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PROSPECTIVE STUDY USING DOPPLER ULTRASOUND AND GUIDED FNAC FOR ASSESSMENT OF AXILLARY LYMPH NODE STATUS IN CARCINOMA OF BREAST

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ABSTRACT

BACKGROUND

For planning the treatment of carcinoma Breast, axillary staging is an essential part of management, and it can be done by sentinel lymph node biopsy. Hence, Doppler ultrasound of the axilla can be used, a non-invasive procedure with less complication than sentinel lymph node biopsy.

AIM AND OBJECTIVE

The prospective study was conducted for evaluation of clinically axillary node negative cases in Breast cancer by using Doppler Ultrasound.

PATIENTS AND METHODS

Eighty histologically (core needle) proven breast cancer cases with clinically negative axilla were evaluated using 7.5 MHz high-frequency Doppler ultrasound. The direction of lymphatic flow in the lymph node, the ratio of the long axis to the short axis (L/S) and the hilum to the long axis (H/L) were noted.

RESULTS

Identifying the group of patients at high risk of harboring nodal metastasis is possible, and these patients can be offered Axillary nodal dissections.

CONCLUSION

Based on preoperative Doppler Ultrasound evaluation of the axilla and Ultrasound guided FNAC, it can be concluded that these investigations are the best tool to assess the axilla in carcinoma Breast in clinically axillary node-negative cases.

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KEYWORDS
Carcinoma Breast, USG evaluation of Axilla, Fine needle aspiration cytology, Assessment of Axillary Node.

INTRODUCTION

The presence of any breast lump/mass is a matter of concern for any woman to consult a surgeon, and below 50 years of age, 40% of carcinomas are considered benign by clinical examination[1]. Thus, clinical diagnosis calls for further investigation for confirmation of diagnosis. To overcome this difficulty, many different imaging methods like mammography and ultrasonography have been suggested to reach the diagnosis[2]. Investigations like USG and USG guided FNAC of axillary lymph node preoperatively, in clinically node-negative axilla, can help avoid more invasive methods like sentinel lymph node biopsy[3,] which has its complication like pain, lymphoedema, and shoulder joint stiffness[4]. Preoperative axillary staging in breast cancer saves time and resource[5].

With the limited sentinel lymph node biopsy, it was decided to evaluate the efficacy of Doppler USG and USG-guided FNAC in differentiating metastatic and non-metastatic axillary lymph nodes in clinically node-negative breast cancer[6].

AIMS & OBJECTIVES

Evaluation of diagnostic accuracy with the help of an Ultrasonogram of axilla and Ultrasound-guided fine needle aspiration cytology of axillary lymph node in node-negative cases of carcinoma breast.

MATERIALS

INCLUSION CRITERIA

The study included all consecutive female and male patients from all age groups presenting with confirmed cases of carcinoma breast and clinically impalpable and insignificant axillary nodes.

EXCLUSION CRITERIA

1. Previously undergone any treatment for carcinoma breast.
2. Clinically node-positive case.

METHODS

All cases satisfying the inclusion criteria were selected for the study. Informed consent was obtained from them. Then they were subjected to ultrasonography and ultrasonography-guided FNAC of the axillary lymph nodes, and a report was obtained from the pathologist regarding the status of the axillary nodes. These were compared with the histopathological examination of the operative specimen regarding the status of the nodes after axillary dissection, and the accuracy of USG (Fig. 1) and USG-guided FNAC (Fig. 2) were assessed by appropriate statistical methods. Doppler ultrasound evaluation of the ipsilateral axilla was done using high- resolution real-time Siemens Sonoline G50 compact ultrasound device with a high-frequency linear array probe of 7.5 MHz. The patients were examined in a supine position with the arm in 90-degree abduction and external rotation, providing better imaging

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and visualisation of the axilla. The following parameters were recorded:

- Long axis/ short axis of lymph node (L/S).
- Long axis of Hilum/ long axis of Lymph node (H/L).
- Central or peripheral lymphatic flow design in the lymph node.
- Resistivity Index (RI): Peak systolic velocity – End diastolic velocity/ Peak systolic velocity

Long axis/Short axis Ratio (L/S Ratio): Lymph node enlargement could be malignant or benign. The lymph node's long axis and the lymph node's globular shape vary from benign to malignant deposits. In this study, we took the L/S ratio < 2 [6].

Hilum axis/Long axis Ratio (H/L Ratio): The hilum of a normal lymph node constitutes the central part of the lymph node and appears homogeneously hyperechoic on Doppler ultrasound. Echogenicity on ultrasonogram is lost due to shrinkage of the hilar area in case of metastatic deposits. In this study, we took the H/L ratio of 0.8 [6].

Pulsatility Index (PI): It is calculated from the difference between peak systolic velocity, minimal diastolic velocity and mean velocity during the cardiac cycle. In this study, we had taken PI index > 2 [6].

Arterial Flow Pattern: The normal blood flow to lymph nodes through the hilum intensifies during inflammation. In the case of metastatic deposits, the hilum is disrupted, and the flow gradually shifts to the periphery[6].

Morphology of lymph node: Usually, a benign lymph node is ovoid, with a hypoechogenic cortex, extremely thin or even invisible at ultrasonography with hyperechogenic hilum due to connective tissue trabeculae, lymphatic tissue cords and medullary sinusoids. Thickening of the cortex, decrease of the hilar region, the node’s shape and its vasculature on ultrasonogram raise the suspicion of metastasis. The metastatic lymph nodes have a hypoechoic cortex, round shape, loss of fatty hilum, and cortical lobulation. Lymph is filtered through the cortex, paracortex and finally, the hilum. Metastatic deposits accumulate in the lymph node peripheral area, causing enlargement of the cortex, usually focal (at early stages) or uniform[6].

Evaluation of the lymph nodes are done on the above observations. In axilla with multiple nodes, the node with minimum L/S ratio, H/L ratio and maximum RI and PI were considered. These nodes were subjected to FNAC. All the patients were subjected to surgical removal of breast lesions and axillary nodes, either by BCT+ALND or MRM depending on the disease stage as per the case's individual need. Doppler ultrasound results correlated with the histopathology of the axilla and breast specimen harvested from the histopathology. Then True positive, True negative, False positive and False negative cases were recorded.

RESULTS

A total of 80 consecutive patients confirmed diagnosis of breast cancer by core needle biopsy with clinically insignificant axillary node during the period from November 2020 to April,

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2022 were included in this study for evaluating the axillary node status concerning Doppler ultrasound evaluation. Table 1 shows the number of positive cases (metastatic axillary node) in the USG of the axilla. Forty-nine (61.42%) patients were positive for nodal metastasis in the USG of the axilla. Of these, true positive cases were 41(95.90%), and false positive were 2 (4.10%). Total node-negative cases were 31(38.75%), out of which true negatives were 25 (80.64%), and false negatives were 6 (19.35%). USG-guided FNAC of axillary node detected metastases in 50(62.50%) cases, out of which 49(98%) cases were confirmed positive, and 1(2%) case was a false positive. Similarly, this method detected 30(37.5%) cases of negative axillary lymph nodes, out of which 26(86.67%) were true negative, and 4(13.33%) were false negative the above result was obtained after histopathological examination of all removed axillary nodes.

Role of USG in Assessing Axillary Metastasis: Considering these, the sensitivity, specificity and positive predictive value of USG of axilla examination in breast lumps were calculated as follows:

True Positive = 47 (58.75 %)

False Positive = 02 (2.50 %)

True Negative = 25 (31.25 %)

False Negative = 06 (7.50 %)

$$\text{Sensitivity} = \frac{\text{True Positive}}{\text{True Positive + False Negative}} \times 100 = \frac{47}{47 + 6} \times 100 = 88.67\ \%$$

$$\text{Specificity} = \frac{\text{True Negative}}{\text{True Negative + False Positive}} \times 100 = \frac{25}{25 + 2} \times 100 = 92.59\ \%$$

$$\text{Positive Predictive Value} = \frac{\text{True Positive}}{\text{Total Positive}} \times 100 = \frac{47}{47 + 2} \times 100 = 95.91\ \%$$

$$\text{Negative Predictive Value} = \frac{\text{True Negative}}{\text{Total Negative}} \times 100 = \frac{25}{25 + 6} \times 100 = 80.64\ \%$$

$$\text{Overall Accuracy} = \frac{\text{True Positive + True Negative}}{\text{Total Number of Cases}} \times 100 = \frac{47 + 25}{80} \times 100 = 90\ \%$$

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Role of USG-guided FNAC in Assessing Metastasis: Out of 50 (62.85%) positive cases, the true positive cases were 49 (97.72%), and the false positive case was 01 (2.28%). Out of 30 (37.15%) negative cases, true negative cases were 26 (88.46%), and false negative cases were 04 (11.54%).

$$\text{Sensitivity} = \frac{\text{True Positive}}{\text{True Positive + False Negative}} \times 100 = \frac{49}{49 + 04} \times 100 = 92.45\ \%$$

$$\text{Specificity} = \frac{\text{True Negative}}{\text{True Negative + False Positive}} \times 100 = \frac{26}{26 + 01} \times 100 = 96.29\ \%$$

$$\text{Positive Predictive Value} = \frac{\text{True Positive}}{\text{Total Positive}} \times 100 = \frac{49}{50} \times 100 = 98\ \%$$

$$\text{Negative Predictive Value} = \frac{\text{True Negative}}{\text{Total Negative}} \times 100 = \frac{26}{30} \times 100 = 86.66\ \%$$

$$\text{Overall Accuracy} = \frac{\text{True Positive + True Negative}}{\text{Total Number of Cases}} \times 100 = \frac{49 + 26}{80} \times 100 = 93.75\ \%$$

DISCUSSION

In this study, 80 patients having carcinoma breasts were included for evaluation. These patients had clinically insignificant axillary lymph nodes. Out of 80 patients, 97% were female, and 3% were male.

This study found that sensitivity, specificity, positive predictive value, negative predictive value and overall accuracy of USG axilla are 89%, 93%, 96%, 81%, and 90%, respectively.

Altomare V et al., in their study, presented a preliminary result regarding the efficacy of fine-needle aspiration cytology (FNAC) in identifying metastatic axillary lymph nodes in the preoperative phase. Echo-guided FNAC of the axillary lymph nodes should thus be included among the regular diagnostic procedures of pre-surgical staging[7]. Van Rijk MC et al.

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evaluated the sensitivity in 58 cases, constituting 21% of the total of 271 patients who were proven to have axillary metastasis at the end of ultrasonography, and FNAC was 21%. Unnecessary sentinel node biopsy was avoided in 8% of the patients.

Holwitt DM et al., in their study, conclude that AUS-guided FNAB/needle core biopsy accurately predicts the axilla status in 70% of clinically node-negative breast cancer patients[9].

De Kanter AY et al. had done a multi-centre study of ultrasonographically guided axillary node biopsy in patients with breast cancer. They concluded that Ultrasonography was sensitive in patients with extensive nodal involvement[10].

Jung et al. did study the Accuracy of preoperative ultrasound and ultrasound-guided fine needle aspiration cytology for axillary staging in breast cancer. This study aimed for preoperative evaluation of axilla by ultrasonogram and ultrasonogram guided FNAC in clinically node-negative cases to avoid sentinel node biopsy. For USG alone, the sensitivity, specificity, and positive and negative predictive values were 54%, 91%, 75% and 81%, respectively. For the US-FNAC, the respective values were 80%, 98%, 97% and 84%. They concluded that Preoperative axillary ultrasound in combination with US- FNAC provides a simple, minimally invasive and reliable approach to the initial determination of the axillary lymph nodes' status[11].

Brancato et al. studied 'Role of ultrasound-guided fine needle cytology of axillary lymph nodes in breast carcinoma' staging to avoid sentinel biopsy or axillary dissection if negative[12]. Cowher MS et al. correlated axillary ultrasound and lymph node needle biopsy with surgical lymph node pathology in patients with invasive breast cancer. The sensitivity of AUS with and without biopsy was 54%, and specificity was 96%. The positive predictive value was 91%, and the negative predictive value was 71% [13].

Davis et al., in their study, concluded that for patients at increased risk for axillary metastases, the use of sonographic evaluation of the axilla in combination with fine-needle aspiration is not only clinically justified but also cost effective[14].

USG-guided FNAC shows sensitivity, specificity, positive predictive value and negative predictive value; overall accuracy is 93%, 95%, 97%,79%, and 94%, respectively. This observation is similar to the study by A Das et al. [6], Altomare et al. [7], Van Rijik et al. [8], DM Holwitt et al. [9], AY Kanter et al. [10], J Jung et al. [11], Brancato et al. [12], and MS Cower et al. [13], JT Davis et al. [14].

CONCLUSION

Doppler USG alone has the sensitivity, specificity, positive predictive value, negative predictive value, and overall accuracy of 89%, 93%, 96%, 81% and 90% for evaluation of axillary and lymph nodes in cases of carcinoma breast %, respectively. USG-guided FNAC has sensitivity, specificity, positive predictive value, negative predictive value, and overall accuracy of 92%, 96%, 98%, 87%, and 94%, respectively. Therefore, USG-guided FNAC is possibly the most valuable preoperative diagnostic tool to assess the axillary nodal metastasis in cases of carcinoma breast with clinically node-negative axilla.

Finally, it can be concluded that USG-guided FNAC in cases of carcinoma breast is the best

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tool to assess the axillary metastasis in carcinoma breast, irrespective of the clinically axillary nodal status.

	Only USG Axilla	**USG Guided FNAC**	**Histopathology of Axillary Nodes**
Positive for Metastasis	49 (61.25%)	50 (62.5%)	54 (67.5%)
Negative for Metastasis	31 (38.75%)	30 (37.5%)	26 (32.5%)
Total	80 (100%)	80 (100%)	80 (100%)

Table 1: Results of the Observation

Fig. 1: Photograph during Doppler Ultrasound of Right Axilla

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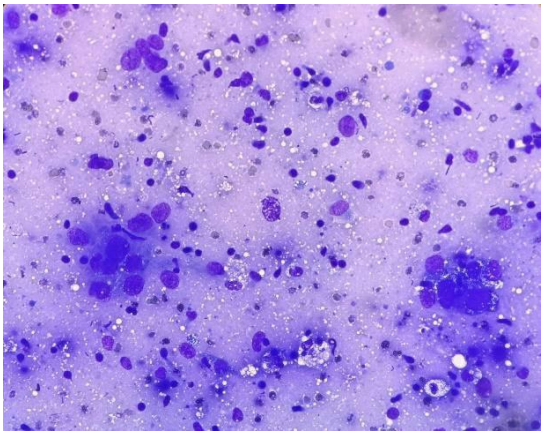

Fig. 2: FNAC. Aspirate From Axillary Node in A Case of Ductal Carcinoma of Breast Showing Clusters of Malignant Epithelial Cells on a background of lymphoid cells.

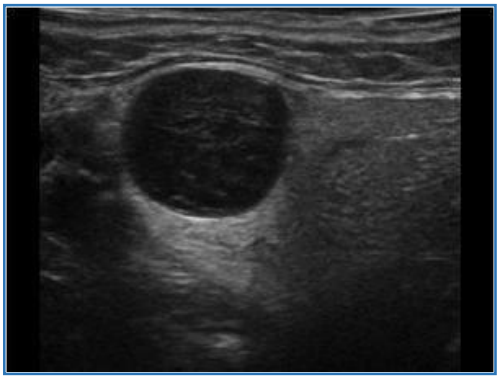

Fig. 3: Benign Axillary Lymph Node

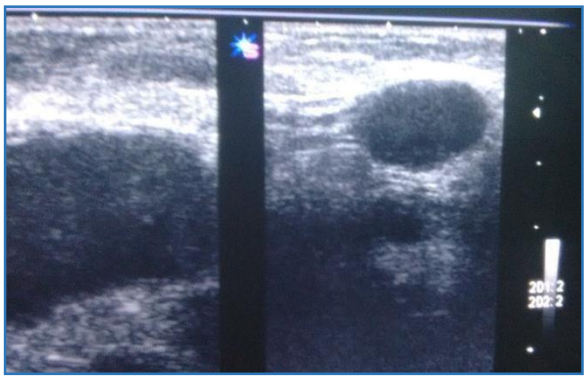

Fig. 4: Malignant Axillary Lymph Node

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