International Surgery Journal
John J et al. Int Surg J. 2021 Jan;8(1):176-179
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: https://dx.doi.org/10.18203/2349-2902.isj20205877

Original Research Article

A prospective observational study on lymph node mapping of sentinel lymph node biopsy using methylene blue in carcinoma breast

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Received: 05 October 2020
Revised: 22 November 2020
Accepted: 03 December 2020

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ABSTRACT

Background: Modern screening methods has made it possible to diagnose breast cancer in as early stage as possible and axillary lymph node status is still the most important prognostic indicator in carcinoma breast. In this study we are trying to analyse the preference of lymph nodal staining in SLNB using methylene blue in early breast cancer, so that surgeons will be more aware of anatomical positions of the stained nodes, thus favouring more precise dissection, reducing the morbidity.
Methods: This was a prospective observational study conducted in the Department of General Surgery, Government Medical College, Kottayam. All cases of clinically N0 carcinoma breast undergoing modified radical mastectomy were included. We injected 3 ml of methylene blue in the subareolar region in three places depending on the quadrant in which tumour was situated, before putting the skin incision for modified radical mastectomy and the pathologist segregated the stained lymph nodes after confirming the anatomical locations.
Results: The study here was diagnostic test evaluation and the diagnostic test being evaluated was sentinel lymph node biopsy using methylene blue. Commonest group of lymph nodes, where sentinel lymph nodes were identified were anterior group (30 out of 34 sentinel lymph nodes).
Conclusions: Though sentinel lymph node biopsy using methylene blue is not a fool proof method; knowing the mode of methylene blue flow i.e., anterior more than central and then posterior group of lymph nodes will definitely reduce the morbidity involved, and above all saving time of the surgery.

Keywords: Anterior axillary lymph nodes, Methylene blue, Sentinel lymph nodes

INTRODUCTION

Carcinoma breast is one of the most common malignancies in women of perimenopausal age in urban India and second most in rural India. Modern screening methods like mammography and self-awareness has made it possible to diagnose carcinoma breast as early as possible and axillary lymph node status is the most important prognostic indicator in carcinoma breast till now. But Axillary dissection is not beneficial in 70-80% of early breast cancer patients who are clinically node negative.[1] A promising alternative to assess axillary lymph node status in early breast cancer patients is sentinel lymph node biopsy (SLNB). The definition of SLN in carcinoma breast is the lymph node most likely to harbour metastases if they are present. The assumption of the procedure is that if SLN is negative, all other axillary lymph nodes will be negative. Thus the technique of SLNB was developed to provide surgeons with information that allows axillary dissection to be avoided if SLN is negative, which is less invasive and with minimum morbidity. We performed SLNB study using methylene blue dye in clinically N0 breast cancer patients. Doing a sentinel node study using methylene blue perioperatively can predict the presence or absence of metastasis in axillary nodes of clinically N0 cases of

breast carcinoma, thus avoiding an axillary dissection and complications related to it. Here in this study our objective is to analyse the preference of lymph nodal staining in sentinel node biopsy using methylene blue in early breast cancer, so that surgeons will be more aware of anatomical positions of stained lymph nodes (anterior, posterior or central groups of lymph nodes) thereby, doing more precise dissection for finding out sentinel lymph nodes. The sample size was calculated based on study by Ramamani et al.[2]

METHODS

After obtaining written informed consent from 40 clinically N0 carcinoma breast admitted for modified radical mastectomy in the Department of General Surgery, we injected 3 ml of methylene blue in the sub areolar region in three places depending on the quadrant in which tumour is situated, before putting the skin incision for modified radical mastectomy. Thorough massaging was done for 5-7 minutes in clockwise manner. Then mastectomy was carried out and axilla was entered. Complete axillary clearance done as in modified radical mastectomy. After the modified radical mastectomy we sent the specimens for histopathological analysis after noting down the different anatomical groups (anterior/posterior/central). The pathologist will segregate the stained lymph nodes after confirming the anatomical locations, study and report them separately along with all the dissected axillary lymph nodes during the surgery.

Inclusion criteria

All cases of clinically N0 carcinoma breast undergoing modified radical mastectomy (MRM) in Department of General surgery during the study period of one year.

Exclusion criteria

All the patients with active skin infection over breast and axilla, palpable axillary lymph nodes, and those patients who underwent neoadjuvant chemotherapy or radiotherapy.

No limitations were expected and the principal investigator collected the data and analyzed them with the help of SPSS. There was no funding agency.

RESULTS

The study here is diagnostic test evaluation and the diagnostic test being evaluated is sentinel lymph node biopsy using methylene blue. Commonest group of lymph nodes, where sentinel lymph nodes were identified are anterior group (30 out of 34 sentinel lymph nodes) (Figure 1). There are 3 cases of central and 1 case of posterior group of nodes. The group of lymph nodes identified as sentinel lymph nodes are shown in Table 1. Of the 22 sentinel lymph node positive for metastasis 16 were found to be anterior, 3 in central, 1 in posterior and none in other groups (Table 2). Number of sentinel nodes ranged from 1 to 3 with median 2.43.

Methylene blue stained anterior axillary lymphnodes.

Figure 1: Showing commonly involved anterior node close to medial pectoral neurovascular bundle.

Table 1: Group of axillary lymph nodes identified as sentinel lymph node.

Group	Total	Percentage
Nil	6	15
Anterior	30	75
Central	3	7.5
Posterior	1	2.5

Table 2: Malignant cells in sentinel lymph nodes detected.

Group	SLN	HPR+
Anterior	30	16
Central	3	6
Posterior	1	0

DISCUSSION

Though axillary lymph node status is the most important prognostic indicator in early breast carcinoma, controversies are existing over the role of axillary dissection in the management of operable carcinoma breast. In patients with small (<1 cm) invasive primary carcinoma breast who are at a less than 10% risks for axillary nodal metastasis, trials are ongoing to eliminate axillary lymph node dissection. Also in patients with microscopic axillary metastasis cure may be possible with adjuvant chemotherapy with or without nodal irradiation in the absence of axillary dissection. There are also many advocates for abandoning axillary dissection in early breast carcinoma. And axillary lymphadenectomy results in significant morbidity like chronic lymphoedema of ipsilateral extremity (3-12%), frozen shoulder syndrome and long term sensory abnormalities.[3-6] The sentinel lymph node (SLN) biopsy concept represents a biological model that assumes the presence of a specific afferent lymphatic drainage pathway from the primary tumour to a

principal, "sentinel", lymph node in the regional lymphatic basin.[7,8]

Axillary sampling has been highly unreliable as the procedure gives a high rate of false negative sampling.[9] It has been shown that 30% of women with positive lymph nodes have metastasis in level II and III when the level I nodes are negative. Therefore, sampling a few nodes in low axilla is insufficient, and there is a possibility that inadequate surgery will under stage the axilla. Consequently, the patients who are node positive may be left alone unrecognised and untreated which may lead on to increased axillary recurrence rates. Other non-invasive techniques have also been evaluated and clinical evaluation has been shown to be unreliable in demonstrating the presence of axillary metastasis. Ultrasonography has also been used to demonstrate the axillary lymph nodal status but although it is more accurate than clinical evaluation, it's reported sensitivity of 73% reduces it as an inadequate method of non-invasive staging.[10] Computed tomography, although superior to clinical examination, CT is not an accurate predictor of axillary lymph node involvement, primarily because of its low negative predictive value.[11] Magnetic resonance imaging has also been studied in assessing the axillary lymph nodes but with, reported sensitivity of 90% for axillary metastasis it means inferior to surgical staging.[12] Positron emission tomography has been used with some degree of success in detection and Staging of carcinoma breast.[13] But, this is an expensive modality and is currently a research tool.

These controversies notwithstanding, the regional nodal status still remains the most important independent prognostic factor for assessing the survival of the carcinoma breast patients. Hence trying to avoid axillary lymph node dissection raises some serious concerns regarding the diagnosis, staging and treatment planning of carcinoma breast patients. Because firstly, the staging of carcinoma breast determines the outcome. Disregard for this statistically important criteria of staging i.e. nodal metastasis is not logical. More than that this disregard for the staging, combined with adjuvant therapy risks involved, may result in greater long term morbidity (heart failure and leukaemia) in the entire population of patients and thus causing significantly greater costs for the healthcare systems. Secondly, the belief that micro metastasis carries no therapeutic significance has been proven to be wrong.

Sentinel lymph node biopsy in patients with clinically node-negative carcinoma breast is useful for the detection of clinically occult metastases by histopathological examination, which may help in determining the need for adjuvant therapy. Best results depends on the accurate visualization of the sentinel lymph nodes. All the visualized lymph nodes in the direct drainage pathway from the primary tumour are considered as sentinel lymph nodes, based on the concept of stepwise spread of metastases through the lymphatic system and should be identified and examined by the pathologist.[14] Considering the cost factors involved, especially where facilities are not available for sophisticated diagnostic methods, doing a sentinel node study using less expensive and equally effective Methylene blue perioperatively can detect the presence or absence of metastatic deposits in the axillary lymph nodes of clinically N0 breast carcinoma, thus avoiding an axillary dissection and complications related to it.[15] Here in this study we tried to analyse the preference of lymph nodal staining in sentinel node biopsy using methylene blue in early breast cancer, so that surgeons will be more aware of anatomical positions (anterior, posterior or central groups of lymph nodes) where they can do more precise dissection for finding sentinel lymph nodes, thus saving the operative time and reducing the morbidity. Lymphatic mapping and sentinel lymph node evaluation provide tools for defining the subset of patients efficiently with micro metastatic disease and thus helping in assessing the need for adjuvant therapy. Finally, in carcinoma breast management the outcome is not known immediately. Therefore, major alterations, in treatment, such as avoidance of axillary lymph node dissection can be substituted of a surgical procedure which is having less morbidity i.e., sentinel lymph node mapping and biopsy.[16]

In our study, where sentinel lymph nodes were identified by methylene blue, the commonest group of lymph nodes identified are anterior group in and around medial pectoral neurovascular bundle (30 out of 34 sentinel lymph nodes). There were 3 cases of central and 1 case of posterior group of nodes. These results are comparable with the studies done by Urens et al where less than 50% of SLNs located in the axilla were in the mid or posterior group of level I axillary lymph nodes.[17] Number of sentinel nodes ranged from 1 to 3 with median 2.43 which is in accordance to the findings in studies conducted by Koller et al and Kern et al where the median number of sentinel nodes is 3 and 2.7 respectively.[18,19] These findings helped us prioritising the areas where we can concentrate on searching for the sentinel lymph nodes thus reducing the morbidity from searching nodes otherwise.

CONCLUSION

Though sentinel lymph node biopsy using methylene blue is not a foolproof method; where there are limited resources we can follow this method for sentinel lymph node biopsy and knowing the mode of methylene blue flow i.e., anterior more than central and then posterior group of lymph nodes will definitely reduce the morbidity involved in the procedure, and above all saving time of the surgery.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: John J, Sansho EU. A prospective observational study on lymph node mapping of sentinel lymph node biopsy using methylene blue in carcinoma breast. Int Surg J 2021;8:176-9.