

## Deep versus Superficial Erector Spinae Block for Modified Radical Mastectomy: A Randomized Controlled Pilot Study

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### Abstract:

In 50 female patients having modified radical mastectomy at AIIMS, New Delhi, this pilot study evaluated the analgesic effectiveness of deep versus superficial erector spinae plane (ESP) blocks. The outcomes demonstrated that, in comparison to the superficial ESP block, the deep ESP block significantly enhanced postoperative pain management by decreasing pain scores, consuming fewer opioids, delaying the need for further analgesia, and improving patient satisfaction. These results imply that the local anaesthetic may be positioned deeper within the ESP block to improve postoperative pain management without adding to the risk of problems. The research backs up the inclusion of deep ESP blocks in pain management protocols for mastectomy procedures; however, additional validation using a larger sample size is advised.

**Keywords:** Erector Spinae Plane Block, Postoperative Pain, Opioid Consumption, Mastectomy.

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### Introduction

Modified radical mastectomy is one type of breast cancer surgery that frequently causes severe pain following the procedure, which has a negative impact on the patient's quality of life, recuperation, and functionality [1]. The need for efficient pain control has led to research into several analgesic methods. Because of its effectiveness and ease of use, the erector spinae plane (ESP) block has become a well-known technique for providing thoracic analgesia [2,3].

The ESP block, which is carried out under ultrasound guidance, entails injecting a local anaesthetic between the vertebral transverse processes and the erector spinae muscle [4]. By obstructing the ventral and dorsal rami of the spinal nerves, this technique has been demonstrated to effectively relieve pain following thoracic, abdominal, and some orthopaedic procedures. The ESP block is still being refined by research, especially with relation to the best depth to inject anaesthetic to reduce problems and maximize pain management [5, 6].

The purpose of this pilot project is to evaluate the safety and efficacy of deep and superficial ESP blocks in patients having modified radical mastectomy. By concentrating on these methods,

the study hopes to offer more thorough advice on how best to use ESP blocks during breast surgery, which could enhance postoperative pain control and patient satisfaction in general. Furthermore, this study will investigate the relationship between the depth of the block and the length of pain relief, the usage of analgesics, and postoperative problems. This research will add significantly to the growing body of knowledge regarding ESP block procedures in breast cancer surgery [7, 8].

### Methodology

**Study Design:** This two-year randomised controlled pilot trial at the All-India Institute of Medical Sciences (AIIMS), New Delhi, examined the pain management efficacy of deep and superficial erector spinae plane (ESP) blocks for modified radical mastectomy patients.

**Participants:** The study comprised 50 female patients aged 18–65 with ASA physical status I–III undergoing elective modified radical mastectomy. Local anaesthetic allergies, coagulopathy, block site infection, chronic opioid use, and refusal to participate were exclusion criteria.

**Randomization and Blinding:** A third-party administrator blinded patients and result assessors

and separated participants into two groups of 25 for the deep or superficial ESP block using a computer-generated sequence.

**Intervention:** Under ultrasound guidance, the deep ESP group got local anaesthesia near the transverse process and the superficial ESP group above the erector spinae muscle in the fascial plane. Both groups administering 20 mL of 0.25% bupivacaine followed conventional general anaesthesia guidelines.

**Outcome Measures:** VAS was used to measure primary outcomes at 1, 6, 12, and 24 hours post-op. Opioid use, patient satisfaction, analgesia time, and complications were secondary outcomes. Data analysis was conducted in SPSS, using t-tests or Mann-Whitney U tests for continuous variables and chi-squared or Fisher's exact tests for categorical variables. Statistical significance was set at  $p < 0.05$

## Results

The study included a total of fifty female participants, with an average age of 52 years. The study groups exhibited a uniform distribution of socioeconomic data and baseline clinical characteristics. There were no notable differences in age, body mass index (BMI), ASA physical status, or baseline pain levels among the deep and superficial erector spinae plane (ESP) block groups.

**Table 1: There were no significant complications related to the ESP block in either group. Minor complications included temporary discomfort at the injection site and mild nausea, both of which were similarly reported in both groups and resolved without intervention.**

Outcome	Deep ESP Block Group	Superficial ESP Block Group	P-value
Mean VAS Score at 6 hours	2.3	4.5	<0.05
Opioid Consumption (mg ME)	10	20	<0.05
Patient Satisfaction (%)	92%	68%	<0.05
Time to First Analgesia (hrs)	12	6	<0.05
Complications (%)	Minor, similar	Minor, similar	N/A

Key:

- VAS: Visual Analog Scale
- mg ME: milligrams of morphine equivalents

This table summarizes the primary and secondary outcome measures, showing the superior performance of the deep ESP block group in terms of pain management, opioid consumption reduction, and overall patient satisfaction.

## Discussion

According to the findings of this preliminary investigation, it seems that the deep erector spinae

The research showed significant disparities in the postoperative Visual Analogue Scale (VAS) pain levels, which were designated as the primary outcome. The group that received the deep ESP block had significantly lower VAS scores at all postoperative time points (1-, 6-, 12-, and 24-hours after surgery) compared to the group that received the superficial ESP block. Significantly, 6 hours after the operation, the deep ESP block group had an average VAS score of 2.3, while the superficial ESP block group had an average score of 4.5. This difference was statistically significant ( $p < 0.05$ ).

In addition, the group that received the deep ESP block experienced a notable decrease in opioid usage during the first 24 hours after surgery, with an average of 10 mg of morphine equivalents. This was significantly lower than the average of 20 mg taken by the group that received the superficial ESP block ( $p < 0.05$ ). In addition, the deep ESP block group exhibited significantly greater patient satisfaction rates, with 92% of participants indicating excellent satisfaction, compared to 68% in the superficial ESP block group ( $p < 0.05$ ). The deep ESP block group demonstrated a significantly longer median duration before the first request for rescue analgesia, lasting 12 hours, compared to the superficial ESP block group, which lasted just 6 hours ( $p < 0.05$ ).

plane (ESP) block is more efficient than the superficial ESP block in relieving postoperative pain following a modified radical mastectomy [9,10]. Notably, individuals who underwent the

deep ESP block experienced a substantial decrease in pain levels at various time intervals following the procedure. This discovery implies that the pain alleviation offered was more efficient [11]. A potential explanation for this phenomenon could be the increased depth at which the local anaesthetic is administered, allowing for a wider distribution and more efficient inhibition of the specific sensory nerves [12].

Furthermore, the reduced use of opioids in the deep ESP block cohort underscores the efficacy of the block in pain management. Given the present focus on minimising the use of opioids due to its possible hazards and negative consequences, this holds particular significance. This decrease signifies not only enhanced pain management but also a reduction in complications and adverse effects linked to opioids, hence fostering patient safety and recovery [13,14].

The ESP block group exhibited a notable increase in patient satisfaction, which correlated with lower pain levels and reduced need for supplementary pain medication [15]. The heightened degree of contentment plays a crucial role in influencing the whole recuperation process and the way patients evaluate their surgical experience. The extended duration between the initial requirement for pain relief further supports the effectiveness of the deep ESP block, providing longer-lasting comfort and reducing the burden on healthcare personnel and patients [16,17].

While the deep ESP block has demonstrated evident advantages, it is important to note that there were no significant differences in major problems between the two groups. This implies that the use of a deeper injection technique does not present any extra hazards. However, due to the narrow focus and small number of participants in this first investigation, it is crucial to carry out larger studies in order to confirm these findings and potentially influence the existing pain management protocols in breast surgery. The findings provided provide compelling evidence for considering the depth of anaesthetic administration in ESP blocks as a means to improve postoperative pain control in mastectomy patients [18-20].

### Conclusion

This study highlights the greater effectiveness of the deep erector spinae plane (ESP) block in improving pain relief after surgery in patients receiving modified radical mastectomy, when compared to the superficial ESP block. The profound ESP block effectively decreases pain scores and opiate usage, extends the duration of pain relief, and enhances overall patient contentment without elevating the danger. Based on the data, it appears that delivering the local anaesthetic at a greater depth within the erector

spinae plane (ESP) could provide a more efficient and less risky method for controlling pain during breast surgery. Further research with bigger cohorts is necessary to corroborate these outcomes and maybe update clinical guidelines to include the deep ESP block as a standard technique for managing postoperative pain in mastectomy surgeries.

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