



## EFFICACY OF PECTORAL NERVE BLOCK- II IN PATIENTS UNDERGOING MODIFIED RADICAL MASTECTOMY IN POSTOPERATIVE PAIN ALLEVIATION AND IMPROVED SHOULDER JOINT MOVEMENT.

### General Surgery

<b>Deepak Kumar Kisku</b>	Assistant Professor, Dept. of General Surgery, Kalinga Institute of Medical Sciences, Bhubaneswar
<b>Samit Kumar Badhai</b>	Assistant Professor, Dept. of General Surgery, Kalinga Institute of Medical Sciences, Bhubaneswar
<b>Rajat Kumar Patra</b>	Associate Professor, Dept. of General Surgery, Kalinga Institute of Medical Sciences, Bhubaneswar
<b>Aakash Prateek</b>	PG Trainee, Final Year, Dept. of General Surgery, Kalinga Institute of Medical Sciences, Bhubaneswar
<b>Gaurav Bhoopathy</b>	PG Trainee, Final Year, Dept. of General Surgery, Kalinga Institute of Medical Sciences, Bhubaneswar
<b>Sudhir Kumar Panigrahi*</b>	Professor, Dept. of General Surgery, Kalinga Institute of Medical Sciences, Bhubaneswar *Corresponding Author

### ABSTRACT

**Objective:** Modified radical mastectomy has been the mainstay treatment of breast cancer as practiced globally. Postoperative shoulder pain and restriction of movement is a documented complication. Hence anesthetic technique like interpectoral block (PECS), that can reduce such complications is of paramount importance in optimising the outcome in such patients. **Methods:** We conducted a randomized controlled study of 40 patients with breast cancer who underwent modified radical mastectomy from January 2020 to October 2021 in the Department of General Surgery in our hospital, a tertiary health care centre. All patients received general anesthesia and in addition, ultrasound guided pectoral nerve block II (PECS group). Postoperative pain score and shoulder joint movement were recorded using set questionnaire with Numeric Rating Scale for pain 24h after surgery. We used Shapiro-Wilk, Mann-Whitney and Chi-square tests, and analyzed the data in R version 4.0.0 (ReBEC). **Results:** in the PECS group, 50% were pain-free 24h after surgery and in the control group it was 42.86%. The majority who presented pain classified it as mild pain (VAS from 1 to 3) - (42.50%) in PECS group and (40.48%) in control group ( $p=0.28$ ). Only 17.50% consumed opioids in the PECS group, similar to the control group with 21.43%. ( $p=0.65$ ). There was a low rate of complications such as PONV in both groups. In the subgroup analysis, there was no statistical difference between the groups that used levobupivacaine or ropivacaine regarding postoperative pain and opioid consumption. **Discussion:** the studied group had a low rate of pain in the postoperative period and it influenced the statistical analysis. **Conclusions:** Modified radical mastectomy done under PEC II block has an advantage of reduced postoperative shoulder pain and a improved shoulder joint movement.

### KEYWORDS

Modified radical mastectomy, pectoral Nerve block-II, postoperative pain, shoulder joint movement

### INTRODUCTION

The breast represents a woman's identity and pride in her sexuality and maternal stature. Diseases of the breast is a threat to the integrity of her femininity and interfere with her identity, considering its functional and psychological significance in puberty, sexuality, motherhood, health, and aging. Breast cancer is the most common cancer diagnosed worldwide and proven itself as the primary cause of cancer-related death in women. Management by surgical intervention is the mainstay treatment option involving multimodal approach that includes neoadjuvant and adjuvant chemotherapy, radiotherapy, hormone therapy, oncoplastic procedures and physiotherapy approach for both local and systemic control of the disease, psychological benefit and to optimize the outcome. Current consensus on surgery advocates Breast Conservative Surgery (BCS) in selected early breast cancer cases to Modified radical mastectomy for locoregional and advanced breast cancers which, involves excision of the primary tumor and staging of the axilla. Breast Conversion Surgery (BCS) offers functional, psychological benefits while retaining a comparable prognosis. Modified radical mastectomy is the standard common procedure practiced throughout the globe for breast cancer treatment. Breast cancer is the number one cancer among Indian females with age adjusted rate as high as 25.8 per 100,000 women and mortality 12.7 per 100,000 women.<sup>[1]</sup> During 2 to 4 months after surgery, regular shoulder-arm exercise for 30 min/day could decrease the effect of the severity of symptoms on quality of life among women operated for breast cancer, which is well tolerated and performed once healthcare providers inform and educate patients about its benefits.<sup>[2]</sup> Early physiotherapy effectively helps in the prevention of secondary lymphedema in women for at least one year after breast surgery involving dissection of axillary lymph nodes.<sup>[3]</sup> It also improves shoulder function in those at risk of shoulder problems and is associated with a lower health-care cost than usual care and improved health-related quality of life. However because of post MRM pain,

early shoulder exercises becomes troublesome for many females.

MRM done under Pectoral Nerve block in addition to general anesthesia helps in reduction of this pain significantly compared to drugs commonly employed post-operatively.

Pectoral nerve block is an effective anesthetic regimen in modified radical mastectomy that can effectively reduce the intra- and postoperative consumption of analgesics, postoperative PONV, and the need for postoperative rescue analgesia and can alleviate early pain (0-6 hours) after surgery.<sup>[5]</sup> PECS block significantly reduces pain in initial 48 h after MRM.<sup>[6]</sup> Postoperative pain scores during the 48 h of the postoperative period were significantly lower in the total intravenous anaesthesia (TIVA) plus PECS block.

Blanco et al. first described the PECS - I block in 2011 as a high volume interfascial block between the pectoralis major muscle and pectoralis minor muscle, targeting the lateral pectoral nerves. PEC II Block as described by Blanco et al., targets the interfascial plane between the pectoralis minor muscle and the serratus anterior muscle in addition to PEC I, aiming to block intercostal nerves 3 to 6, intercostobrachial and the long thoracic nerves, all of which are encountered during axillary node dissection. Axillary dissection after PECS Block becomes relatively difficult as there is little anatomical distortion due to edema caused by the block, and hence need experience.

### Aims & Objective

To study the following in a patient undergoing MRM for breast carcinoma with pectoral nerve block;

- intraoperative difficulties and operative time
- intraoperative bleeding
- number of nodal yield
- post operative analgesic requirement

- ability to perform required shoulder exercises on post-op day2
- nodal yield and positive nodes.
- inadvertent injury
- post operative complications

No pilot study or case series is available for surgical outcome of MRM following pectoral nerve block and few studies are there to validate its routine application. Considering benefit of pectoral nerve block, we want to do a prospective study for assessing feasibility and surgical outcome in cases done at our institute.

The study includes Patients who are admitted in the Department of General surgery, PBMH, Kalinga Institute of Medical Sciences, Bhubaneswar, Odisha for Breast carcinoma and planned for MODIFIED RADICAL MASTECTOMY from 1st June 2022 to 31st May 2024. It is a Observational Study (Prospective Single Institutional Study). A total of 40 patients are selected after applying the following inclusion and exclusion criteria.

**MATERIALS**

**Inclusion Criteria:**

The study included all consecutive female patients from all age groups confirmed to suffer from carcinoma breast and clinically impalpable and insignificant axillary nodes admitted and undergone elective breast surgeries with removal of axillary nodes in the Department of Surgery, Kalinga Institute of Medical Sciences Bhubaneswar, Odisha. All patients planned for MRM are included in our study.

**Exclusion Criteria:**

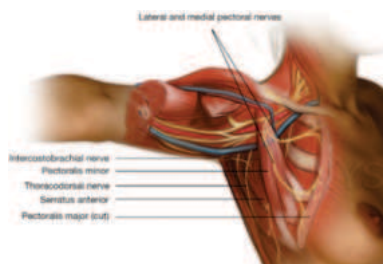
- Patients with already having shoulder dysfunction
- Recurrent and metastatic breast cancer
- Patients allergic to local anesthetic drug.
- Clinically large matted nodes present in axilla.
- MRM following Breast Conservation surgery (BCS) and Single Lymph Node Biopsy(SLNB).

**METHODS**

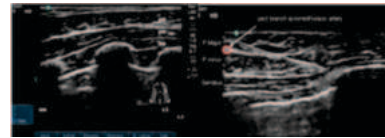
All cases satisfying the inclusion criteria were selected for the study. Informed consent obtained from them. This study is conducted by all proficient surgeons of this department. Pectoral Nerve Block is given just pre-operatively. The Surgical outcome is compared in terms of intraoperative difficulties and operative time, intraoperative bleeding, number of nodal yield, post operative analgesic requirement, ability to perform required shoulder exercises on post-op day 2, nodal yield and positive nodes, inadvertent injury, post operative complications.

All patients received PEC-II block post general anesthesia. Drug used for block was Inj. Ropivacaine 40ml + Inj. Dexamethasone 4ml, divided in 2 equal doses (20ml Ropivacaine and 2ml Dexamethasone in each injection). The local anesthetic should cover two important compartments of the fascias involved: The pectoral compartment with the pectoral nerves and the intercostal branches for the axilla and chest and hydrodissection is done.

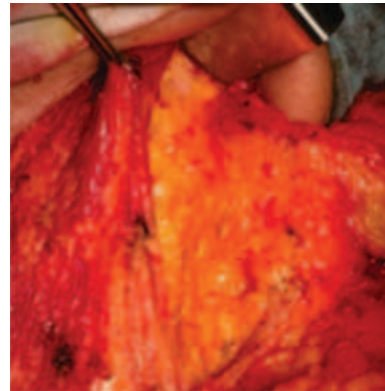
The nerve block is performed with the patient supine with the arm abducted 90 degrees. For the first injection between pectoralis major and pectoralis minor, the main landmarks to identify the point of injection under US guidance are the pectoralis major and pectoralis minor muscles and the pectoral branch of the thoracoacromial artery. The transducer is rotated slightly to allow an in-plane needle trajectory from the proximal and medial side toward the lateral side (i.e, the caudal border of the transducer is moved laterally, while the proximal border remains unchanged).This rotation helps image the pectoral branch of the thoracoacromial artery. The second injection is given at the anterior axillary line at the level of the fourth rib. The proper fascial plane is confirmed by hydrodissection to open the space between the pectoralis muscles and between pectoralis minor and serratus anterior. The depth is usually 1–3 cm for the first injection and 3–6 cm for the second injection.



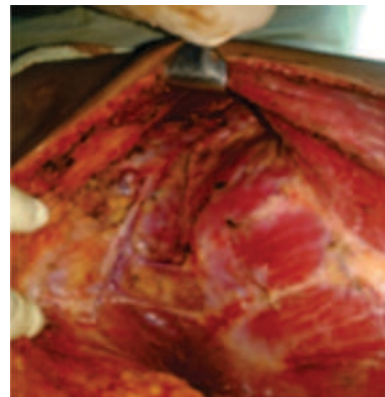
**Figure 1:** Pectoral region anatomy including nerves and vessels



**Figure 2:** First injection between the pectoralis major and pectoralis minor (a) and Second injection between pectoralis minor and serratus anterior (b).



**Figure 3:** Diffuse Axillary Edema post PEC-II block.



**Figure 4:** Adequate axillary nodes cleared despite axillary edema.

**Table-1** Demographic Details, Operative Time, Intra-op Bleeding, Nodal Yield, Positive Nodes, And Time Of Drain Removal (Mean And Standard Deviation)

	Mean	Std. Deviation
AGE(years)	56.23	11.44
OPERATIVE TIME(hrs)	2.96	0.51
INTRA-OP BLEEDING (ml)	125.00	33.97
NODAL YEILD	11.58	1.47
POSITIVE NODES	1.00	1.15
BMI	24.12	1.41
TIME OF DRAIN REMOVAL (on POD)	13.58	1.45

**Table-2** Frequency And Percentage Of N0 And N1 Status In All Cases

N		Frequency	Percent
	N0	24	60.0
	N1	16	40.0
	Total	40	100.0

**Table-3** Post-op Analgesia Requirement In All Patients

POST-OP ANALGESIC REQUIREMENT		Frequency	Percent
	NO	35	87.5
	YES	5	12.5
	TOTAL	40	100.0

**Table-4** Inadvertent Injury In All Patients

INADVERTENT INJURY		Frequency	Percent
	NIL	40	100.0

**Table-5** Shoulder Exercise On Post-op Day 2

SHOULDER EXERCISE ON POD-2	
----------------------------	--

	Frequency	Percent
NO	5	12.5
YES	35	87.5
Total	40	100.0

**Table-6** Postoperative Complications

POST-OP COMPLICATION			
	Frequency	Percent	
FLAP NECROSIS	1	2.5	
LYMPHEDEMA	1	2.5	
NIL	38	95.0	
Total	40	100.0	

**DISCUSSION**

Pectoral nerve blocks have been shown to provide efficacious analgesia after breast surgery.<sup>[6]</sup>

In the PECS II Block, an additional injection of local anesthetic is administered in the plane between the pectoralis minor and serratus anterior muscles.<sup>[6]</sup>

The aims of the PECS II Block are blockade of the lateral and median pectoral nerves at an inter-fascial plane between the pectoralis major and pectoralis minor muscles, long thoracic nerve, thoracic intercostal nerves from T2 to T6, and thoracodorsal nerve. An ultrasound guided PECS II Block is safer, easier and faster to operate, and has long analgesia.<sup>[6]</sup>

The PECS II Block guided by ultrasound applied to MRM can not only reduce intraoperative use of opioids, it has less of an effect on hemodynamics.<sup>[6]</sup>

Thus, for patients with comorbidities undergoing breast surgery, this strategy greatly reduces the risk of anesthesia, risk of postoperative complications and improves the postoperative quality of life of patients.<sup>[6]</sup> Recent studies have shown that the PECS II Block can prevent chronic pain 3 months after breast surgery.<sup>[6]</sup> Complications are rare with the use of ultrasound guidance, as the pleura and major blood vessels are visible throughout the procedure. The most common complications are pneumothorax, local anesthetic toxicity/allergy, vascular puncture and failed block.<sup>[7]</sup>

In this study outcome of modified radical mastectomy in breast cancer patient following pectoral nerve block was studied in terms of intra-op difficulty, operative time, intra-op bleeding, positive nodes, nodal yield, post-op analgesic requirement, shoulder exercise on pod-2, inadvertent injury, post-op complication and time of drain removal. In this study, modified radical mastectomy became a little tedious especially axillary lymph node dissection and clearance was difficult but it was subjective surgeon to surgeon. Experienced surgeons, who are used to doing the procedure found little change in difficulty level in axillary lymphatic clearance whereas less experienced surgeons found axillary clearance to be more difficult due to intraoperative diffuse axillary edema which is caused by PEC-II block.

In this study, the mean age of the patients is 56.23 years (+/- 11.44 years), mean operative time in this study is 2.96 hours (+/- 0.51 hours), mean intraoperative bleeding is 125 ml (+/- 33.97 ml), average nodal yield is 11.58 nodes (+/- 1.47) with average positive nodes in specimen is 1 (+/- 1.15). The average BMI of patients was 24.12 kg/m<sup>2</sup> (+/- 1.41) and average time of drain removal was on postoperative day 13.58 (+/- 1.45). The average operative time of modified radical mastectomy is 2.5-3 hours<sup>[8]</sup> and in our study mean operative time is 2.96 hours with standard deviation of 0.51 hours. There is no significant increase in operative time with increase in operative difficulty, although it is subjective surgeon to surgeon.

The average blood loss in a modified radical mastectomy is within 400 ml<sup>[9]</sup> and in this study the mean intraoperative blood loss is 125 ml with a standard deviation of 33.97 ml which is well within the average standards. The minimum number of lymph nodes that should be removed in and axillary lymph nodal clearance in a modified radical mastectomy is 10. In this study mean nodal yield is 11.58 nodes with standard deviation of 1.47 nodes which is well within the standards. The mean positive nodes in the specimen in this study is 1 node with standard deviation of 1.15.

Although there is slight increase in intraoperative difficulty during axillary nodal clearance which is most important in a modified radical

mastectomy, but irrespective of that there is no compromise in nodal clearance in all patients, but one, in this study. The average time of drain removal in a patient who has undergone modified radical mastectomy is 8-16<sup>th</sup> postoperative day<sup>[10]</sup> and in this study the mean time of drain removal is postoperative day 13.58 with a standard deviation of 1.45 which is well within the standards of routine care.

One of the aims of this study is to decrease the postoperative analgesia requirement which is significantly achieved in all patients. Table 3 shows that in this study, 87.5% of all patients (35 of 40) did not require postoperative analgesia till postoperative day 2 and only 12.5% of all patients (5 of 40) required postoperative analgesia before postoperative day 2.

Early shoulder exercise and free range motion of upper limb and shoulder is recommended in patients who have undergone modified radical mastectomy by postoperative day 2<sup>70</sup>. Table 5 shows that in this study, 87.5% of all patients (35 of 40) could do early shoulder exercise and free range motion of upper limb and shoulder by postoperative day 2 due to less postoperative pain. Only 12.5% of all patients (5 of 40) did shoulder exercise after postoperative day 2.

Table 4 shows that in all patients (40 of 40) there was no inadvertent injury irrespective of diffuse axillary edema and increased difficulty in lymphatic clearance in axillary dissection.

Irrespective of any comorbidities that patient was having or due to diffuse axillary edema and increased difficulty in lymphatic clearance in axillary dissection, there was only 2 of 40 (5%) patients that had complications like flap necrosis and lymphedema in axilla. Dangerous complications like pneumothorax, local anesthetic toxicity/anaphylaxis and vascular puncture were not encountered in this study. This may be credited to usage of ultrasound guidance to give PEC-II block to the patient.

**CONCLUSION**

The aim of this study is to decrease the postoperative pain and decrease the need of postoperative requirement of analgesia without any decrease in nodal yield, any significant intraoperative hemorrhage or inadvertent injury, ability of patient to perform free range of movement and shoulder exercise on postoperative day 2 and avoid any postoperative complications arising from MRM like flap necrosis, lymphedema of upper limb and complications of pectoral block like pneumothorax, local anesthetic toxicity/allergy and vascular puncture. The limitations of this study is small sample size to render the findings as standard of care.

**REFERENCES**

- 1) Diana PJ, Cultural views of the female breast, *ABNF J*, Jan-Feb, 2004; 1-2
- 2) Park K, Non communicable diseases: In Park K, (Ed) *Park's text book of preventive & social medicine*, 22<sup>nd</sup> edition, Jabalpur, MP, India Banarsidas Bhanot, 2013, PP: 352-361.
- 3) Sainsbury Richard, The breast: In Williams NS, Bulstrode CJK, O'Connell PR, (eds) *Bailey & Love's short practice of surgery*, 26<sup>th</sup> edition, NW, Taylor & Francis Group, 2013, PP 798-822.
- 4) Cahill CJ, Boulter PS, Gibbs NM, Price JL. Features of mammographically negative breast tumours. *Br J Surg*. 1981 Dec;68(12):882-4.
- 5) Dixon JM, Anderson TJ : FNAC in relationship to clinical examination and mammography in the diagnosis of a solid breast mass. *Br. J. surg* 1984; 71: 593-96.
- 6) Deng W, Fu D, He L. Evaluation of Pectoral Nerve Block in Modified Radical Mastectomy: Comparison of Three Concentrations of Ropivacaine. *Clin Interv Aging*. 2020;15:937-44.
- 7) Pectoralis Nerve Block Carter Battista; Sandeep Krishnan.
- 8) Velotti N, Limite G, Vitiello A, Berardi G, Musella M. Flap fixation in preventing seroma formation after mastectomy: an updated meta-analysis. *Updates Surg*. 2021 Aug 1;73(4):1307-14.
- 9) Mastectomy Blood Loss: Can We Predict the Need for Blood Transfusion? [Internet]. [cited 2024 Jul 22]. Available from:
- 10) Exercise to prevent shoulder problems after breast cancer surgery: the PROSPER RCT Julie Bruce, Bruno Mazuquin, Pankaj Mistry, Sophie Rees, Alastair Canaway, Anower ossain, Esther Williamson, Emma J Padfield, Ranjit Lall, Helen Richmond, Loraine Chowdhury, Clare Lait, Stavros Petrou, Katie Booth, Sarah E Lamb, Raghavan Vidya, Alastair M Thompson.