

**Original article:**

## **Study of evaluation of analgesic effect of the addition of dexamethasone to ropivacaine in serratus anterior plane block for modified radical mastectomy**

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### **Abstract:**

**Background:** Adequate postoperative pain management is crucial for patients undergoing modified radical mastectomy. The addition of dexamethasone to ropivacaine in regional anesthesia techniques has shown promise in enhancing analgesic outcomes. This study aimed to evaluate the analgesic effect of combining dexamethasone with ropivacaine in peripheral nerve stimulator-guided serratus anterior plane (SAP) block for modified radical mastectomy.

**Methods:** This hospital-based, prospective, randomized controlled trial included 60 female patients undergoing modified radical mastectomy. The patients were randomly allocated into two groups: Group 1 (ropivacaine with normal saline) and Group 2 (ropivacaine with dexamethasone). Parameters such as intra-operative fentanyl requirement, rescue analgesic requirement, time to first analgesic rescue, postoperative numeric rating scores (NRS) for pain, nausea and vomiting scores (NVS), and post-operative complications were assessed.

**Results:** Group 2 demonstrated a significantly lower intra-operative fentanyl requirement compared to Group 1 ( $p < 0.05$ ). Furthermore, Group 2 exhibited a lower requirement for rescue analgesics and a longer time to first analgesic rescue ( $p < 0.05$ ). Postoperative NRS scores at rest and during movement were significantly lower in Group 2 at various time points ( $p < 0.05$ ). Additionally, the incidence of nausea and vomiting was significantly reduced in Group 2 ( $p < 0.05$ ). No significant differences were observed in post-operative complications between the two groups.

**Conclusion:** The addition of dexamethasone to ropivacaine in SAP block for modified radical mastectomy resulted in improved analgesic outcomes, reduced opioid requirements, prolonged analgesic duration, and reduced incidence of nausea and vomiting. This combination holds promise as an effective strategy for enhancing postoperative pain management in breast surgery.

**Keywords:** dexamethasone, ropivacaine, serratus anterior plane block, modified radical mastectomy, analgesia, postoperative pain management.

### **Introduction:**

Modified radical mastectomy is a surgical procedure involving the removal of breast tissue, including the mammary gland, pectoralis major muscle, and axillary lymph nodes, as a treatment for breast cancer. Postoperative pain management is crucial for ensuring patient comfort and optimizing recovery outcomes. Adequate analgesia not only reduces suffering but also promotes early ambulation, reduces the risk of complications, and enhances overall patient satisfaction.<sup>1,2</sup>

Serratus anterior plane (SAP) block has gained popularity as a regional anesthesia technique for providing postoperative analgesia following breast surgery. This technique involves the deposition of local anesthetics in the plane between the serratus anterior muscle and the overlying fascia, targeting the thoracic intercostal nerves. Ropivacaine, a long-acting local anesthetic, is commonly used for SAP blocks due to its favorable safety profile and duration of action.<sup>3</sup> Recently, the addition of dexamethasone, a potent corticosteroid with anti-inflammatory properties, to local anesthetics has emerged as a potential strategy to enhance the analgesic efficacy of regional blocks. Dexamethasone acts by reducing inflammation, inhibiting prostaglandin synthesis, and modulating nociceptive pathways, thereby prolonging the duration of analgesia.<sup>4,5</sup> This study aims to evaluate the analgesic effect of the addition of dexamethasone to ropivacaine in SAP blocks for modified radical mastectomy. The primary objective is to assess whether the combination of dexamethasone and ropivacaine provides superior postoperative analgesia compared to ropivacaine alone. Secondary objectives include evaluating the duration of analgesia, opioid consumption, patient satisfaction, and the incidence of adverse effects.<sup>6,7</sup>

Understanding the potential benefits of combining dexamethasone with ropivacaine in SAP blocks for modified radical mastectomy could significantly improve postoperative pain management strategies and enhance patient outcomes. The findings of this study may contribute to the growing body of evidence on optimizing regional anesthesia techniques for breast surgery and provide valuable insights for clinical practice.

### **Methodology:**

This hospital-based prospective, randomized, and comparative study was conducted over a period of 18 months at a tertiary care center in the Department of Anesthesiology. The study population consisted of adult female patients with American Society of Anesthesiologists (ASA) physical status classification of 2 or 3, aged between 18 and 60 years, and weighing between 30 and 80 kg. The patients were scheduled to undergo modified radical mastectomy (MRM) under general anesthesia and were referred to the department's outpatient and inpatient departments.

A total of 60 patients were enrolled in the study and randomly divided into two groups:

Group 1: This group consisted of 30 patients who received 0.375% ropivacaine at a dose of 0.4 ml/kg, mixed with normal saline.

Group 2: This group comprised 30 patients who received 0.375% ropivacaine at a dose of 0.4 ml/kg, mixed with 8 mg of dexamethasone (2 ml).

The study utilized a peripheral nerve stimulator-guided serratus anterior plane (SAP) block for analgesia. The SAP block was performed before the surgery, and the ropivacaine-dexamethasone mixture or ropivacaine-saline mixture was administered into the targeted plane between the serratus anterior muscle and the overlying fascia.

Various parameters were assessed during the study, including pain scores, duration of analgesia, opioid consumption, patient satisfaction, and the incidence of adverse effects.

Ethical approval was obtained from the Institutional Review Board, and informed consent was obtained from all participating patients. The data collected during the study were analyzed using appropriate statistical methods to determine the significance of any differences observed between the two groups.

The study design and methodology employed in this research aimed to evaluate the analgesic effect of adding dexamethasone to ropivacaine in a peripheral nerve stimulator-guided SAP block for patients undergoing modified radical mastectomy.

### Results:

A hospital-based study was conducted with 60 patients to evaluate the analgesic effect of the addition of dexamethasone to ropivacaine in peripheral nerve stimulator guided serratus anterior plane block for modified radical mastectomy. Patients were randomly divided into following two groups:

**Group 1:** 30 patients received 0.375% ropivacaine (0.4ml/kg) with normal saline.

**Group 2:** 30 patients received 0.375% ropivacaine (0.4ml/kg) with 8mg dexamethasone (2ml).

Majority of the patients (36.7%) in Group 1 were in the age group of 51-60 years followed by 26.7% patients in the age group of 41-50 years, 13.3% patients in the age group of 31-40 years, 10% in the age groups of 21-30 years and 61-65 years and 3.3% patients in the age group of 18-20 years. The mean age of patients was  $46.77 \pm 12.54$  years.

7 (23.3%) and 2 (6.7%) patients in Group 1 and Group 2 respectively required fentanyl intra-operatively. The requirement of fentanyl intra-operatively was significantly higher in Group 1 compared to Group 2 as per Chi-Square test ( $p < 0.05$ ).

**Table 1: Distribution of patients according to Intra-Operative Requirement of Fentanyl**

| Intra-operative Requirement of Fentanyl | Group 1 |       | Group 2 |       | p Value |
|---|---------|-------|---------|-------|---------|
|   | N       | %     | N       | %     |         |
| Yes                                     | 7       | 23.3% | 2       | 6.7%  | <0.05   |
| No                                      | 23      | 76.7% | 28      | 93.3% |         |
| Total                                   | 30      | 100%  | 30      | 100%  |         |

26 (86.7%) and 5 (16.7%) patients in Group 1 and Group 2 respectively required rescue analgesic. It was observed that significantly higher number of patients in Group 1 required rescue analgesic as per Chi-Square test ( $p < 0.05$ ).

**Table 2: Distribution of patients according to Requirement of Rescue Analgesic**

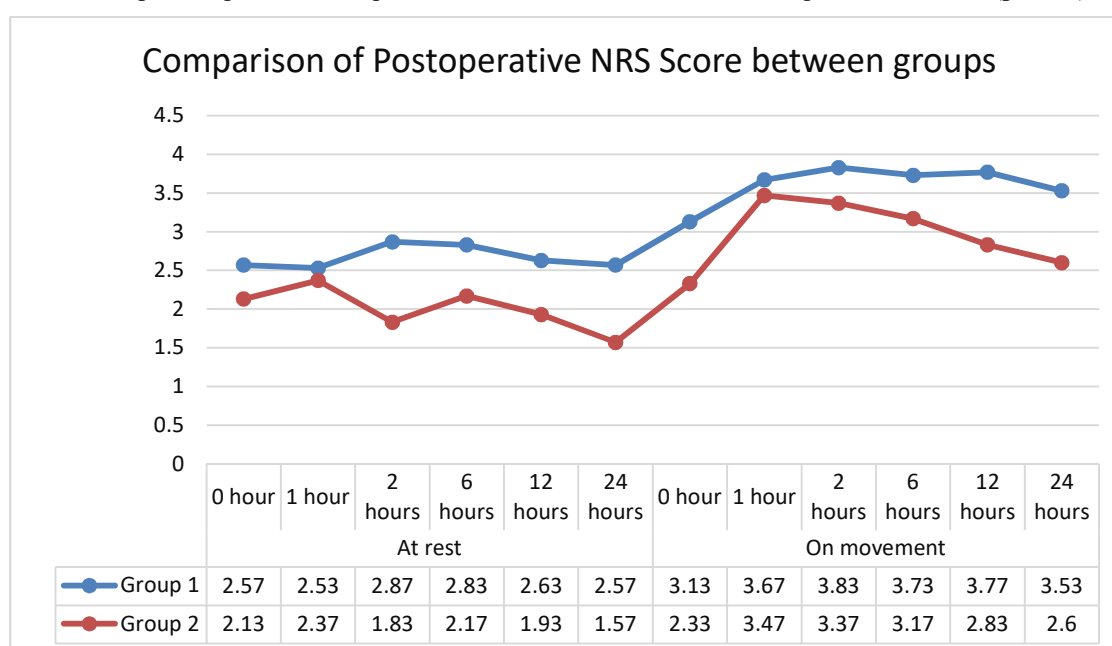
| Rescue Analgesic | Group 1 |       | Group 2 |       | p Value |
|------------------|---------|-------|---------|-------|---------|
|                  | N       | %     | N       | %     |         |
| Required         | 26      | 86.7% | 5       | 16.7% | <0.05   |
| No requirement   | 4       | 13.3% | 25      | 83.3% |         |
| Total            | 30      | 100%  | 30      | 100%  |         |

The requirement of first analgesia rescue was significantly faster in Group 1 compared to Group 2 as per Student t-test (8.85±2.15 hours vs. 19.80±3.03 hours;  $p<0.05$ ).

**Table 3: Distribution of patients according to Use of First Analgesia Rescue**

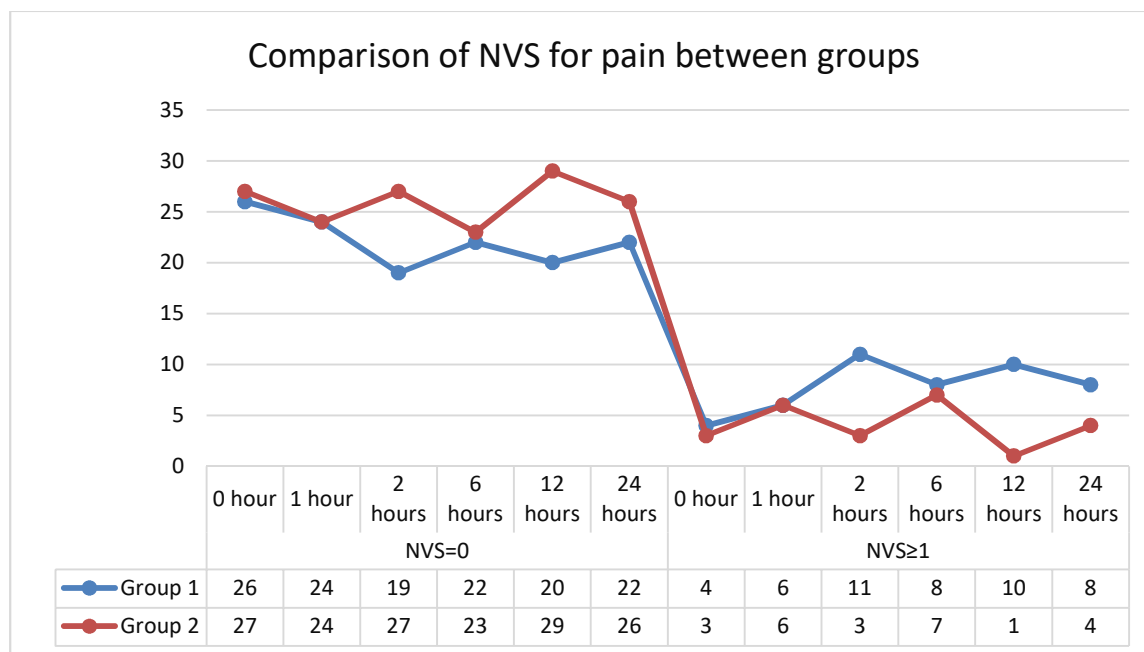
|                                       | Group 1 |      | Group 2 |      | p Value |
|---------------------------------------|---------|------|---------|------|---------|
|                                       | Mean    | SD   | Mean    | SD   |         |
| Use of First Analgesia Rescue (hours) | 8.85    | 2.15 | 19.80   | 3.03 | <0.05   |

Postoperative pain scores at rest were significantly less in Group 2 compared to Group 1 at 2 hours, 6 hours, 12 hours and 24 hours as per Student t-test ( $p<0.05$ ). Postoperative pain scores on movement were significantly less in Group 2 compared to Group 1 at 6 hours, 12 hours and 24 hours as per Student t-test ( $p<0.05$ ).



**Graph 1: Comparison of Postoperative NRS Score between groups**

The nausea and vomiting scores were significantly higher in group 1 compared to Group 2 at 2 hours and 12 hours postoperatively as per Chi-Square test ( $p<0.05$ ).



**Graph 2: Comparison of Nausea and Vomiting Score (NVS) for pain between groups**

1 (3.3%) patient each in Group 1 had hypotension and shivering while 1 (3.3%) patient in Group B had hypotension. There was no significant difference between the groups as per Chi square test ( $p > 0.05$ ).

**Table 4: Comparison of Post-operative Complications between groups**

| Post-operative Complications | Group 1 |      | Group 2 |      | p Value |
|------------------------------|---------|------|---------|------|---------|
|                              | N       | %    | N       | %    |         |
| Hypotension                  | 1       | 3.3% | 1       | 3.3% | >0.05   |
| Shivering                    | 1       | 3.3% | 0       | -    |         |
| Bradycardia                  | 0       | -    | 0       | -    |         |
| Urinary Retention            | 0       | -    | 0       | -    |         |

**Discussion:**

The aim of this hospital-based study was to evaluate the analgesic effect of adding dexamethasone to ropivacaine in peripheral nerve stimulator-guided serratus anterior plane (SAP) block for modified radical mastectomy. The study included 60 patients who were randomly divided into two groups: Group 1 (ropivacaine with normal saline) and Group 2 (ropivacaine with dexamethasone).

The results of this study showed several significant differences between the two groups. In terms of intra-operative fentanyl requirement, Group 1 had a significantly higher number of patients requiring fentanyl compared to Group 2. This suggests that the addition of dexamethasone to ropivacaine in SAP block may reduce the need for intra-operative opioids.

Furthermore, the requirement for rescue analgesics was significantly higher in Group 1 compared to Group 2. This indicates that patients in Group 2 experienced better analgesia and had a lower need for additional pain relief measures.

The time to the first analgesic rescue was significantly shorter in Group 1 compared to Group 2. This finding suggests that the addition of dexamethasone to ropivacaine prolonged the duration of analgesia, leading to a delay in the requirement for rescue analgesics.

Postoperative pain scores at rest were significantly lower in Group 2 compared to Group 1 at multiple time points, indicating better pain control with the addition of dexamethasone. Additionally, postoperative pain scores on movement were significantly lower in Group 2 at several time points, suggesting improved analgesia during physical activity. The incidence of nausea and vomiting was significantly higher in Group 1 compared to Group 2 at certain time points. This finding suggests that dexamethasone may have provided some antiemetic effect when combined with ropivacaine in SAP block.

Regarding post-operative complications, there were no significant differences between the two groups. The occurrence of hypotension and shivering was similar in both groups, indicating that the addition of dexamethasone did not increase the risk of adverse events. The results of this study indicate that the addition of dexamethasone to ropivacaine in SAP block for modified radical mastectomy may offer several benefits. It reduced the intra-operative requirement for fentanyl, decreased the need for rescue analgesics, prolonged the time to the first analgesic rescue, improved postoperative pain control at rest and during movement, and potentially reduced the incidence of nausea and vomiting. These findings support the notion that dexamethasone has an additive analgesic effect when combined with ropivacaine in SAP block.

Wu Y et al<sup>8</sup> single-center, double-blind, randomized clinical trial investigating the role of ultrasound-guided deep serratus anterior plane block dSAPB with dexmedetomidine found median postoperative global QoR-15 score, VAS score at rest at 12th hour, VAS score in movement at 12th hour and at 24th hour, and median sufentanil rescues consumption of Group RD were significantly lower than those of the Group R. Patient satisfaction score of Group RD were significantly higher than those of the Group R. Preoperative dSAPB administration of 0.375% ropivacaine with DEX reduced acute VAS pain scores at rest at 12th hour, exercise at 12th and 24th hour after surgery. There was no significant difference between resting and exercise 48 h after surgery.

Kaur H et al<sup>9</sup> prospective randomized control study comparing analgesic effect of dexamethasone 8 mg as an adjuvant to 0.25% ropivacaine versus 0.25% ropivacaine alone VAS were persistently low for first 4 hours in group B and for first 9 hours in group A. The mean duration of analgesia was prolonged in group B as compared to group A ( $612.33 \pm 41.77$  min in Group B and  $307.70 \pm 22.37$  min in group A).

However, it is important to consider some limitations of this study. Firstly, the sample size was relatively small, and a larger study population would provide more robust results. Secondly, the study focused on a specific surgical procedure (modified radical mastectomy), and the findings may not be directly applicable to other types of surgeries. Further research is needed to evaluate the efficacy and safety of this combination in different surgical settings.

#### **Conclusion:**

From this study, we conclude that, this study demonstrates that the addition of dexamethasone to ropivacaine in SAP block for modified radical mastectomy resulted in improved analgesic outcomes, reduced opioid

requirements, and enhanced patient comfort. The findings support the potential clinical utility of this combination as a valuable adjunct in regional anesthesia techniques for breast surgery. Further investigations are warranted to validate these results and explore the long-term effects of dexamethasone in SAP blocks.

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