.5	0.4
SURGICAL DURATION (MIN.)	55.6±10.4	59.2±8.78	0.23
PARITY	NO (%)	NO (%)	
PRIMIPARA	6 (20%)	3 (10%)	0.6
MULTIPARA	24 (80%)	27 (90%)	

Data for 30 women in each group were analyzed. There was no significant between-group difference in age, body weight, spinal level, or parity (Table 1).

Table 1 Demographic and other characteristics of parturients

There was a significant difference in median (IQR) duration of analgesia between the ESP group and the TAP group (12 hours [10, 14] vs 8 hours [8, 8]; p<0.0001) as shown in Table 2.

	ESP (N=30)	**TAP (N=30)**	**P VALUE**
Duration of block (hours)	11 (10-13)	7 (6-9)	<0.001
Total analgesic consumption (mg)	80 (70-100)	110 (90-150)	<0.005

Table 2 Comparison of the Duration of the Block of the Two Groups

Table 3 shows that the VAS pain score was significantly lower in the ESP group than in the TAP group at 8 and 12 hours (p<0.0001). However, there was no statistically significant between-groups difference in the VAS score at other times (p>0.05).

		ESP (n=30)	TAP (n=30)	P value
VAS at 2 HRS	At rest	2 (2-3)	2 (2-3)	0.42
	At movement	3 (2-3)	3 (3-4)	0.34
VAS at 4 HRS	At rest	3 (3-4)	3 (3-4)	0.9
	At movement	4 (3-4)	4 (4-5)	0.87
VAS at 6 hrs	At rest	3 (2-3)	4 (4-5)	0.1
	At movement	4 (4-5)	4 (4-5)	0.78
VAS at 12 hrs	At rest	4 (4-5)	6 (5-6)	0.001
	At movement	5 (5-6)	7 (5-6)	0.005
VAS at 24 hrs	At rest	5 (5-6)	7 (6-7)	0.003
	At movement	6 (5-6)	8 (7-8)	0.002
VAS at 36 HRS	At rest	6 (5-7)	7 (7-8)	0.5
	At movement	7 (6-7)	8 (7-9)	0.5
VAS at 48 HRS	At rest	6 (6-7)	7 (7-9)	0.1
	At movement	7 (6-7)	8 (7-9)	0.1

Table 3 Comparison of the VAS Score at Rest and with movement Between the Groups

After adjustment of the VAS pain scores at rest for repeated measures, these scores were lower on average in the ESP group than in the TAP group (estimate −0.32, 95% CI −0.12 to −0.52, t= −3.234, p=0.002) during the first 24 postoperative hours and lower in the ESP group (estimate −0.48, 95% CI −0.17 to −0.78, t= −3.148, p=0.003) in the first 12 postoperative hours.

The VAS pain scores after movement were on average lower in the ESP group than in the TAP group (estimate=−0.49, 95% CI −0.09 to −0.88, t= −2.421, p=0.016) during the first 24 postoperative hours and lower on average in the ESP group (estimate −0.61, 95% CI −0.36 to −0.86, t= −5.014, p<0.0001) during the first postoperative 12 hours (Figure 1). The median (IQR) total diclofenac consumption in the first 24 hours was significantly higher in the TAP group than in the ESP group (125 mg [100, 150] vs 100 mg [75, 100], p=0.003; Table 2).

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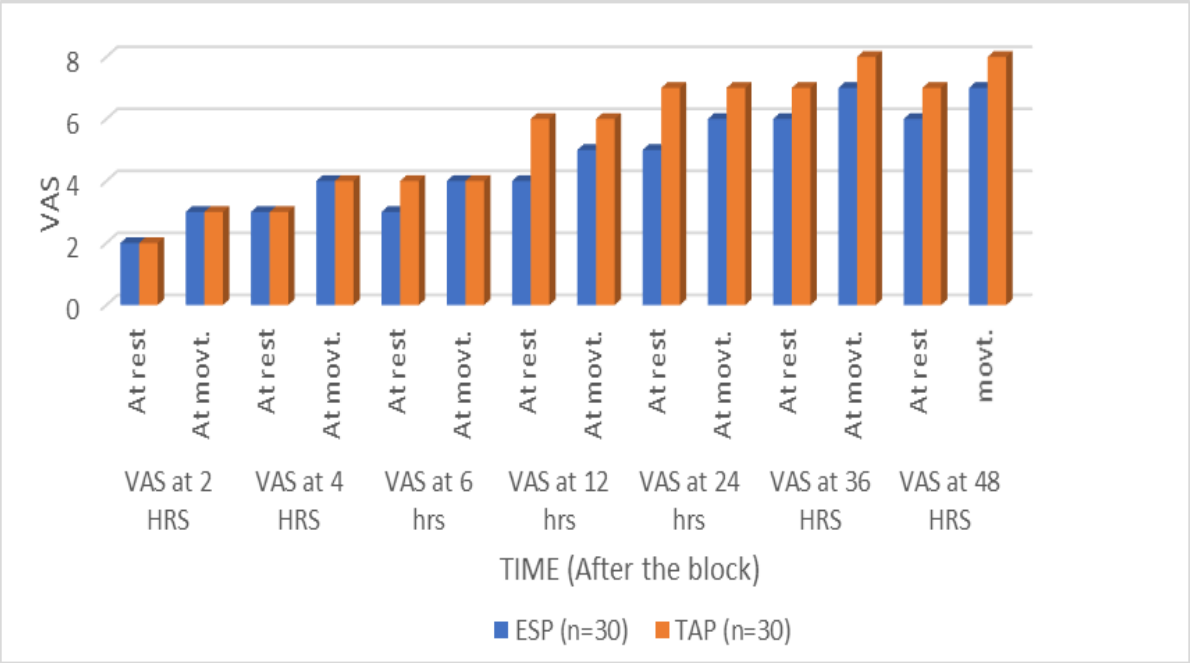

Figure 1. VAS score at rest and with movement.

PATIENT SATISFACTION	ESP (N=30)	TAP (N=30)	P VALUE
POOR	4 (14%)	7 (23%)	0.04
GOOD	11 (36%)	18 (60%)	
EXCELLENT	15 (50%)	5 (17%)	

Table 4. Patient Satisfaction comparison

There was no significant difference in maternal satisfaction between the groups (Table 4, Figure 2).

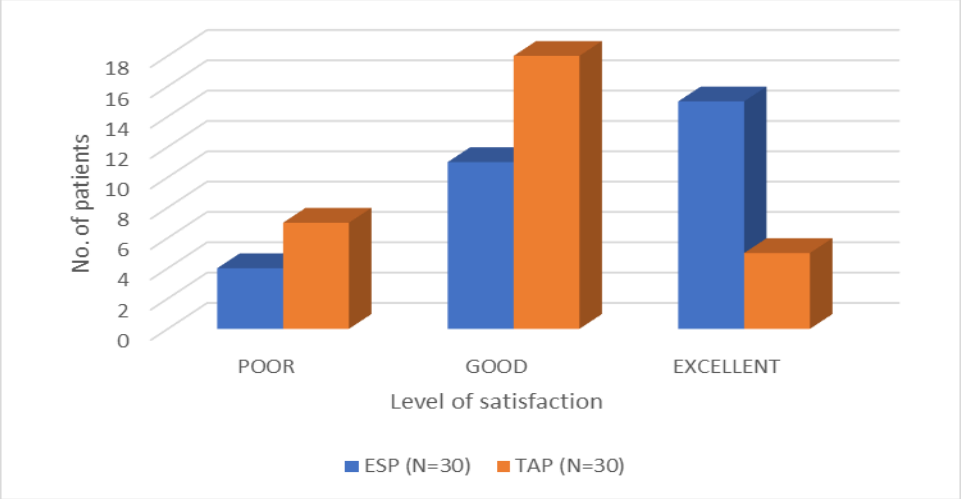

Figure 2. Maternal analgesic satisfaction comparison

No adverse effects or complications were observed in either group.

Discussion

In this study, we found that the duration of analgesia and the initial time to request analgesia were longer in women who gave birth by caesarean section when they received ESP block than when they received TAP block. VAS pain scores both at rest and after movement were lower in our ESP group than in our TAP group within the first 8 and 12 working hours and were higher in the TAP group within the first 24 hours after exercise. Total diclofenac use during the first 24 hours was low in the ESP group.

ESP block brings about widespread, potent analgesia. This effect is achieved by injecting a local anesthetic into the plane between the erector spinae muscle and the flexible process; the anesthetic then spreads to the paravertebral region through the spaces between adjacent vertebrae and blocks both spinal cord and ventral spinal nerves.[7,8,9] In contrast, the TAP block is achieved by injecting a local anesthetic between the internal inclined muscles and the transversus abdominis. Spinal cords that provide thoracolumbar sensation pass through this plane and are flawless anterolateral abdominal wall; Therefore, the TAP block can only close somatic pain.[10]

Over the past two decades, multimodal opioid-sparing analgesia has become an effective alternative to traditional opioid-based analgesia.[11] Peripheral nerve blockers and truncal blocks are some of the most effective components of multimodal protocols.[12] ESP block used successfully in a variety of forms. types of surgery and offers flexible duration of postoperative analgesia. Yamak et al [13] reported long-term analgesia in a patient undergoing surgical resection after a two-state ESP blockade using a single injection and reported average score of 1-3 in the first 24 hours.

Tulgar et al [14] reported that the analgesic effect of ESP block lasted 17, 16, and 13 hours in three patients performing various types of abdominal surgery. In addition, Hamed et al [15] found that the analgesic effect of ESP block lasted 12 hours in women undergoing hysterectomy of the abdomen.

TAP block was reported as an effective component of multimodal analgesia protocol for the management of post-cesarean pain and providing better analgesia, reducing opioid use, and reducing the incidence of opioid-induced side effects compared to sham block.[16] Other studies compare the analgesic efficacy of TAP block with neuroaxial morphine and reported better analgesia with intrathecal morphine but with lower side effects.[17,18]

Meta-analysis of Mishriky et al [19] and Champaneria et al [20] concluded that the TAP block could be considered when intrathecal morphine was blocked or had side effects. The TAP block can provide effective analgesia for the first 12 hours after reversal surgery. The meta-analysis of Abdallah et al [10] found that the duration of analgesia achieved by the posterior TAP block after lower abdominal transverse surgery was longer than that achieved by the combined TAP block. They think that the posterior TAP block has a better effect due to the re-distribution of local anesthetic in the paravertebral region. In this study, there was no significant difference in patient satisfaction between the TAP and ESP groups, presumably

because pain management, despite being an important component, is not the only variable effect on women 's satisfaction given childbirth.

The Bilateral ESP block does not have directly recorded adverse reactions. However, pneumothorax was the first reported case of ESP block [21] and motor impairment in the lower extremities was reported after a two-year ESP blockade on a woman undergoing surgery. [22] TAP block is considered a low risk of complications. However, several complications have been reported for the second time in the TAP block, which includes intrahepatic injection into a patient with hepatomegaly, [23] intraperitoneal misplacement of the TAP catheter without abdominal injury, and anaphylactic reaction after injecting ropivacaine.[24] Short-term femoral nerve palsy. it is a potential complication due to the proximity of TAP to the femoral nerve.[25,26] In our study, no adverse effects were noted for any type of block but the problems mentioned above should be kept in mind when performing a TAP block.

This study had some limitations, ranging mainly from the difficulty of recording the success rate and distribution of any type of block due to blockade from spinal anesthesia, reaching the first stage of surgery. In addition, limited data were available on the effectiveness of ESP block for postoperative analgesia, which limited our ability to compare current data with those in other reports.

Given that the TAP block posteriorly undoubtedly has a better analgesic effect than the one-sided approach, we recommend that future studies compare the analgesic efficacy of the ESP block with that of the posterior TAP block after childbirth and that these tests are performed o; LP\ patients below. of general anesthesia to better assess both distribution rate and effectiveness.

Conclusions

ESP block has long-term analgesia, slows down the initial need for analgesia, and reduces diclofenac use compared to TAP block and can be used in multimodal analgesia and opioid-sparing regimens after the surgical phase.

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