

Original Research Article

Preserving of intercostobrachial nerve relieves breast carcinoma patients from postmastectomy pain syndrome

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ABSTRACT

Background: Post-mastectomy pain syndrome (PMPS) is a complication experienced by majority of the patients who undergo breast surgery for cancer. The etiology of this chronic neuropathic pain syndrome seems to be complex and it is still understood below par. Injury to the intercostobrachial (ICB) nerve is presumed to be the dominant one for developing PMPS. This prospective study was designed to appraise the effect of preservation of intercostobrachial nerve on post-mastectomy pain syndrome and also to determine the most common anatomical variation of the intercostobrachial nerve during surgery.

Methods: A total of 100 patients were included in this study and were divided into 2 groups. Group A included patients with ICB nerve preserved and Group B patients with ICB nerve sectioned. The patients were evaluated for pain subjectively on the 2nd day, 1 month and in the 3rd month post-operatively by short form of McGill pain questionnaire and visual analog scale. During surgical dissection, anatomical variation of ICB nerve was ascertained each time.

Results: After 3 months, 68.2% of the patients were asymptomatic in Group A (ICB nerve preservation group) and 31.8% in the Group B (nerve section group) (chi-square test was applied and p value was 0.002). We found that type 1 anatomical variation was commonest with 87%.

Conclusions: Preservation of ICB nerve might greatly decrease the incidence of PMPS. Hence, the insight of the anatomical variations of this nerve is very crucial for the operating surgeons to preserve them and to prevent PMPS.

Keywords: Intercostobrachial nerve, Post mastectomy pain syndrome

INTRODUCTION

The breast cancer incidence rate in India as well as Western countries has risen in recent years.¹ With rising incidence and awareness, breast cancer is the commonest cancer in urban Indian females, and the second commonest in the rural Indian women.²

Chronic neuropathic pain after surgery for breast cancer is a common problem with prevalence rates ranging from 20-65%.³⁻⁵ Post-mastectomy pain syndrome is a

neuropathic pain condition following surgical treatment for breast cancer, including radical mastectomy, modified radical mastectomy and breast conservative surgery.⁶⁻⁸ The cause of PMPS probably has multi-factorial origin. ICB nerve injury is supposed to be the main cause.⁸ The pain characteristics include Paroxysms of lancinating pain against a background of burning; aching and tightening sensations.⁹⁻¹³ With increasing survival rates, improving the post-treatment quality of life assumes greater significance. In this context, chronic pain following breast cancer treatment is an under-recognized

problem. A study of chronic breast pain may help increase current awareness, identify the predisposing factors and improve management approaches by treating surgeons. The study outcomes may be useful for establishing guidelines for patient awareness, early diagnosis and treatment of the chronic pain.

Anatomical considerations

The innervation of the cutaneous and subcutaneous (adipose, lactiferous) structures of the breast is simple with somatic and preganglionic sympathetic innervation being supplied through the medial and lateral cutaneous branches of the ventral ramus of the third through sixth intercostal ramus. The lateral cutaneous branch of the 2nd intercostals nerve (T2) (intercostobrachial nerve) crosses the axilla to innervate the upper medial portion of the arm, axilla, and part of the anterior chest wall. Axillary dissection for breast cancer poses risks to the ICBN from stretches as well as from frank transection. With reference to earlier study conducted by Cunnick et al. there are six anatomical variations of ICB nerve.¹⁴

Classification of the pain after breast surgery

Jung et al distinguished four different types of chronic neuropathic pain following breast cancer due to surgical trauma.¹⁵

- Phantom Breast Pain is experienced in the area of the removed breast.
- Intercostobrachial Neuralgia pain is often accompanied with sensory changes in the distribution of the intercostobrachial nerve following breast cancer surgery with or without axillary dissection. Cunnick et al revealed a wide variation of size, location and branching of the intercostobrachial nerve which may explain the high risk of damage to these nerves irrespective of surgical approach.¹⁶ Post-mastectomy pain syndrome consists of pain and sensory changes localized to the axilla, medial arm, and/or anterior chest wall on the ipsilateral side of the surgery. Damage to the intercostobrachial nerve has been indicated as the most common cause for developing PMPS.^{9,15}
- Neuroma pain (including scar pain) is the pain in the region of a scar on the breast, chest, or arm that is provoked or exacerbated by percussion. A neuroma is formed from masses of tangled axons formed at the cut end of peripheral nerves. Neuroma trapped in scar tissue has shown to cause chronic neuropathic pain, spontaneous pain and severe sensitivity to pressure on the breast surgery area.
- Other nerve injury pain results from damage to the medial/lateral pectoral, long thoracic or thoracodorsal nerve.

Reduction in the axillary morbidity by preserving the intercostobrachial nerve during axillary node clearance for breast cancer had been claimed in several non-

randomized studies.¹⁷ The only prospective randomized study to have examined this relationship found no difference in symptoms between both groups (ICB nerve preserved and sectioned groups) three months postoperatively, but the sensory deficit remained larger when the ICB nerve was divided.¹⁸ The authors considered this needs more studies, hence the preset study.

Several other factors seem to increase the risk of developing PMPS after breast cancer surgery including, younger age at diagnosis, a larger tumor size, level of axillary node invasion and use of chemotherapy and/or radiation therapy. Post-operative complications such as bleeding, infection or seroma formation may also increase the risk of developing PMPS. Surgical techniques also play an important role in PMPS, particularly those that routinely remove the intercostobrachial nerves.^{8,19}

By this study our aim is to evaluate various risk factors leading to PMPS and to assess the impact of the preservation of the ICB nerve on postmastectomy pain syndrome and also to determine the most common anatomical variations of the intercostobrachial nerve.

METHODS

This was an prospective study which was conducted on Patient admitted and operated for carcinoma breast in department of General Surgery, Government Medical College, Kozhikode, Kerala, India from April 2014 to October 2015 for total of 18 month with sample size of 50 Subjects (patients with nerve preserved) and 50 Controls (patients with nerve divided).

Inclusion criteria

- Unilateral disease
- Early disease (upto stage IIB)
- Biopsy or FNAC proven breast carcinoma
- No previous axillary surgery

Exclusion criteria

- Advanced disease (beyond stage IIB)
- Bilateral and recurrent diseases
- Lost in follow up
- Patients receiving neo adjuvant chemotherapy or radiotherapy
- Angina pectoris

Methodology

After surgery, the cases and controls were evaluated for pain on the 2nd day, 1 month and in the 3rd month post-operatively. Chronic pain was defined as any kind of pain in ipsilateral breast, chest wall, shoulder, arm or axillary region, persisting for at least 3 months after termination

of surgery and adjuvant therapy. Pain characteristics were assessed in detail using the Short Form McGill Pain Questionnaire (SF-MPQ). It is a 15-item form of the longer McGill Pain questionnaire.²⁰ The SF-MPQ consist of 15 descriptors (11 sensory; 4 affective) which are rated on a 4-point intensity scale as 0=none., 1=mild, 2=moderate or 3=severe.

Three pain scores are derived from the sum of the intensity rank values of the words chose for sensory, affective and total descriptors. The SF-MPQ also includes the Present Pain Intensity (PPI) index of the standard MPQ and as visual analogue scale (VAS). Evidence for validity in cancer pain has been established.^{21,22} This questionnaire was used to characterized the similarities and differences in chronic pain descriptions. Site of pain was recorded each time.

The last evaluation in the 3rd month was based on studies showing that alternations of pain sensitivity in the arm at

this time are persistent and didn't present significant difference further down the lane. And the anatomy of the nerve was described in the patients of both groups. The nerve trunk was identified medially where it emerged from the intercostal spaces. The intercostals spaces from which nerves arose were obtained by counting down from the 2nd rib which was an easily palpable landmark during surgery.

RESULTS

Table 1 shows Comparison of short form of McGill pain questionnaire (SFMPQ) scores @ 3 months between stages of breast carcinoma. Chi-square test was applied and P value of 0.012 was obtained which is statistically significant as the stage at diagnosis is higher the chance of post mastectomy pain syndrome after breast surgery for carcinoma breast increases. It might be due to increased chance of lymphatic spread making axillary dissection difficult during surgery.

Table 1: SFMPQ scores @ 3 Months against stage of breast cancer.

Stage of Breast Ca		SFMPQ @ 3 Months			Total
		Mild sensory	Moderate sensory	NIL	
IIA	Count	6	4	18	28
	% within SFMPQ @ 3 Months	13.3%	36.4%	40.9%	28.0%
IIB	Count	39	7	26	72
	% within SFMPQ @ 3 Months	86.7%	63.6%	59.1%	72.0%
Total	Count	45	11	44	100
	% within SFMPQ @ 3 Months	100.0%	100.0%	100.0%	100.0%

Table 2: SFMPQ scores @ 3 Months against ICB nerve status.

ICB NERVE Status		SFMPQ @ 3 Months			Total
		Mild sensory	Moderate sensory	NL	
Preserved	Count	14	6	30	50
	% within SFMPQ @ 3 Months	31.1%	54.5%	68.2%	50.0%
Not preserved	Count	31	5	14	50
	% within SFMPQ @ 3 Months	68.9%	45.5%	31.8%	50.0%
Total	Count	45	11	44	100
	% within SFMPQ @ 3 Months	100.0%	100.0%	100.0%	100.0%

Table 2 shows Comparison of short form of McGill pain questionnaire (SFMPQ) scores @ 3 months ICB nerve status. Chi-square test was applied and p value obtained was 0.002 which is statistically very much significant.

Preservation of intercostobrachial nerve is very important in preventing the development of post mastectomy pain syndrome. This nerve is usually cut during axillary dissection to achieve proper clearance of axillary lymph nodes. Enhanced care should be given to preserve this nerve and one should know the anatomical variation in anatomy of this nerve.

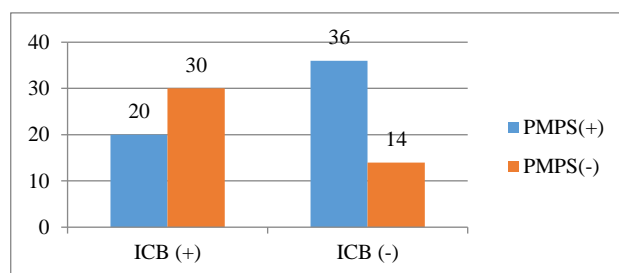


Figure 1: SFMPQ Scores @ 3 months against ICB nerve status.

Table 3 shows Comparison of short form of McGill pain questionnaire (SFMPQ) scores @ 3 months between complications. Chi-square test was applied and p value obtained was 0.000 which is statistically very much

significant. It implies that development of complication in early post op period plays important role in development of post mastectomy pain syndrome.

Table 3: SFMPQ scores @ 3 months against complication.

Complications		SFMPQ @ 3 Months			Total
		Mild sensory	Moderate sensory	NL	
Wound infection	Count	5	0	0	5
	% within SFMPQ @ 3 Months	11.1%	0.0%	0.0%	5.0%
Seroma	Count	10	7	0	17
	% within SFMPQ @ 3 Months	22.2%	63.6%	0.0%	17.0%
None	Count	30	4	44	78
	% within SFMPQ @ 3 Months	66.7%	36.4%	100.0%	78.0%
Total	Count	45	11	44	100
	% within SFMPQ @ 3 Months	100.0%	100.0%	100.0%	100.0%

Table 4: Anatomical variations Of ICB nerve.

Type of variation	Frequency	Percentage
Type I	80	80
Type II	17	17
Type III	3	3
Type IV	0	0
Type V	0	0
Type VI	0	0
TOTAL	100	100

Table 4 shows distribution of study participants in relation to variation in anatomy of intercostobrachial nerve (ICB nerve), during our study majority of them 80 percent had type I.

Next commonest variation being type II around 17%, and only 3 percent of participants had type III variation. Even though there are a total of six types anatomical variation of ICB nerve as proposed by Cunnick et al, we did not find any type IV/ type V/ type VI variation in our study.¹⁴

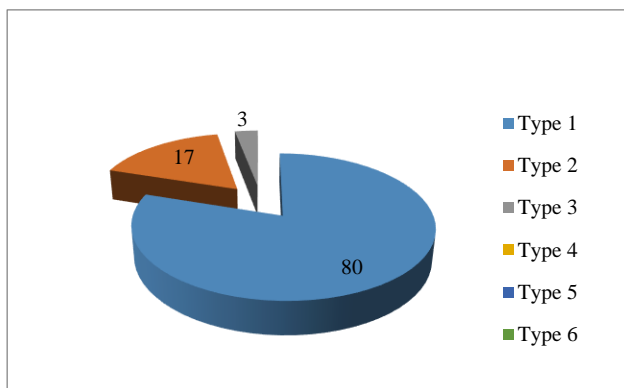


Figure 2: Anatomical variation in ICB nerve.

DISCUSSION

The reported incidence of PMPS is 20% to 65%. PMPS is largely underestimated and unaddressed area after breast surgery especially in our country because of lack of proper follow up and awareness. The main reason seems to be the injury to the ICB nerve during axillary dissection, because of the concern with adequacy of axillary clearance, surgical difficulty involved, and partly because of their underestimation of clinical advantages of preserving it. Advantages from preserving the ICB nerve have been identified in several non-randomized studies.²³⁻²⁵ ICBN is encountered during exposure of the long thoracic and thoracodorsal nerves, hence careful dissection of these nerves is therefore essential to its preservation.^{25,26} Considering the post-operative benefits resulting from ICB nerve preservation, there is a surge towards preservation of ICBN during axillary surgery.¹⁴

In this study, 20/50 (40%) in the ICB nerve preservation group and 36/50 (72%) in the ICB section group were having post-mastectomy pain syndrome 3 months postoperatively. although we found significantly more symptomatic patients in the nerve section Group, we also had 40% patients symptomatic in the nerve preservation group. A probable explanation could be as a result of an unrecognized operative trauma to the nerve due use electrocautery and improper handling of the nerve, although it is said to be transient as found in majority of the studies.^{23,24,27} The etiology of PMPS is multifactorial. The risk factors include younger age, increased body mass index, pre-operative pain, depression, anxiety, postoperative chemotherapy, radiotherapy, post-operative hematoma, and seroma formation, apart from ICB nerve injury.²⁸ In present study, we found that PMPS was more common in patients of higher stage of disease. There are no clear associations observed with chemotherapy, radiotherapy due to short term follow up and post-

operative treatment guidelines were same for patient in both groups to keep this parameter constant. In present study also, we found younger women (<40years) reported post mastectomy pain syndrome more than women more than 40 years. Other studies also suggested that younger age as predisposing factor for PMPS.^{4,8,31}

The age effect could be due to more extensive efforts at axillary dissection and clearance in younger women and also aggressive character of disease in this group. A benefit of preservation of the ICB nerve has been reported in several descriptive studies and includes a reduction in postoperative pain, improved sensation and reduced arm stiffness.^{24,28-30} The course of the nerve is important for the surgeon. Cunnick et al described that the anatomy of the ICB nerve in the axilla is highly variable.¹⁴ He had grouped it into the six variants as mentioned above. In present study we have only observed three types of variations in the course of the ICBN and the most common variation being type 1.

CONCLUSION

Present study has shown that preservation of intercostobrachial nerve is advantageous and a way to reduce the incidence of developing post-mastectomy pain syndrome following surgery for breast cancer. The knowledge of various variations of this nerve is very important for the operating surgeons. It is also important to discuss with the patients about the risk of developing PMPS ahead of surgery.

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