

**Comparative Assessment of Analgesia and Sensory Blockade in Patients Undergoing MRM**Stuti Kumari<sup>1</sup>, Ravi Kumar<sup>2</sup>, Akhilesh Kumar Singh<sup>3</sup>, Bijoy Kumar<sup>4</sup><sup>1</sup>Senior Resident, Department of Anaesthesia & Intensive Care, Nalanda Medical College and Hospital, Patna, Bihar, India<sup>2</sup>Senior Resident, Department of Anaesthesia & Intensive Care, Nalanda Medical College and Hospital, Patna, Bihar, India<sup>3</sup>Assistant Professor, Department of Anaesthesia & Intensive Care, Nalanda Medical College and Hospital, Patna, Bihar, India<sup>4</sup>Professor and HOD, Department of Anaesthesia & Intensive Care, Nalanda Medical College and Hospital, Patna, Bihar, India

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**Abstract****Aim:** We aimed to compare the techniques in terms of analgesia and sensory blockade in patients undergoing modified radical mastectomy (MRM).**Methods:** The present study was conducted in the Department of Anaesthesia & Intensive Care, for 1 year. The study adheres to CONSORT guidelines. 100 American Society of Anesthesiologists (ASA) I/II patients between the age group 20 and 60 years, who were scheduled to undergo unilateral MRM under general anaesthesia, were screened. Out of these, 50 patients were allocated in one of the two groups.**Results:** Morphine consumption within 24 h postoperative period in group I was  $6.50 \pm 1.30$  mg and in group II was  $8.65 \pm 0.75$ mg. The difference was highly significant between the two groups ( $P < 0.001$ ). The intraoperative fentanyl consumption ( $\mu\text{g}/\text{kg}$ ) was more in group II ( $1.56 \pm 0.480$ ), compared to the other group:  $1.5 \pm 0.570$ **Conclusion:** Injection of drugs deep to erector spinae muscle provides more cranio-caudal blockade of posterior and lateral chest wall than superficial group.**Keywords:** Erector spinae plane block, Modified radical mastectomy, Postoperative pain.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Erector spinae plane (ESP) block is a simple and safe myo-fascial plane block. [1] The role of ultrasound-guided ESP block for breast surgeries has been established. [2,3] Preoperative administration of block reduces opioid consumption and opioid related adverse effects in modified radical mastectomy (MRM).

A case series illustrated opioid free anaesthesia in patients scheduled for MRM. [4] The extent of analgesia provided by this block depends on the volume of drug injected, site of injection, approach of block, and pattern of spread within the myo-fascial plane. Forero et al. were the first to describe the block, wherein he used two approaches: Superficial and deep to erector spinae muscle. [1]

Most published articles concluded that the ESP block is an effective analgesic technique in a variety of clinical scenarios. It can be utilized successfully in the treatment of acute and chronic pain. Likewise,

it has also been effective for analgesia at the cervical, thoracic, and abdominal levels. Other studies indicated that it can provide adequate analgesia in the upper or lower limbs if it is performed at the high thoracic and lumbar levels, respectively. [5]

Several other studies also reported that ESP block significantly reduces post-operative pain after modified radical mastectomy, total radical mastectomy and other breast surgeries. [6-8] It also reduces the requirement of conventional analgesic treatment, which possess a great value on reducing the analgesic related adverse drug reactions and also contributes to achieve a good long term outcome of pain related morbidities.

The modified radical mastectomy (MRM) with axillary lymph nodes dissection is commonly performed surgical procedure for breast cancer in women. [9] Inadequate postoperative pain control

may attribute to negative physiological and psychological consequences and causative factors for the development of chronic pain. [2]

We aimed to compare both these techniques in terms of analgesia and sensory blockade in patients undergoing MRM. The primary objective was to ascertain the postoperative analgesic consumption in patients undergoing MRM after superficial technique when compared to the classical deep technique of ESP block. Secondary objectives included preoperative sensory blockade and adverse effects.

### Methods

The present study was conducted in the Department of Anaesthesia & Intensive Care, Nalanda Medical College and Hospital, Patna, Bihar, India for 1 year. The study adheres to CONSORT guidelines. 100 American Society of Anesthesiologists (ASA) I/II patients between the age group 20 and 60 years, who were scheduled to undergo unilateral MRM under general anaesthesia, were screened. Out of these, 50 patients were allocated in one of the two groups.

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All the patients were explained about the procedure, made familiar with numerical rating scale and patient controlled analgesia pump in the preoperative visit. Following this, an informed consent was taken from all these patients. The exclusion criteria included patients with allergy to the drugs, coagulopathy, infection at puncture site, mental disorder, communication failure, unable to discriminate cutaneous pin prick, chronic use of analgesics, and having body mass index (BMI) >30 kg/m<sup>2</sup>. Premedication in the form of alprazolam 0.5 mg was administered orally in the morning before shifting to operating room. The enrolment for the study was done by the primary investigator. The patients were randomised into two groups of 25 each using computer-generated randomised numbers by the statistician. The random allocation sequence was kept concealed in opaque, sealed envelopes till group was assigned.

The patients were shifted to preoperative holding area and monitors including noninvasive blood pressure, electrocardiography (ECG), and peripheral oxygen saturation (SPO<sub>2</sub>) attached. All the blocks were performed by the second author who refrained from perioperative management or data collection.

The blocks were performed with the patient in the sitting position at least 30 min before incision. A high-frequency linear probe (38 mm, 7–12 MHz

frequencies) (Sonosite, Inc., Bothell, WA, USA) was placed in a transverse plane. The lateral tip of T4 transverse process was visualised as a hyperechoic structure. Trapezius, rhomboid major, and erector spinae muscles were superficial to the T4 process. Thereafter, the probe was turned 90° longitudinally.

A blunt tip, 22 gauge echogenic needle (Pajunk, sonoplexstim cannula, Geisingen, Germany; 80 mm) was inserted in plane in a caudal direction after injecting 2 cc of 2% lignocaine locally.

In group I, the needle tip was kept in contact with the transverse process. We confirmed the needle tip position by injecting 0.5–1 mL of saline. It was followed by injection of 20 mL of 0.2% ropivacaine.

In group II, needle tip position was kept superficial to erector spinae muscle and drug (20 mL of 0.2% ropivacaine) was injected in the fascial plane between rhomboid major and erector spinae muscle. All the patients were blinded to the block technique as the entry point for both the block procedures was the same. The sensory level of block was assessed by a blinded observer who was not present at the time of performance of block. Pin-prick testing was done every 5 min in dermatomal distribution from T1 to T8 anteriorly in mid clavicular line (MCL), laterally in mid axillary line (MAL), posteriorly in posterior axillary line (PAL), axilla, and at medial side of upper arm.

The patient's ECG and SpO<sub>2</sub> were monitored over a period of 30 min after procedure. Any decrease in blood pressure (>20%) or vascular puncture was documented. General anaesthesia was given in a standardised manner (propofol 2 mg/kg, fentanyl 2 µg/kg, and vecuronium 0.08 mg/kg). The HR and blood pressure were recorded at baseline, after induction, after laryngeal mask airway (LMA) insertion, at skin incision, and then every 15 min until the end of surgery. Anaesthesia was maintained with sevoflurane in air and oxygen, targeted to maintain bispectral index values between 40 and 60. Intravenous ondansetron 4 mg and 8 mg of dexamethasone were given to all the patients for prophylaxis of postoperative nausea and vomiting after start of surgery. All the patients received an infusion of normal saline at a rate of 5–8 ml kg/h during surgery. If two consecutive readings showed an increase in mean arterial pressure (MAP) of 20% above baseline, intravenous fentanyl 1.0 µg/kg bolus was given. At the end of surgery, the neuromuscular block was antagonised with neostigmine and atropine. The LMA was taken out once the patients became fully awake and breathing adequately. Intravenous paracetamol 1 gm was given before extubation and sixth hourly thereafter to all the patients. A patient-controlled analgesia pump was attached to the patient for rescue analgesia. No background infusion was given. A lockout interval

of 5 min with a maximum of 10 doses (1 mg boluses) per hour was preset. Opioid consumption in 24 h and adverse effects (hypotension, respiratory depression, shivering, nausea/vomiting and urinary retention) were documented. Rescue antiemetic

ondansetron 0.1 mg kg<sup>-1</sup> i.v. was given if the patient complained of nausea.

## Results

**Table 1: Demographic data**

	Group I Mean $\pm$ SD	Group II Mean $\pm$ SD	P
Age (years)	48.04 $\pm$ 11.70	45.55 $\pm$ 10.08	0.425
Duration of surgery (h)	128.09 $\pm$ 18.78	126.80 $\pm$ 17.70	0.820
Weight (BMI)	22.5 $\pm$ 1.935	22.007 $\pm$ 2.652	0.850

The present study did not find any significant difference in age, duration of surgery, and BMI in both the groups.

**Table 2: Duration of analgesia and morphine requirement**

	Group I Mean $\pm$ SD	Group II Mean $\pm$ SD	P
Morphine requirement (mg)	6.50 $\pm$ 1.30	8.65 $\pm$ 0.75	<0.001
Intraoperative fentanyl consumption ( $\mu$ g/kg)	1.5 $\pm$ 0.570	1.56 $\pm$ 0.480	<0.001

Morphine consumption within 24 h postoperative period in group I was 6.50  $\pm$ 1.30 mg and in group II was 8.65  $\pm$ 0.75mg. The difference was highly significant between the two groups (P < 0.001). The intraoperative fentanyl consumption ( $\mu$ g/kg) was more in group II (1.56  $\pm$ 0.480), compared to the other group: 1.5  $\pm$ 0.570.

## Discussion

The MRM is associated with moderate-to-severe acute postoperative pain. Failure to provide adequate acute pain control is associated with poor quality of recovery and chronic postsurgical pain. [2,10] Acute postoperative pain after MRM can be managed with either parenteral analgesic or regional analgesics techniques. The regional techniques obviate the need of parenteral analgesia, hence associated side effects are also minimized. However, an ideal method has not yet been identified and all of these blocks also have some associated drawbacks too.

ESP block is a newer block wherein the drug is deposited more superficial and far from midline compared to TEA and PVB. ESP block is a safer truncal block, and provides better cephalocaudal spread of LA. The analgesia of ESP because of drug diffusion into PVB space, hence it is also known as indirect PVB. The literature described that drug deposited has better craniocaudal spread as it is tight compartment and ESP fascia extend cranially from cervical level to caudally at sacral level. Several other randomized controlled trial results have shown significantly decreased morphine consumption for the first 24 h postoperatively in the ESP block group compared to the control group. [6,11]

The ESP block is a relatively new interfascial plane block that has gained popularity due to its ease and safety. Its use extends to various surgeries like MRM, laparotomy, hernia, pyeloplasty, etc. [12-14] Forero et al. were the first to describe it, wherein they used two techniques for the same block: i) Deep

technique: Drug deposited deep to erector spinae muscle, ii) Superficial technique: Drug deposited superficial to erector spinae muscle at T5 level. In the superficial technique, the first patient had sensory blockade ranging from T2 to T9 in a cephalocaudal direction, and 3 cm lateral to the thoracic spine to the midclavicular line in an anterior-posterior direction. There was sensory blockade in axilla and medial aspect of the upper arm. Clinically, the patient had adequate pain relief.

We used a dose of 20 mL at the level of T4 based on a study done by Gurkan Y, et al. They gave ESP (deep technique) block for MRM, which reduced the opioid consumption significantly. [11] The morphine consumption reduced from 16.6  $\pm$  6.92 to 5.76  $\pm$  3.8 mg in the ESP group compared to the control group. Our results are also comparable as the 24-h morphine consumption was 6.50  $\pm$ 1.30 mg in the deep group.

Other studies have used local anaesthetic ranging from 20 to 30 ml. Cassai et al. stated that the volume needed to cover one dermatome ranged from 2.5 to 6.6 mL, with a median value of 3.4 mL. [9] In our study, the spread ranged from 3 to 6 dermatomes with a volume of 20 mL. [15]

In our study, the sensory blockade was more in deep technique, which could be explained by the same mechanism. In the deep group, there would have been more seepage of drug in the paravertebral space, while in the superficial group, the muscle might act as a barrier to the spread. The target of ESP block for mastectomy patients is to block the ventral rami of the spinal cord. Depositing the drug deep to ESP muscle enables the drug to seep in the paravertebral space contrary to what would be seen in superficial block. Hence, deep technique is better in terms of analgesia and is the standard technique in mastectomy patients.

## Conclusion

Injection of drugs deep to erector spinae muscle provides more cranio-caudal blockade of posterior and lateral chest wall than superficial group. The quality of analgesia following breast surgery is better on injecting the drug deep to erector spinae muscle.

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