International Journal of Health Sciences and Research
www.ijhsr.org ISSN: 2249-9571

Original Research Article

Preservation of Intercostobrachial Nerve during Mastectomy in Patients of Breast Cancer

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ABSTRACT

Background: Breast cancer is the leading type of cancer in women, accounting for 25% of all cases. One in every eight women developed breast cancer of which approximately 60 percent are to be treated surgically for primary breast tumour resection and axillary lymph node staging. Since more and more patient are surviving breast cancer as a result of progress in diagnosis and treatment, the population at risk for chronic pain and other late complications can therefore be expected to increase in coming years.
Aims and Objectives: Role of preservation of intercostobrachial nerve in the postoperative morbidity of patients of modified radical mastectomy, incidence of successful preservation of intercostobrachial nerve and factors responsible for division of the intercostobrachial nerve in modified radical mastectomy for breast cancer.
Materials and Methods: A total of 30 patients with a histological diagnosis of breast cancer and an indication for modified radical mastectomy were included. The 19 patients in whom the attempt was successful were treated as Case group while the Control group consisted of 11 patients in whom the attempt to preserve the nerve remained unsuccessful.
Results: In our study, 6 (20%) patients had a clinical staging of T1N0, only 1 (3.3%) had T1N1, 10 (33.3%) had stage T2N0 while 13 (43.3%) patients had T2N1 stage breast cancer ($p > 0.05$). An average of 13.03±5.28 lymph nodes were harvested per patient, the mean in control group (13.18±5.01) being slightly higher than case group (12.95±5.56) though the difference was statistically non-significant ($p > 0.05$). The sensory symptoms decreased with time in both the groups. On 42nd day follow up, 16 (53.3%) patients were symptomatic, 8 (72.7%) from the control group and 8 (42.1%) from case group, the difference was statistically significant (0.034) implying decreased sensory symptoms at the end of 6 weeks on preservation of intercostobrachial nerve. Pain was the commonest (50%) sensory symptom observed followed by numbness (40%), for the entire study population on 42nd day assessment. Neuropathic pain was seen in 30% of all the patients ($p < 0.05$). Anaesthesia was the commonest (33.3%) sensitivity alternation observed followed by hypoesthesia (23.3%).
Conclusion: Preservation of intercostobrachial nerve during modified radical mastectomy leads to a statistically significant decrease in the postoperative sensory symptoms including numbness and neuropathic pain, as well as sensory deficits including anaesthesia and hypoaesthesia, thereby, reducing the postoperative morbidity of the patients without compromising the axillary clearance (in stages upto T2N1) or increasing the incidence of postoperative complications.

Keywords: Intercostobrachial, Mastectomy, Breast Cancer

INTRODUCTION

Worldwide, breast cancer is the leading type of cancer in women, accounting for 25% of all cases. [1] One in every eight women developed breast cancer of which approximately 60 percent are to be

treated surgically for primary breast tumour resection and axillary lymphnode staging. Since more and more patient are surviving breast cancer as a result of progress in diagnosis and treatment, the population at risk for chronic pain and other late complications can therefore be expected to increase in coming years. This has effectively increased the number of women for whom post-treatment quality of life is important. Chronic pain following treatment for breast cancer surgery is a significantly under-recognised and under-treated problem.

The complications resulting from axillary lymnphadenectomy include chronic pain, lymphedema, limitations to shoulder flexion and range of motion, winged scapula, atrophy of the thoracic and shoulder muscles and paresthesia and numbness of the upper limb due to nerve lesions. [2-4] Postoperative sensations reported by patients can be transient or long lasting and can include pain, phantom sensations and sensory loss.

Chronic pain following surgical procedures for breast cancer was once thought to be rare. The results of recent studies, however, suggested that its incidence may be over 50%. [5-7] Chronic pain can be a source of considerable disability and psychological distress in patients undergoing surgical treatment for breast cancer. Persisting pain is an additional burden for individuals already suffering from many psychosocial and medical stressors. [8-10]

Nephropathic pain is the most prevalent type of chronic pain and it may be derived from breast cancer, breast cancer surgery and non-surgical treatment. The pain characteristics include paroxysms of lancinating pain against a background of burning, aching and tightening sensations. [11-13] At times the pain is also described to the vague, dull aching in nature.

The surgery related pain syndromes present as pain in the surgical scar, chest wall and upper arm, as well as shoulder discomfort and phantom breast dysesthesias and paresthesias. Other neuropathic pain syndromes that may add to functional impairment include tumour recurrence pain, paraneoplastic processes, complex regional pain syndrome, chemotherapy associated neuropathy (especially paclitaxel), radiation plexitis and plexopathy. [14]

A recent term coined in this regard is post-mastectomy Pain syndrome. [15,16] Post-mastectomy pain syndrome (PMPS) is experienced by 20-65% of the patients who undergo surgery for breast cancer. It is a neuropathic pain condition that can follow surgical treatment for breast cancer, including radical mastectomy, modified radical mastectomy and segmental mastectomy (lumpectomy). It is thought to develop from surgical nerve damage especially in mastectomy patients undergoing axillary dissection. However, several other factors can be hypothesized to increase the risk of developing PMPS after breast cancer surgery, including younger age at diagnosis, a larger tumor size and axillary node invasion. Chemotherapy and radiotherapy can be the additional sources of pain and related symptoms in such patients and make the diagnosis of PMPS difficult. Postoperative complications such as bleeding, infection or seroma formation have also been reported to increase the risk of developing PMPS.

MATERIALS AND METHODS

The present prospective study was conducted in the Department of General Surgery, Pt. B.D. Sharma PGIMS, Rohtak. A total of 30 patients with a histological diagnosis of breast cancer and an indication for modified radical mastectomy were included. Preservation of the main trunk of intercostobrachial nerve was attempted in all the patients during the surgery. The 19 patients in whom the attempt was successful were treated as Case group while the Control group consisted of 11 patients in whom the attempt to preserve the nerve remained unsuccessful.

The protocol was approved by the Institutional Review board and all of the

women signed an informed consent statement before entering the study. All patients underwent full clinical examination and all relevant investigations including PAC investigations, breast ultrasonography, mammography and FNAC or core needle biopsy. The preoperative state of the patients including pain and psychological aspects was assessed and no patient complained of pain preoperatively. Patients underwent modified radical mastectomy by Auchincloss technique in which pectoralis major and minor were preserved. Interpectoral lymph nodes were exposed, dissected and excised, with preservation of the lateral pectoral nerve supplying pectoralis major, pectoralis minor was retracted medially for exposure of intercostobrachial nerve and medial pectoral nerve that were preserved and then pectoralis major and minor were retracted medially for complete axillary evacuation up to the level II. In both Cases and Control groups, wounds were closed after placement of wound and axillary drains. All patients underwent smooth operative procedures with no intraoperative complications. Successful complete axillary clearance was achieved in all cases without impending insult to any important axillary structure or any noticeable difficulty. The results illustrated the feasibility of complete axillary evacuation even with intercostobrachial nerve preservation. In case of any adhesion of the intercostobrachial nerve with the enlarged axillary lymph nodes or any hindrance in adequate axillary clearance the idea of nerve preservation was given up. In case of enlarged and fixed axillary lymph nodes found intraoperatively, the patients were excluded from the study considering them of higher stage (N2) and nerve resection and complete axillary clearance were carried out.

Immediate postoperative care was provided in postoperative care unit and patients were shifted to general surgical ward after two hours of observation. They received postoperative analgesia in form of intramuscular diclofenac 12 hourly initially and oral diclofenac 12 hourly Its postoperative day onwards. Patients having severe acute postoperative pain requiring greater use of analgesics were given tramadol in first 7 days of surgery. Cannulation of the ipsilateral limb was avoided. Arm exercises were started after 48 hours surgery. All patients were discharged 23 hours after removal of both the drains. Wound care and follow up was conducted. After wound healing and removal of stitches patients were scheduled for radio and/or chemotherapy. Patients were reassessed on 7^{th}, 28^{th} and 42^{nd} after surgery sensory symptoms and sensory deficit subjectively by a questionnaire and objectively by neurological examination respectively.

Objective assessment, examination of sensitivity to touch and prick was done by means of cotton wool and a pin respectively. In order to ensure that the symptoms and signs were due to injury to intercostobrachial nerve, the sensory symptoms and clinical examination were restricted to the specific dermatome supplied by the intercostobrachail nerve only. DN4 questionnaire was applied and a score of 1 was given to each positive answer and a score of 0 to each negative reply. The total score was calculated as the sum of the 10 answers, a minimum score of 4/10 ensuring that the pain was neuropathic in origin.

Statistical methods

Data was statistically analyzed by using SPSS 20.0 statistical software.

OBSERVATIONS

Out of a total 30 patients, preservation of the main trunk of intercostobrachial nerve was attempted in all the patients but the attempt was successful in 19 patients (Case group) only. Out of 11 patients having their intercostobrachial nerve divided (Control group), the division was accident in 3 (27.3%) while in 8 (72.7%) it was done in order to facilitate better access to axilla for satisfactory axillary clearance.

Mean age for all the 30 patients was 52.23±9.05 years and median age was 51 years with the minimum age being 35 years and maximum being 76 years. Though the mean age of Case group (51.21±8.80 years) was lower than control group (54±9.62 years), the difference was statistically not significant (p>0.05).

In our study, 6 (20%) patients had a clinical staging of T1N0, only 1 (3.3%) had T1N1, 10 (33.3%) had stage T2N0 while 13 (43.3%) patients had T2N1 stage breast cancer (p >0.05). An average of 13.03±5.28 lymph nodes were harvested per patient, the mean in control group (13.18±5.01) being slightly higher than case group (12.95±5.56) though the difference was statistically non-significant (p>0.05).

The sensory symptoms decreased with time in both the groups. On 42nd day follow up, 16 (53.3%) patients were symptomatic, 8 (72.7%) from the control group and 8 (42.1%) from case group, the difference was statistically significant (0.034) implying decreased sensory symptoms at the end of 6 weeks on preservation of intercostobrachial nerve. Pain was the commonest (50%) sensory symptom observed, followed by numbness (40%), for the entire study population on 42nd day assessment. Neuropathic pain was seen in 30% of all the patients (p <0.05). Persisting pain on 42nd day assessment had a major neuropathic component irrespective of the intraoperative preservation or division os intercostobrachial nerve (p >0.05).

Younger age and higher stage of the disease (upto stage T2N1) were ruled out as risk factors for the development of neuropathic pain in our study in both the groups.

Association of severe acute postoperative pain with later development of neuropathic pain, the results were statistically highly significant (p<0.001) implying severe acute postoperative pain to be an indicator of later development of neuropathic pain.

Thirteen patients (43.3%) suffered from postoperative complications, seroma being the commonest occurring in 40% patients.

The sensory deficit due to neuropathy increased with time in our study. 17 (56.7%) on 42nd day follow up had sensory deficit 8(42.1%) from the Control group and 9 (81.8%) from Case group. Anaesthesia was the commonest (33.3%) sensitivity alternation observed followed by hypoesthesia (23.3%).

DISCUSSION

Our study was not restricted to female patients, but in due course of time it was realised that only three male patients were diagnosed and treated for breast cancer in the entire study period, all of them having staging higher than T2N1 and were give neoadjuvant chemotherapy, excluding them from the study. Also, all the 30 surgeries were carried out by the same surgical team so that the postoperative findings would not vary due to any difference in surgical techniques. The last follow up was done on day 42nd as after that patient compliance for follow up was poor due to their postsurgical treatment continuation i.e. in Radiotherapy department and not general surgery. Also, with the effects of chemotherapeutic drugs and radiotherapy as confounding factors, it was really difficult to access the role of preservation of intercostobrachial nerve during surgery in the postoperative sensory symptoms and deficits independently, any later than 6 weeks postoperative period.

Out of 30 patients, preservation of the main trunk of intercostobrachial nerve was attempted in all the patients, 19 patients in whom the attempt was successful were treated as Case group while the control group consisted of 11 patients in whom the attempt to preserve the nerve remain unsuccessful. The incidence of successful preservation of the main trunk of intercostobrachial nerve was 63.33%. This is in accordance with Abdullah's study in which the rate of preservation was 65%. [17] In the remaining 11 cases, intercostobrachial nerve was divided in 8 (72.7%) to allow

adequate axillary clearance and in 3 (27.3%) accidently during axillary dissection.

The axillary lymph node dissection was done up to level 2 and for a total of 30 patients included in the study, an average of 13.03±5.28 lymph nodes were harvested per patient, the mean in Control group (13.18±5.01) being slightly higher than Case group (12.95±5.56). Since the axillary status is considered the most important isolated prognostic factor of breast cancer, any procedure that would interfere with axillary clearance could have a negative impact on disease treatment. In the present study, no significant difference were found regarding the number of lymph nodes harvested (p=0.909). This is in accordance with the studies done by earlier researchers Torresan and Ivanovic who found no statistically significant difference in the number of lymph nodes harvestdd between the intercostobrachial nerve preservation and division group, thereby, reinforcing the safety of intercostobrachial nerve preservation in early breast cancer surgeries without compromising the curative intent. [18]

In the three evaluations for sensory symptoms in the intercostobrachial nerve area, the sensory symptoms showed a decreasing trend with passage of time as the wounds healed with 93.3% of patients being symptomatic on Ist evaluation on day 7 which reduced to 53.3% on 42nd day assessment. This figure agrees with the study done by Wallace according to which 56% of the patients undergoing mastectomy were symptomatic but the assessment in that study was done after 12-72 months of follow up, irrespective of the division of the intercostobrachial nerve in majority of the cases. [19]

Pain (nonspecific pain, comprising of both nociceptive and neuropathic components) was the commonest (50%) sensory symptom observed followed by numbness (40%) on 42nd day assessment. On further analysis of pain, neuropathic pain was seen in 30% of all the patients. Other symptoms like decreased sensation and altered sensation were much less frequently seen.

The incidence of neuropathic pain was statistically significant different between the two groups in all the three examinations, risk of developing neuropathic pain being 3.46 times higher after division of the nerve at the end of the study (RR ratio 3.46 on 42nd day assessment). The assessment of the various sensory symptoms on three successive evaluations implied that the sensory symptoms decreased with the passage of time and were significantly lower in frequency in the intercostobrachial nerve preservation group than the division group, as concluded in Torresan's randomised controlled trial also. [4]

Etiology of intercostobrachial neuralgia, however, remained a matter of debate and could not be relied only on damage to intercostobrachial nerve nor was found to be present in every case of nerve injury. In the current study, the nerve was preserved in 19 of 30 patients but neuropathic pain occurred in 3 patients out of these 19 patients, while neuropathic pain was absent in 5 of the 11 patients of the Control group even after division of the intercostobrachial nerve. This signified that other factors could operate in the development of pain even after nerve preservation or absence of pain after nerve division. A possible explanation could be neuropathy in the region of the intercostobrachial nerve following its conservation, possibly as a result of an operatively traumatised nerve, although it is said that neuropathy following intercostobrachial nerve conservation is transitional and found in the majority of the studies. [20,21]

In control group patients, the extensive nerve injury during modified radical mastectomy may provide wide areas of hypoesthesia thus decreasing the frequency of pain sensation in pain free patients with documented intercostobrachial nerve division. [22]

Several studies suggest that younger patients are at greater risk, others find no relationship between age and pain after breast surgery. [23,24] Importantly, breast cancer patients under 35 years of age have a poorer prognosis as age independently predicts increased relapse and decreased survival. [25]

Neuropathic pain was absent in all 11 patients having no history of postoperative complications with preserved intercostobrachial nerve. This implies that postoperative complications could have a bearing on the later development of neuropathic pain in patients whom neuropathic pain developed despite preservation of intercostobrachial nerve as has already been suggested in a few studies. [19]

Numbness was the 2nd most common sensory symptom after pain, seen in 12 (40%) out of 30 patients on 42nd day follow up. Though the differences were statistically non-significant between the two study groups on the 7th day examination, the difference became statistically significant on 28 and 42nd day assessment implying lower incidence of numbness on preservation of intercostobrachial nerve as has been found in numerous previous studies. [17]

Anaesthesia was the commonest (33.3%) sensitivity alternation observed followed by hypoesthesia (23.3%). The differences in their individual prevalence between the two groups were statistically non significant ($p>0.05$). Smaller study size along with the shorter duration of follow up seemed to be the limiting factor and made it difficult to assess the frequency and statistical significance of each sensory deficit individually. Thus, it was seen that the observations made were, in general, in favour of the preservation of intercostobrachial nerve during breast cancer surgery, although the constraints of the limited time, for assessment and follow up of the patients and the small size of the study population did reflect on some of the assessments and observations.

CONCLUSION

Preservation of intercostobrachial nerve during modified radical mastectomy leads to a statistically significant decrease in the postoperative sensory symptoms including numbness and neuropathic pain, as well as sensory deficits including anaesthesia and hypoaesthesia, thereby, reducing the postoperative morbidity of the patients without compromising the axillary clearance (in stages upto T2N1) or increasing the incidence of postoperative complications. Successful preservation of intercostobrachial nerve is possible in majority of the patients. In our study, it could be done in 63.33% of the patients. The most common reason for division of intercostobrachial nerve is to facilitate adequate axillary clearance.

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How to cite this article: Mishra N, Nityasha, Sharma P et al. Preservation of intercostobrachial nerve during mastectomy in patients of breast cancer. Int J Health Sci Res. 2017; 7(4):61-67.

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