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Transverse Abdominis Plane BlockVersus Erector Spinae Plane Block for Post operative analgesia in Patients Undergoing Laparoscopic Abdominal Surgeries

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Abstract:
Background*: Postoperative analgesic efficacy of transversus abdominis plane (TAP) block was a component of multimodal analgesic approach among patients scheduled for elective laparoscopic surgeries. Erector spinae plane (ESP) block is a para-spinal regional method that allows the dispersion of local anaesthesia into the interfascial plane between transverse process and erector spinae muscles, attaining a paravertebral spread of 3 and 4 levels cranially and caudally.*
Aim:*This study was done to compare the efficacy of transverse abdominisplane (TAP) block witherector spinae plane (ESP) block for post-operative analgesia in patients undergoing laparoscopic abdominal surgeries.*
Materials and Methods: *This study was done at a tertiary care teaching institute in the Department of anaesthesia at NRI Institute of medical sciences, Mangalagiri, Andhra Pradesh, India, from June 2022 to November 2022. 60 patients were included as per the eligibility criteria. They were randomized into two groups T and E, each group containing 30 patients. Age, gender, ASA grade,pain scores, and hemodynamic parameters were assessed and compared between the two groups.*
Results:*There is no significant difference in the mean age and ASA grade of patients of both groups. Most of the patients were males. There is significantly less pain as per the Visual analogue scale(VAS) during rest, during 6 12, 18 and 24 hours of movement in between the groups.There is no significant difference in the hemodynamic parameters. Rescue analgesia requirement was significantly less in E-group patients.*
Conclusion:*From our study results, it is concluded that the ESP block is significantly more effective compared to TAP block for providing postoperative analgesia among patients scheduled for various laparoscopic elective abdominal surgeries.*
Key Words: *Abdominal surgeries, Erectorspinae plane block, Transverse abdominis plane block, Post-operativeanalgesia, Laparoscopy, Randomizedstudy*

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I. Introduction

Ideal analgesic method that is safe, reliable,and effective is mandatory after various laparoscopic surgeries, as most of the patients had moderate-to-severe pain affecting their quality of life.[1]Conventional methods used for providing analgesia during the postoperative period include infiltration with local anaesthetics, analgesics given through insertion of epidural catheter, intravenous administration of non-steroidal anti-inflammatory drugs, paravertebral blocks.

Postoperative analgesic efficacy of transversus abdominis plane (TAP) block wasa component of multimodal analgesic approach among patients scheduled for elective laparoscopic surgeries.[2] It provides adequate analgesia with no visceral blockade.[3]TAP blocks only somatic pain fibresand deeper fibres of anterior and lateral cutaneous branches of 9th to 11th thoracic intercostal nerves

Erector spinae plane (ESP) block is a para-spinal regional methodthat allows the dispersion of local anaesthesia into the interfascial plane between transverse process and erector spinae muscles, attaining a paravertebral spread of 3 and 4 levels cranially and caudally.[4] It covers ventral and dorsal rami and inhibits both visceral and somatic pain.[5-7]It is a relatively new technique for analgesia.

Hypothesis: Thereis no significant difference in the efficacy of ESP block vs TAP block.

Objectives:

- To compare the total dose of analgesic required
- To know the severity of postoperative pain using visual analogue scale score during rest and movement.

II. Material And Methods

This comparative study was carried out at a tertiary care centre in India from June 2022 to November 2022.
Study Design: InterventionalRandomized single-blinded study
Study Location: This study was done at a tertiary care teaching institute in the Department of anaesthesia at NRI Institute of Medical Sciences, Mangalagiri, Andhra Pradesh, India.
Study Duration: June 2022 to November 2022
Sample size: 60 Patients
Simple random sampling was the sampling procedure used.

Sample size calculation: The sample size was estimated as per the study done by **Altiparmak et al**.[8] who reported that there is at least 25% difference in pain scores between patients of ESP and TAP block groups at the end of 2 hours during postoperative period.Considering 95% confidence intervals with power of 0.1, the minimum sample size came to be 30 in each group and hence we included 30 patients in each group in our study.

Subjects & selection method:
The study population includes patients who were scheduled for various elective laparoscopicabdominal surgeries at our tertiary care center.

Patients of Group T(n=30)underwent TAP block.
Patients in Group E(n=30)underwent ESP block.

Eligibility criteria:

Inclusion criteria:
1. Patients aged above 18 yearsof either sex, scheduled for elective laparoscopic surgeries.
2. Patients who provided informed consent to participate in the study.

Exclusion criteria:
1. Patients with bleeding abnormalities
2. Patients with obesity (BMI above 30kg/m^2.)
3. Patients with severe cardiac or hepatic or renal disorders interfere data collection.
4. Patients with hypertension
5. Patients with advanced psychiatric illness
6. Patients with incomplete data.

Methodology:
Pre-anaesthetic evaluation was done on day before surgery. Baseline parameters like heart rate, non-invasive blood pressure, and oxygen saturation were measured. Pain was assessed using visual analogue scale score, which is a 11-point scale with score ranging from 0 to 1.
0 implies no pain and 1 implies worst pain as shown in the below image:

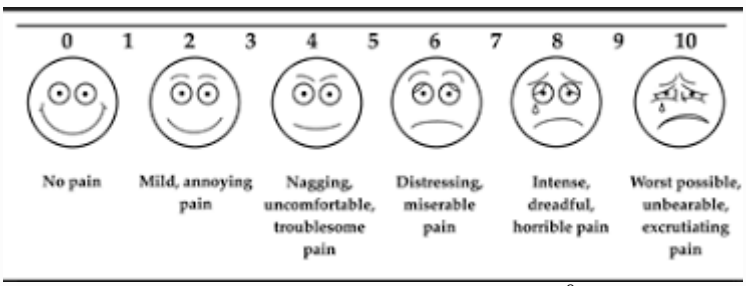


Image 1 shows visual analogue scale[9]

After entering the surgery theatre, IV access was gained, and patients were premedicated using ondansetron, glycopyrrolate and fentanyl. Propofol was used for induction. Anaesthesia was maintained with the help of oxygen, sevoflurane and atracurium. All blocks were done under strict aseptic conditions using linear ultrasound probe. TAP block was done in supine position. Transducer was kept below the costal margin in oblique plane and muscles like transverse abdominis, rectus abdominis, obliquemuscles were identified.21-gauge needle was introduced using an in-plane approach, lateral to the transducer from medial to lateral

direction. 1-2 ml of solution was injected between rectus abdominis muscle and transversus abdominis muscle. After confirming the correct position and placement of the needle, rest of the anaesthetic medication was injected along subcostal line in TAP. ESP block was given in lateral position and transducer was kept in a longitudinal parasagittal orientation which is 3-cm lateral to T9 spinous process. Erector spinae muscle was identified superficial to the tip of T9 transverse process.18-gauge needle was inserted using superior to inferior approach on the anterior aspect of erector spinae. Location of the needle tip was confirmed by fluid.

Parameters assessed:

- Age
- Gender
- ASA grade
- Hemodynamic parameters
- VAS score at rest, during movement
- Total tramadol consumption per patient
- Total diclofenac consumption per patient.

Statistical analysis: Data was analyzed using Epi info software version 7.2.5. Results were expressed as percentages and mean with standard deviation. Students t test was used to compare numerical parameters between two groups and chi square test was used to compare categorical parameters between two groups. P value below 0.05 is considered significant.

Ethical considerations: Informed consent was taken from every patient participated in the study.

III. Results

The current study included 60 patients scheduled for elective laparoscopic abdominal surgeries.

Age:

There is no significant difference in the mean age of patients of two groups.

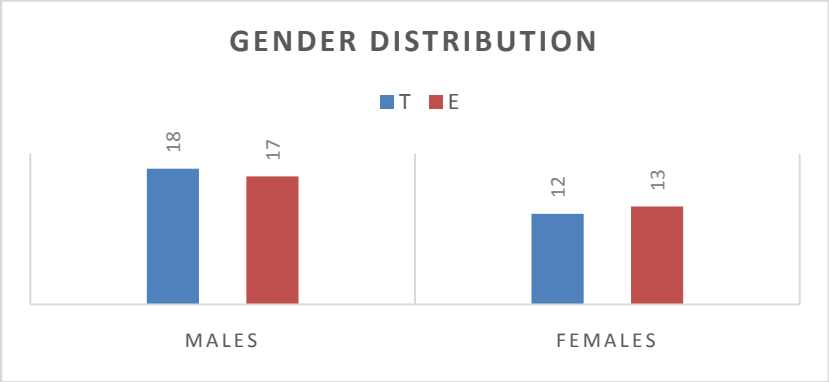
Table 1 shows mean age of patients in both groups

Groups	Mean age	P value
T	45.3±4.1 years	0.53
E	46.2±6.7 years	

Gender:

Males were more compared to females in the current study.

Graph 1 shows gender distribution of patients in each group



ASA Grade:

There is no significant difference in the ASA Grade between two groups.

Table 2 shows ASA grade of patients

Groups	ASA Grade I(no of patients)	ASA Grade II (no of patients)	P value
T	17	13	0.598
E	19	11	

Hemodynamic parameters:

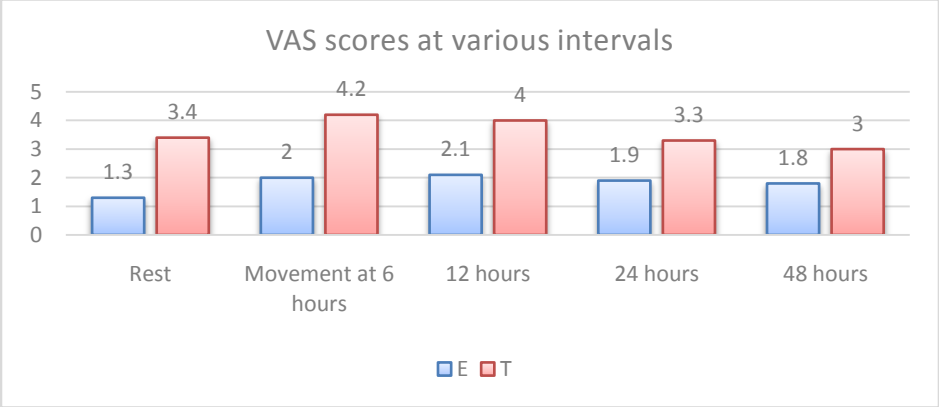
There is no significant difference in the heart rate, systolic blood pressure, diastolic blood pressure, respiratory rate and oxygen saturation between two groups of patients.

Table 3 shows hemodynamic parameter comparison between two groups

Parameters	Group T	Group E	P value
Mean HR	78.2±5.2	79.4±7.1	0.45
Mean Systolic blood pressure	128.8±12.1	126.2±4.5	0.27
Mean diastolic blood pressure	79.8±5.9	80.4±1.8	0.59
Mean respiratory rate	18±2.3	17.4±2.9	0.37
Mean oxygen saturation	99±2.3	98.4±4.1	0.48

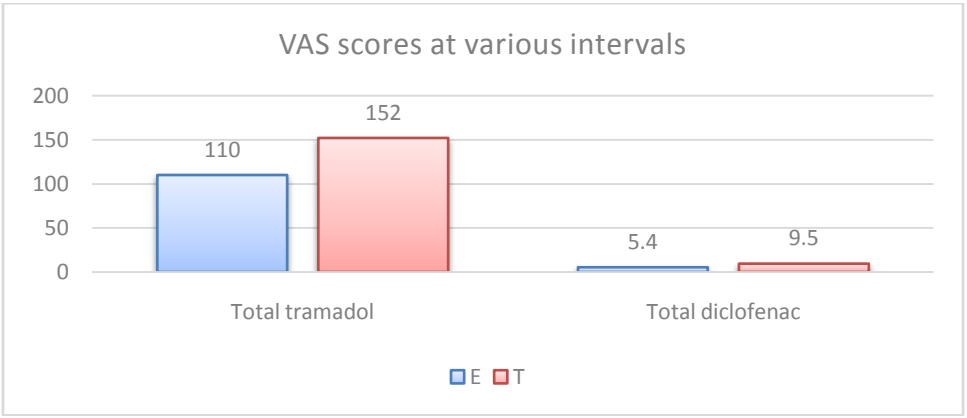
VAS scores:
Mean VAS scores were significantly lower in group E patients compared to group T patients(p=0.001) at various intervals.

Graph 2 shows VAS scores at various intervals



Rescue analgesia requirement:
Mean total tramadol consumption per patient in 24 hours and mean total diclofenac consumption per patient in 24 hours was significantly less in E group patients compared to T group patients(p=0.001).

Graph 3 shows rescue analgesia requirements



IV. Discussion

ESP block provides more duration of craniocaudal spread causing extensive somatic and visceral analgesia with an effect that is comparable with retrolaminar and paravertebral blocks.[10-11]Other studies on ESP block reported multi dermatomal analgesia in neuropathic pain,[12] breast cancer surgeries where overall opioid usage was found to be reduced by 65% at 24 hours after surgery compared to the control group[13]with few descriptions on its efficacy in repairing ventral hernias or bariatric surgery.[14-15]The current study was done on 60 patients scheduled for elective laparoscopic abdominal surgeries.There is no significant difference in the mean age and ASA grade of patients of both groups. This indicates that there is no age-related bias. Most of the patients were males. There is significantly less pain as per Visual analogue scale during rest, during 6 hours of movement, 12, 18 and 24 hours of movement in between the groups. Rescue analgesia requirement was less significantly for ESP block patients. This indicates that ESP block significantly reduces pain compared to TAP

block. There is no significant difference in the hemodynamic parameters. This implies that both procedures are safe hemodynamically.

In the study done by **Malawat**[16] 60 patients scheduled for elective caesarean section wererandomized into ESP or TAP block. Results showed that ESP block provided more duration of analgesia compared to TAP block, similar to our study. The mean time for rescue analgesia was more in ESP block group patients. ESP blockproduced a significant reduction in analgesic requirement compared to TAP block, similar to our study.

In the study of **Kamel F**[17], authors wanted to compare ESP block with TAP block under ultrasound guidance using bupivacaine.Results showed that VAS score as significantly less in ESP group, similar to our study. The time for the requirement of 1st morphine was prolonged in the ESP group patients compared to TA group patients. Amount of morphine consumption in statistically low in ESP group, similar to our study.

V. Conclusion

From our study results, it is concluded that the ESP block is significantly more effective compared to TAP block for providing postoperative analgesia among patients scheduled for various laparoscopic elective abdominal surgeries.Our hypothesis that there won't be any significant difference in the efficacy of two blocks was false.

The study is self-sponsored. There were no conflicts of interest.

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