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# COMPARISON BETWEEN USG GUIDED TRANSVER ABDOMIS PLANE BLOCK (TAP) AND ERECTOR SPINAE PLANE BLOCK (ESP) WITH BUPIVACAINE 0.25% 15 ML BILATERALLY AS POST OPERATIVE ANALGESIA OF ADULT PATIENTS UNDERGOING ABDOMINAL SURGERIES.

Anaesthesiology

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## ABSTRACT

**Introduction:** ultrasound guided erector spinae plane block (ESP) has emerged as an effective and safe analgesic regional technique which also provides visceral pain relief. Our aim in this study was to compare analgesic efficacy of ESP block over Transverse abdominis plane block (TAP) block under USG guidance for abdominal surgeries. **Methods:** This was a prospective, randomized, comparative study. Following exclusion, 60 patients were randomly distributed in two groups, 30 in each group. group T (TAP) block and Group E(ESP) block of ASA grade 1 and 2. The drug used was bupivacaine 0.25% 15 ml on each side. Tramadol 100mg iv was given as rescue analgesia whenever VAS> 5 or on demand in post operative period. The primary outcome was to estimate pain score by VAS in first 24 hours in both the groups and time of first rescue analgesia required. The secondary outcome was to compare the analgesic efficacy between TAP and ESP blocks. **Results:** There were no demographic differences between the two groups. Compared to TAPB group ESPB had lower VAS pain score and less Tramadol consumtion. The difference was statistically significant at 1-, 2- and 24 – hours, with the score being lower in the ESP block than in the TAP block ($p = 0.01$, 0.02, and 0.003).Mean rescue analgesia time for ESP block patients was 5.1 hours compared to 4.6 hours in TAP block patients. TAP block 79.7% and ESP block 72.3% patients required post operative analgesia. Differences across research groups were statistically significant ($p<0.04$). TAP block had higher pain score in comparison with ESP block. **Conclusion:** we conclude that ultrasound guided ESP block provide better postoperative pain control and prolonged duration of analgesia with less Tramadol consumption compared to ultrasound guided TAP block in patients after abdominal surgeries

## KEYWORDS

## INTRODUCTION:

As a part of multimodal analgesic regimen for pain treatment after a variety of abdominal procedures, abdominal wall blocks offer an alternative to gold standard, epidural analgesia.

Surgery is frequently necessary to treat pathology that effects the abdomens essential organ systems. Following abdominal surgery, pain is severe and has both somatic and visceral components, it is more so after a laparotomy. Inadequate analgesia during the recovery phase impairs breathing, set off a sympathetic reaction and postpones immobilization and motility of the stomach. [1]. Depending on the length of the incision, continuous mid to low thoracic epidural analgesia is the recognized gold standard for pain management. When an epidural is contraindicated, technically challenging to administer or unsuccessful systemic opioids become the go to medicine.

The postoperative analgesic efficacy of TAP block has already b been used as a component of multimodal analgesic approach in cesarean section. It provides adequate somatic analgesia with little or no visceral blockade.

ESP block is a Para spinal regional anesthesia technique that allows local anesthetic dispersion into interfacial plane between the transverse process and the erector spinae plane muscles, attaining a paravertebral spread of third and fourth vertebral levels cranially and caudally, respectively covered ventral as well as dorsal rami inhibiting both visceral and somatic pain.

Considering paucity of literature regarding post-operative analgesia of the se technique we have compared Erector spinae plane block and Transverse abdominis plane block using bupivacaine 0.25% bilaterally as post-operative analgesia in abdominal surgeries.

## MATERIALS AND METHODS:

### Study Design:

This was a hospital based observational, prospective, randomized and comparative study conducted in the Department of Anesthesiology Jaipur National University, Institute for Medical sciences and research Centre, Jaipur, Rajasthan.

### Study Duration:

This study was conducted from September 2022 to February 2024. The study was examined and approved by The Ethics Committee.

### Sample Size:

Based on the previous study Kamael A A et al 2020, a sample size of 60 patients was taken and divided into two groups; Group T (TAP) block and Group E (ESP) block each comprising of 30 patients

Group T received 0.25% Bupivacaine 15ml bilaterally

Group E received 0.25% Bupivacaine 15 ml bilaterally

A sample size calculation done by MEDCALC 16.4 version software showed that 30 patients were required in each group based on this formula.

$n = t^2 * P * (1-P)/e^2$

t 95% confidence interval (t= 1.96)

P prevalence
e allowable error = 5% (e= 0.05)

Informed and written consent from all subjects was taken before initiation of study procedures. The study protocols adhered to the ethics guidelines of the 2013 Declaration of Helsinki.

### Inclusion Criteria:

all the participants scheduled for elective abdominal surgeries, healthy males and females of age group 18-65 years of age, consenting to procedure, ASA grade I and II.

### Exclusion Criteria:

Unwilling for the procedure, ASA grade III and above, patients allergic to Bupivacaine, age <18 years and > 65 years of age, emergency procedures.

For randomization, permutated block randomization method was used. The generation of the randomization scheme was done using the website (http://www.randomization.com). All the patients and investigators were blinded to the allocated interventions. Subsequently, numbered, sealed and opaque envelopes were arranged and supplied to the anesthesiologist who performed block procedure and another anesthesiologist was assigned to observe post intervention parameters and blinded to the study.

Patient's detailed preoperative checkup was done.

All patients received 40mg Pantoprazole per oral 2 hours before surgery and a Visual analogue scale (VAS) grades from (0= no pain, 10= worst pain) was explained.

In the operating room 18G intravenous cannula was secured in the non-dominant hand/arm. Standard monitoring (ECG, Noninvasive blood pressure, pulse oximetry, heart rate, and respiratory rate) was instituted. Patients were premeditated with Glycopyrollate 0.1mg/kg, Emset 0.15mg/kg, and fentanyl 1mcg/kg. patients was preoxygenated with 100% oxygen for 3 to 5 minutes then induced with Propofol 2mg/kg then the endotracheal tube placement was facilitated with 0.5mg/kg atracurium. Anesthesia was maintained with 1.2% Isoflurane in 100% oxygen, atracurium 0.1mg/kg and Fentanyl 0.5mcg/kg.

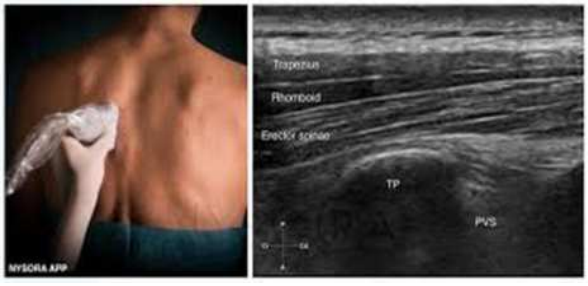
After ending the surgical procedure and before reversing the muscle relaxant, patient in Group T received bilateral USG guided TAP block with Bupivacaine 0.25% 15 ml and Group E received bilateral USG guided ESP block with Bupivacaine 0.25% 15 ml bilaterally at T( level.

TAP and ESP block was accomplished under ultrasonography guidance using a linear array ( 6-13 MHz) transducer (FUJIFILM Sonosite, INC. Bothell, Washington)

**ERECTOR SPINAE PLANE BLOCK:**

For block performance patients were turned laterally to one side and T9 spinous process was marked, the transducer probe was shifted from the midline, 3cm laterally to visualize the T9 transverse process and erector spinae muscle.

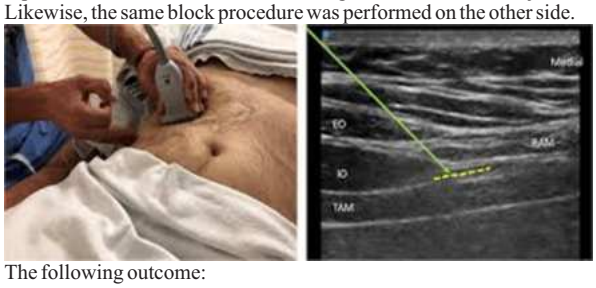
A 22G spinal needle was inserted in the plane cranial to caudal till the tip of plane between erector spinae muscle and transverse process. The position of needle tip was checked by hydro dissection with 2ml normal saline; hence a total of 0.25% Bupivacaine 15ml was injected. The speed of injectable was observed ultrasonographically. Likewise, the same block procedure was performed on the other side.




**TRANSVERSE ABDOMINIS PLANE BLOCK:**

After placing patients in the supine position, the skin was disinfected. A linear ultrasound probe to be placed on the lateral part of anterior abdominal wall. In this region there are three muscle layers ( external oblique, internal oblique, transversus abdominis).

A 22 G spinal needle was placed in the space between Internal oblique and transverse abdominis muscle of the abdomen using in plane technique; 2ml of normal saline was injected to separate IO and TA and to confirm position of the needle. After negative aspiration, 0.25% bupivacaine 15ml was injected; USG showed that the local anesthetic separated IO and TA muscle confirming the success of the injection. Likewise, the same block procedure was performed on the other side.




The following outcome:

**Primary Outcome:**

Time for rescue analgesia administration. It was noted, considering the time of completion of respective block procedure on each side as the reference point (time 0).

Recue analgesia or 1st postoperative analgesia (Tramadol 100mg Iv with Emset 4mg Iv) was considered when VAS >/4 was observed

**Secondary Outcome:**

- Total dose of analgesia required in first 24 hours after surgery.
- Severity of post-operative pain assessed by VAS score
- Any side effects after the block procedure ( nausea, vomiting, pruritis)

The VAS score was assessed at various predetermined time intervals of 1 hour, 2 hour, 6 hours, 12 hours and 24 hours. At 24 hours, patients were assessed for any side effects like nausea, vomiting, pruritis.

VAS used for pain assessment was a continuous scale comprising of horizontal line anchored by “no pain” (score 0) and 'worst pain” (score 10).

**Statistical Analysis:**

The data was entered using MS Excel and analyzed statistically using SPSS- 25. Quantitative variables were expressed as mean value +- standard deviation or median+- interquartile range and were compared by student's t test. Qualitative data was expressed as percentages (%) or proportions and were compared using chi square test among groups.

Appropriate statistical test was used to interpret association between the two variables and a p value of <0.05 was considered statistically significant.

**RESULTS:**

Our study group comprised of 60 patients. With 30 patients randomly allocated in each group. There was no deviation from the said protocol. The patient's demographics were similar with no significant differences among both groups.

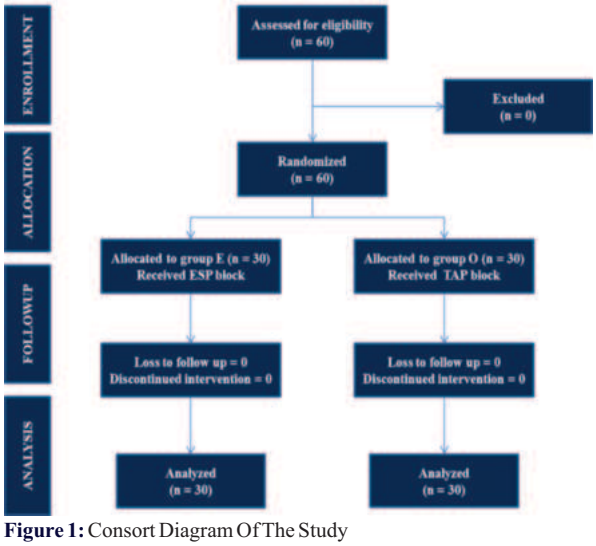



**Figure 1:** Consort Diagram Of The Study

**Table 1: Demographic And Other Data**

| DATA | Group ESP | | Group TAP | |
|---|---|---|---|---|
| | Mean | SD | Mean | SD |
| Age | 38.77 | 6.44 | 41.47 | 5.01 |
| Weight (in kg) | 59.8 | 7.75 | 58.3 | 7.46 |
| Height (in cm) | 161.47 | 4.18 | 163.2 | 4.47 |
| ASA grade | 1.63 | 0.48 | 1.53 | 0.49 |

**Table 2: Comparison Of Post-operative Systolic Blood Pressure (SBP) Among Two Groups**

| SBP at different time intervals | Group | | t statistic, p-value* |
|---|---|---|---|
| | TAP Block | ESP Block | |
| 1 hour | 108.73 ± 6.53 | 112.80 ± 8.03 | - 2.15, 0.03 |
| 2 hours | 112.60 ± 6.97 | 113.23 ± 7.33 | - 0.34, 0.76 |
| 6 hours | 111.13 ± 7.93 | 112.73 ± 8.70 | - 0.74, 0.46 |
| 12 hours | 111.23 ± 7.60 | 113.20 ± 8.16 | - 0.96, 0.34 |
| 24 hours | 110.50 ± 9.29 | 110.97 ± 8.53 | - 0.20, 0.84 |

** p value < 0.05 statistically significant; Independent samples t-test applied*

**Table 3: Mean Duration Of Rescue Analgesia And Tramadol Consumption In Group E**

| Interval | Rescue analgesia in Group E | Injection Tramadol (mg) |
|---|---|---|
| 1 hour | 0 | 0 |
| 2 hours | 0 | 0 |
| 6 hours | 5 | 500 |
| 12 hours | 8 | 800 |
| 24 hours | 15 | 1500 |

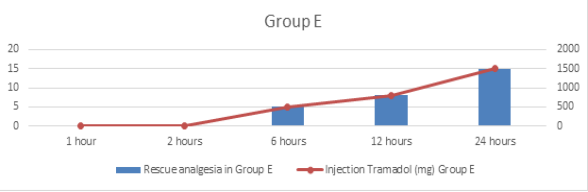



**Table 4: Mean Duration Of Rescue Analgesia And Tramadol Consumption In Group T.**

| Interval | Rescue analgesia in Group T | Injection Tramadol (mg) |
|---|---|---|
| 1 hour | 0 | 0 |
| 2 hours | 1 | 100 |
| 6 hours | 15 | 1500 |
| 12 hours | 5 | 500 |
| 24 hours | 7 | 700 |

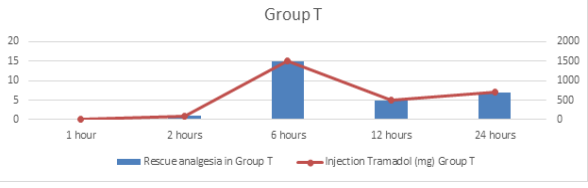
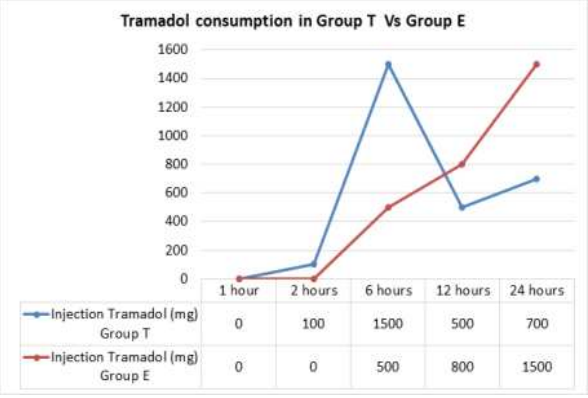



**Table 5: Comparison Of Tramadol Consumption In Both The Groups.**




## DISCUSSION:

Although ultrasound TAP block is an easy technique, decreases postoperative pain, and opioid consumption, it lacks visceral pain relief and limits the spread of local anesthetics. The ultrasound-guided ESP block is considered an alternative method that provides effective postoperative analgesia for breast and thoracic surgery when performed at the T4-5 and T7 level for abdominal surgery. ESP block improves the somatic and visceral pain by affecting the ventral ramus and rami communicates that contain sympathetic nerve fibers when local anesthetic spreads through the paravertebral space (10, 11).

Our results have shown that ultrasound-guided bilateral ESP block performed at the end of abdominal surgery showed lowered VAS scores at postoperative measured times and was statistically significant at 1, 2, 6, 12, 24 hours when compared with TAP block. Rosato C et a, 2023 [53]: the TAP group had higher NRS scores for pain in the immediate post-operative period (0.08). The need for intraoperative remifentanyl was higher in the TAP group/ (p=0.08).

ESP block is a periparavertebral block that influences the somatic and visceral pain fibers.

A study by Kamel et al. found lower morphine consumption in patients receiving ESP compared to TAP blocks after total abdominal hysterectomy, but there was no difference in postoperative nausea and vomiting. A study conducted by Warner et al. in patients undergoing laparoscopic.

Hysterectomies showed no significant difference in pain scores, opioid consumption, or patient satisfaction between ESP and TAP blocks.

The study conducted by Malawat et al. also showed prolonged time to first analgesic request, lower total diclofenac consumption and lower VAS pain scores in ESP compared to TAP blocks. [22] In their study, a posterior TAP block was supplemented with rescue diclofenac boluses at a VAS score ≥ 40 mm, in contrast to our study, where patients could self-administer morphine for any severity of pain. Additionally, they did not assess differences in patient satisfaction.

Hamed et al (9) concluded that bilateral ESP block markedly decreased 24 hours postoperative fentanyl consumption compared with control group after total abdominal hysterectomy.

In my study the mean rescue analgesia time for ESP block patients was 5.1 hours compared to 4.6 hours in TAP block patients. TAP block 79.7% and ESP block 72.3% patients required post-operative analgesia. Differences across research groups were statistically significant (p<0.04). TAP block had higher pain score in comparison with ESP block.

As seen in other studies like: Rosato C et a, 2023 [53]: the TAP group had higher NRS scores for pain in the immediate post-operative period (0.08). the need for intraoperative remifentanyl was higher in the TAP group/ (p=0.08), also seen in study of Engineer SR et al, 2022 [50]: In this study the comparison is to the oblique subcostal TAP block with ESP block which had lower numerical rating scores up to 12 hours, a longer time period for the need for the first rescue analgesic, and lower overall analgesic intake postoperatively.

A higher proportion of patients (72.3.7% and 79.7%) in the TAP and ESP block group required 1 – 2 times analgesia. And more than 3 times analgesia was required less in ESP block compared to TAP block. The difference between the two study groups was significant (p <0.04).

This is seen similarly in other studies as well.

**HUSSAIN A A et al. 2022** [48]:Within the first twenty-four hours, the ESPB group consumed less fentanyl than the TAPB group, and both research groups consumed less than the control group.

## CONCLUSION:

Bilateral ultrasound-guided ESP block provides more potent and longer postoperative analgesia with less morphine consumption than TAP block after abdominal surgeries.

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Nil.

**Conflicts Of Interest**
There are no conflicts of interest.

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