

A Comparison of Paravertebral Block and the Combination of Erector Spinae Plane Block and Paravertebral Block for Post Operative Analgesia in Thoracic Surgeries

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Abstract: **Background:** Pain is defined as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage. After thoracic surgery, the patient may experience significant pain and discomfort due to muscle incisions, rib retractions, and intercostal nerve damage. Various regional anaesthesia techniques, such as thoracic epidural analgesia (TEA), paravertebral block (PVB) and erector spinae plane block (ESPB) have been extensively utilized to relieve post-operative pain following VATS. **Objective:** The aim of the study is to compare the efficacy of paravertebral block and combination of paravertebral and erector spinae block for post operative analgesia in thoracic surgery. **Methods:** After obtaining institutional ethical committee clearance and clearance from head of the department, the study was started. 60 patients from either gender who satisfy the inclusive criteria are selected and they were randomly allotted into two groups- Group I patients received Thoracic paravertebral block (TPVB) and Group 2 received combination of Thoracic paravertebral block with erector spinae plane block. **Results:** The results showed that the VAS score and the mean dose of rescue analgesia used were comparatively higher in Group I (TPVB) at 6, 12 and 24 hours post operatively compared to group II (combination of TPVB and ESPB) and Group I required rescue analgesia earlier compared to group. Ultimately TPVB combined with ESPB emerges as the more favorable approach, offering improved pain relief and reduced need for analgesics when compared to TPVB for thoracic surgeries.

Keywords: Erector spinae plane block, thoracic paravertebral block, post operative analgesia, thoracic surgeries.

1. Introduction

Pain is defined as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage”.

The presence of acute pain following thoracic surgery can significantly impact an individual's quality of life and potentially lead to the development of chronic pain after the surgery. [1,2] These factors can lead to pulmonary complications, including atelectasis, pneumonia, and increased oxygen consumption.[3]

For pain control in VATS, a number of regional anaesthetic methods have been widely used to treat post-operative pain, including Erector Spinae plane block (ESPB), paravertebral block (PVB) and thoracic epidural analgesia (TEA).[3,4]

Aim and Objectives:

The aim of the study is to compare the efficacy of paravertebral block and combination of paravertebral and erector spinae block for post operative analgesia in thoracic surgery.

Primary Objectives:

- Duration of Postoperative analgesia.

Secondary Objectives:

- Need for rescue analgesia.
- Hemodynamic variations
- Complications if any.

2. Material and Methods

The proposed study titled “A Comparison of Paravertebral Block and the Combination of Erector Spinae Plane Block and Paravertebral Block for Post Operative Analgesia in Thoracic Surgeries” was carried out in Swaroop Rani Nehru Hospital associated with Moti Lal Nehru Medical College, Prayagraj after obtaining approval from the Institutional Ethical Committee and obtaining written informed consent from all patients.

Group Allocation: Total number of 60 patients of either sex selected were randomly divided into two groups– Group I, Group II–each group will be allotted with thirty(n=30) participants each.

Groups were divided as follows:

Group I(n=30): Received Thoracic paravertebral nerve block (TPVB). After induction of anesthesia, patient was placed in lateral position with patient lying on the unaffected side and an ultrasound high-frequency linear array probe was used to scan at approximately 2–2.5 cm next to T4–5 spinous process in the median sagittal position. The transverse process, pleura, and thoracic paravertebral space could be clearly visualized under the ultrasound. Once the needle tip was advanced beyond the superior costotransverse ligament, 0.5 to 1 mL of normal saline was injected to confirm the correct needle tip position by the displacement of the pleura and 20 ml of 0.25% bupivacaine was injected into T4–T5 paravertebral spaces using an in plane approach technique.

Group II(n=30): Received combined paravertebral and erector spinae plane block. The linear probe was placed on the patient in a longitudinal position at approximately 3 cm lateral to the midline. The tip of the T5 transverse process, overlying the erector spinae muscle, apex of the TPVS, and pleura were identified. A 22-gauge block needle was inserted using an in-plane technique. After the needle tip was advanced beyond the superior costotransverse ligament, 0.5 to 1 mL of normal saline was injected to confirm the correct needle tip position by the displacement of the pleura, and then 10 mL of 0.25% bupivacaine was injected. Subsequently, the needle was withdrawn and adjusted to come in contact with the tip of the T5 transverse process. Correct needle tip position was confirmed by hydro-dissection by visualizing the linear spread of the fluid that lifted the erector spinae muscle off the transverse process. Then, 10 mL of 0.25% ropivacaine was injected in a cranial-to-caudal direction into the ESP.

Monitoring

Patients were assessed for pain at 6, 12 and 24 hours of post operative period. In addition, blood pressure and heart rate were noted to assess hemodynamic stability. Assessment of the Pain was done using a Visual Analog Scale given by Revill in 1976. 0 indicates no pain while 10 denotes worst pain imaginable. A score noted for Pain. IV Paracetamol 1 gram infusion was given as rescue analgesic when VAS was more than 4/10.

3. Result

Table 1: VAS scores post operatively

Time interval	Group I (n=30)	Group II (n=30)	t value	P Value
6 Hour	3.50±1.548	1.47± 0.507	6.836	.001
12 Hour	5.47±.681	3.87± 1.432	5.526	.001
24 Hour	5.33±.959	4.83± 1.367	1.640	.106

Table 2: Time in hours at which the first dose of rescue analgesia was administered post operatively

Time at which first rescue analgesic administered (in hours)	Group I (n=30)	Group II (n=30)	t value	P Value
Mean±S.D.	10.00± 2.877	14.13± 2.030	-4.133	.001

Table 3: Mean dose of rescue analgesia (Injection paracetamol in grams) administered in 24 hours.

Mean dose of rescue analgesic administered (in grams)	Group I (n=30)	Group II (n=30)	t value	P value
Mean±S.D.	2366.67± 490.133	1866.67± 434.172	4.182	.001

4. Discussion

In our study it was found that VAS scores at 6hr, 12 hours and 24 hours of group I (3.50±1.548, 5.47±.681, 5.33±.959 respectively) was found to be higher than that of group II at 6, 12 and 24 hours (1.47± 0.507, 3.87± 1.432, 4.83± 1.367 respectively) with a significant p value of at 6hrs (0.001), 12hrs (0.001) indicating that combination group II has better post operative analgesia cover.

Upon analyzing the postoperative period in terms of first time for rescue analgesia and the total amount of rescue analgesics between the two blocks, a statistically significant difference (p value < 0.05) was observed. The mean duration at which the first rescue analgesia was administered in Group I was 10.00± 2.877 hours, while in Group II it was 14.13±2.030 hours with a significant p value of 0.001. The group TPVB (Group 1) needed rescue analgesia more frequently compared to group where combination of ESPB and TPVB is used (Group 2). It was observed that the mean dose of rescue analgesic (Injection paracetamol) given in Group I was 2366.67±490.133 grams, whereas in Group II it was 1866.67± 434.172 grams with a significant p value of 0.001. Therefore, in terms of the amount of rescue analgesic used, it was found that the TPVB group (Group I) required a significantly higher mean dosage of rescue analgesics compared to the combined group.

A recent study by Zhao et al. and Çiftçi et al., observed that ultrasound guided ESPB was non-inferior in analgesic effect compared to TPVB in terms of pain scores, rescue analgesia requirement and quality of recovery. ^[5]

A comprehensive analysis conducted by Chang revealed that the ESPB has been described as an effective alternative to TPVB or when epidural is contraindicated due to thrombocytopenia, anti-platelet or anticoagulant treatments or coagulopathy. ^[6]

A study by Fu et al., ^[7] the findings revealed no significant difference in postoperative hydromorphone consumption between the ESPB and TPVB groups.

5. Conclusions

Thoracic wall blocks can be a valuable addition to the analgesic regimen. Ultimately TPVB combined with ESPB emerges as the more favorable approach, offering improved pain relief and reduced need for analgesics when compared to TPVB for thoracic surgeries. Thus, the combination of ESPB and TPVB might be an effective and comparative option to TPVB in alleviating post-operative pain in thoracic surgeries.

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