e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2022; 14(9); 157-162

Original Research Article

A Hospital Based Randomized Clinical Assessment Of Deep Versus Superficial Erector Spinae Block For Modified Radical Mastectomy

Shiv Shankar[1], Vivek Ranjan[2], Akriti Singh[3], Nitin Kumar[4]

[1]PDCC, Senior Resident, Department of Critical Care Medicine (Anesthesiology), IGIMS, Patna, Bihar, India

[2]Fellow, Senior Resident, Department of Emergency and Critical Care (Trauma and Emergency) IGIMS, Patna, Bihar, India

[3]Assistant Professor, Department of Trauma and Emergency, IGIMS, Patna, Bihar, India

[4]Assistant Professor, Department of Trauma and Emergency, IGIMS, Patna, Bihar, India

Received: 05-07-2022 / Revised: 05-08-2022 / Accepted: 15-08-2022

Corresponding author: Dr. Vivek Ranjan

Conflict of interest: Nil

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 Critical Care medicine(Anesthesiology), IGIMS, Patna, Bihar, India, for 1 year. The study adheres to CONSORT guidelines. 100 American Society of Anaesthesiologist (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 ±1.30 mg and in group II was 8.65 ±0.75mg. The difference was highly significant between the two groups ($P < 0.001$). The intraoperative fentanyl consumption (µg/kg) was more in group II (1.56 ±0.480), compared to the other group: 1.5±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

Introduction

Erector spinae plane (ESP) block is a simple and safe myofascial 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 myofascial 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.

Materials and Methods

The present study was conducted in the Department of Critical Care medicine(Anesthesiology), ,IGIMS, 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.

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/m2. 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 randomized into two groups of 25 each using computer-generated randomized 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 (SPO2) 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% ropivicaine.

In group II, needle tip position was kept superficial to erector spinae muscle and drug (20 mL of 0.2% ropivicaine) 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 SpO2 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-1 i.v. was given if the patient complained of nausea.

Results

Table 1: Demographic data

	Group I Mean ±SD	Group II Mean ±SD	p-value
Age (years)	48.04 ±11.70	45.55 ±10.08	0.425

Duration of surgery (h)	128.09 ±18.78	126.80 ±17.70	0.820
Weight (BMI)	22.5 ±1.935	22.007 ±2.652	0.850

The present study did not find any significant difference in age, duration of surgery, and BMI in both the groups as shown in Table 1.

Table 2: Duration of analgesia and morphine requirement

	Group I Mean ±SD	**Group II Mean ±SD**	**p-value**
Morphine requirement (mg)	6.50 ±1.30	8.65 ±0.75	<0.001
Intraoperative fentanyl consumption (μg/kg)	1.5 ±0.570	1.56 ±0.480	<0.001

Morphine consumption within 24 h postoperative period in group I was 6.50 ±1.30 mg and in group II was 8.65 ±0.75mg. The difference was highly significant between the two groups (P < 0.001).The intraoperative fentanyl consumption (μg/kg) was more in group II (1.56 ±0.480), compared to the other group: 1.5 ±0.570 [Table 2].

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 cephalocaudad direction, and 3 cm lateral to the thoracic spine to the mid clavicular 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 ± 6.92 to 5.76 ± 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 ±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. [16] 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.

References

1. Forero M, Adhikary SD, Lopez H, Tsui C, Chin KJ. The erector spinae plane block: a novel analgesic technique in thoracic neuropathic pain. Regional Anesthesia & Pain Medicine. 2016 Sep 1;41(5):621-7.
2. Andersen KG, Kehlet H. Persistent pain after breast cancer treatment: a critical review of risk factors and strategies for prevention. The Journal of Pain. 2011 Jul 1;12(7):725-46.
3. Malawat A, Jethava D, Sachdev S, Jethava DD. Erector spinae plane block for breast oncological procedure as a surrogate to general anaesthesia: A retrospective study. Indian Journal of Anaesthesia. 2020 Apr;64(4):328.
4. Nair AS, Seelam S, Naik V, Rayani BK. Opioid-free mastectomy in combination with ultrasound-guided erector spinae block: A series of five cases. Indian Journal of Anaesthesia. 2018 Aug;62(8):632.
5. Kot P, Rodriguez P, Granell M, Cano B, Rovira L, Morales J, Broseta A, Andrés J. The erector spinae plane block: a narrative review. Korean J Anesthesiol. 2019 Jun;72(3):209-220.
6. Singh S, Kumar G. Ultrasound-guided erector spinae plane block for postoperative analgesia in modified radical mastectomy: a randomised control study. Indian journal of anaesthesia. 2019 Mar;63(3):200.
7. Orozco E, Serrano RE, Rueda-Rojas VP. Erector spinae plane (ESP) block for postoperative analgesia in total radical mastectomy: case report. Colombian Journal of Anestesiology. 2018 Dec;46:66-8.
8. Aksu C, Kuş A, Yörükoğlu HU, Kılıç CT, Gürkan Y. Analgesic effect of the bi-level injection erector spinae plane block after breast surgery: a randomized controlled trial. Agri. 2019 Jul 1;31(3):132-7.
9. Gu X, Zheng R, Xia C, Zeng H, Zhang S, Zou X, Yang Z, Li H, Chen W. Interactions between life expectancy and the incidence and mortality rates of cancer in China: a population-based cluster analysis. Cancer communi-cations. 2018 Dec;38(1):1-5.
10. Hussain N, Shastri U, McCartney CJ, Gilron I, Fillingim RB, Clarke H, Katz J, Juni P, Laupacis A, Wijeysundera D, Abdallah FW. Should thoracic paravertebral blocks be used to prevent chronic postsurgical pain after breast cancer surgery? A systematic analysis of evidence in light of IMMPACT

recommendations. Pain. 2018 Oct 1;15 9(10):1955-71.
11. Gürkan Y, Aksu C, Kuş A, Yörükoğlu UH, Kılıç CT. Ultrasound guided erector spinae plane block reduces postoperative opioid consumption following breast surgery: a randomized controlled study. Journal of clinical anesthesia. 2018 Nov 1;50:65-8.
12. Restrepo-Garces CE, Chin KJ, Suarez P, Diaz A. Bilateral continuous erector spinae plane block contributes to effective postoperative analgesia after major open abdominal surgery: a case report. A & A case reports. 2017 Dec 1;9(11):319-21.
13. Chin KJ, Adhikary S, Sarwani N, Forero M. The analgesic efficacy of pre-operative bilateral erector spinae plane (ESP) blocks in patients having ventral hernia repair. Anaesthesia. 2017 Apr;72(4):452-60.
14. Munshey F, Rodriguez S, Diaz E, Tsui B. Continuous erector spinae plane block for an open pyeloplasty in an infant. Journal of Clinical Anesthesia. 2018 Mar 21;47:47-9.
15. De Cassai A, Bonvicini D, Correale C, Sandei L, Tulgar S, Tonetti T. Erector spinae plane block: a systematic qualitative review. Minerva anestesiol-ogica. 2019 Jan 4;85(3):308-19.
16. Hasibuan D. A., & Petrus A. Character Determination in Elementary School Children of Madrasah Ibtidaiyah Al Jamiyatul Washliyah in 2021 Based on the Fingerprint of Right Hands. Journal of Medical Research and Health Sciences, 2021; 4(11): 1545–1550.