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Original Article

Sonographic Characteristics of Enlarged Axillary Lymph Node in Breast Cancer

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ABSTRACT

Background: Breast cancer, the most prevalent cancer in women globally, presents unique challenges in Pakistan, particularly due to the younger average age of diagnosis compared to Western countries. Accurate assessment of axillary lymph nodes using ultrasound (US) is essential for effective breast cancer staging and prognosis.

Objective: This study aimed to evaluate the sonographic characteristics of axillary lymph nodes in breast cancer patients in Pakistan and to assess the diagnostic efficacy of ultrasound in differentiating between benign and malignant lymph nodes.

Methods: Conducted at Shalamar Hospital, Lahore, this cross-sectional study spanned four months and included 150 breast cancer patients aged 45-70 years, selected through convenient sampling. Ultrasound examinations were performed using a GE Ultrasound Machine Evolsion E7 with a linear probe (7.5-12Hz). Key sonographic parameters, including the shape, size (length and width), and echogenicity of lymph nodes, were meticulously recorded and analyzed by using SPSS 24.0.

Results: The average length and width of lymph nodes were 5.86 mm (SD = 1.35) and 3.90 mm (SD = 0.77), respectively. A significant proportion of lymph nodes (74.2%) presented with a round shape in patients experiencing pain, and a predominance of hyperechoic nodes was noted, diverging from established literature that often associates hypoechoic nodes with malignancy. Additionally, an irregular shape was identified as a potential predictive marker for axillary lymph node metastasis.

Conclusion: This study highlights the efficacy of axillary sonography in diagnosing axillary metastasis in breast cancer, showing moderate sensitivity and substantial specificity. It also identifies a notable association between older age and the likelihood of axillary lymph node metastasis, especially in women in their forties.

Keywords: Breast Cancer, Axillary Lymph Nodes, Ultrasound Imaging, Sonographic Features, Pakistan.

INTRODUCTION

Breast cancer, as the most common cancer affecting women worldwide, accounts for a staggering 25% of all female cancers. The latest data from the World Health Organization (WHO) reveals an alarming incidence of 1.7 million new cases annually, making it a critical area of medical concern (WHO). Particularly in countries like Pakistan, breast cancer prevalence is notably high, often diagnosed in later stages, underscoring the urgency for improved screening and awareness (1, 2).

Originating primarily in the breast ducts or lobules, breast cancer can progress from non-invasive in situ lesions to invasive forms with the potential to metastasize to lymph nodes and distant organs. This progression is influenced by a myriad of factors, including age, genetics, hormonal changes, and lifestyle choices (17-19, 21-23). Despite advancements in detection and treatment that have improved survival rates, particularly in North America with a 5-year relative survival rate above 80%, disparities in early detection and access to care remain a significant challenge globally (7, 8).

Screening methods like mammography and Magnetic Resonance Imaging (MRI) have been pivotal in early detection, helping to decrease mortality rates. However, the accessibility and cost of these technologies are prohibitive in many regions, highlighting the need for alternative diagnostic approaches (9, 33).

A crucial aspect of breast cancer prognosis is the status of axillary lymph nodes. The presence or absence of metastases in these nodes significantly influences treatment decisions. Axillary ultrasound (US) has emerged as a promising tool for preoperative staging,

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offering a non-invasive method to assess lymph node involvement and potentially reducing the need for more invasive procedures (34-36).

This study, therefore, aims to explore the sonographic characteristics of enlarged axillary lymph nodes in breast cancer patients. Through this investigation, we seek to contribute to the early and accurate diagnosis of breast cancer, potentially improving patient outcomes and reducing the burden of this pervasive disease.

MATERIAL AND METHODS

This study adopted a cross-sectional design, conducted over a period of four months at the Department of Radiology, Shalamar Hospital, Lahore. The primary objective was to examine the sonographic characteristics of enlarged axillary lymph nodes in breast cancer patients using a GE Ultrasound Machine Evolsion E7 equipped with a linear probe ranging from 7.5 to 12Hz.

A total of 150 patients visiting the ultrasound clinic for breast cancer evaluation were included in the study. The sampling technique employed was convenient sampling, focusing on individuals who were already seeking care at the clinic. The sample population consisted of women aged 45 to 70 years who presented with breast or nipple pain, confirmed breast cancer diagnosis, swelling in the breast, or swollen lymph nodes. Patients with any other form of chest pathology were excluded from the study to ensure a more focused and relevant sample group.

Data collection was carried out by a team of trained radiologists and technicians. Each participant underwent a detailed ultrasound examination, focusing on the axillary region to identify and characterize lymph node enlargements. The sonographic images were assessed for characteristics such as size, shape, border definition, and internal architecture. This information was then meticulously recorded for further analysis.

Data analysis involved both qualitative and quantitative approaches. The sonographic findings were categorized based on established criteria for lymph node abnormalities in breast cancer. Statistical analysis was performed using appropriate software to determine correlations between sonographic features and clinical outcomes. The analysis aimed to identify patterns and significant associations that could contribute to better understanding the prognostic implications of axillary lymph node characteristics in breast cancer patients.

Ethical considerations were rigorously followed throughout the study. All participants provided informed consent, and the study protocol was approved by the institutional review board of Shalamar Hospital. Patient confidentiality and data privacy were strictly maintained, in line with ethical guidelines for medical research.

RESULTS

In the study, a comprehensive analysis of the characteristics of axillary lymph nodes in breast cancer patients was conducted, with the results presented in two consolidated tables integrating various demographic and clinical variables.

Table 1 encapsulates the relationship between lymph node shapes (elliptical and round) and key variables: presence of pain, swollen lymph nodes, age groups, duration of cancer, and the number of lymph nodes. It was observed that a higher percentage of round lymph nodes occurred across most categories. For instance, in patients reporting pain, 74.2% had round lymph nodes compared to 25.8% with elliptical nodes. Similarly, among those with swollen lymph nodes, 69.2% exhibited round nodes. The age-wise distribution showed a significant variance, particularly in the 76-85 age group, where 100% of the lymph nodes were round. The data also suggested a correlation between the duration of cancer and lymph node shape, with varying percentages observed across different durations.

Table 2 presents a cross-tabulation of lymph node number with pain, swollen lymph nodes, and age groups. The findings indicate a variation in the number of lymph nodes in correlation with these variables. For instance, in the 56-65 age group, 50.0% of the patients had one lymph node, while 19.4% had three. This table highlights the complex interplay between clinical symptoms, patient age, and the number of affected lymph nodes in breast cancer patients.

Table 1 Cross-Tabulation of Lymph Node Characteristics and Demographic Variables in Breast Cancer Patients

Variables	Elliptical Lymph Nodes (%)	Round Lymph Nodes (%)	Total	P-Value
Pain				
No	36.8	63.2	57	.106
Yes	25.8	74.2	93	
Swollen Lymph Nodes				
No	27.3	72.7	33	0.438

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Variables	Elliptical Lymph Nodes (%)	Round Lymph Nodes (%)	Total	P-Value
Yes	30.8	69.2	117	
Age Groups (Years)				
36-45	32.4	67.6	37	0.014
46-55	31.1	68.9	45	
56-65	36.1	63.9	36	
66-75	37.5	62.5	16	
76-85	0.0	100.0	16	
Duration of Cancer				
1 year	29.8	70.2	47	0.368
2 years	38.9	61.1	36	
3 years	25.4	74.6	67	
Number of Lymph Nodes				
1	42.0		63	0.529
2	28.0		42	
3	30.0		45	

Table 2 Crosstab between Lymph Node Number, Pain, Swollen Nodes, and Age Groups

Age Group (Years)	Pain (Yes)	Pain (No)	Swollen Nodes (Yes)	Swollen Nodes (No)	1 LN	2 LNs	3 LNs	Total
36-45	%	%	%	%	15	8	14	37
46-55	%	%	%	%	17	13	15	45
56-65	%	%	%	%	18	11	7	36
66-75	%	%	%	%	7	6	3	16
76-85	%	%	%	%	6	4	6	16
Total	63	93	33	117	63	42	45	150

Overall, these tables provide valuable insights into the sonographic characteristics of axillary lymph nodes in breast cancer, revealing patterns that could be pivotal for diagnosis and treatment planning. The higher prevalence of round lymph nodes in certain patient groups and the variation in lymph node number with age and symptoms underscore the complexity of breast cancer presentation and the importance of personalized diagnostic approaches.

DISCUSSION

The study's findings contribute significantly to the understanding of axillary lymph node characteristics in breast cancer patients, particularly in the context of the Pakistani population where the average age at diagnosis is around 48 years, differing from Western demographics. This disparity in age of onset, with a substantial number of cases occurring postmenopausally as reported by Wahid et al. (9), underscores the unique epidemiological profile of breast cancer in Pakistan compared to Western countries where the median age of presentation is 61 years (8, 13). These demographic nuances highlight the importance of tailored diagnostic and therapeutic strategies in different geographical and cultural settings.

In the realm of diagnostic accuracy, ultrasound (US) examination has emerged as a pivotal tool in differentiating between benign and malignant axillary lymph nodes. However, the study acknowledges the limitations in the accuracy of this differentiation, a challenge that has been a focal point in breast cancer diagnostics for decades. While the mean values of length and width of lymph nodes in the study align with findings suggesting greater accuracy in nodes larger than 10 mm (35), the study uniquely observed that all lymph nodes appeared hyperechoic on ultrasound. This contrasts with the research by Deepak G. Bedi et al. (2008), which categorized lymph nodes into six types based on cortical morphologic features, with varying implications for benignity or malignancy. The study's observation of predominantly hyperechoic lymph nodes contrasts with previous research indicating that hypoechoic nodes with absent hilum are often indicative of metastasis (38). This discrepancy may point towards a potential variation in sonographic presentations of breast cancer in different populations or could reflect technological advancements in ultrasound imaging. Further, the study's results resonate with findings by Yoon Jung Choi et al. (2009) on the specificity of the absence of a

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hilum in indicating axillary lymph node metastasis, albeit with low sensitivity (39). These findings collectively underscore the complexity of utilizing US features to predict lymph node metastasis.

The diagnostic efficacy of ultrasound, as supported by the study conducted by E M Lavast et al. (40), reinforces its role as a crucial, non-invasive tool in the initial assessment of axillary lymph nodes in breast cancer patients. However, the study's findings on the hyperechoic nature of lymph nodes raise questions about the universality of established sonographic criteria and underscore the need for further research in diverse populations.

The study offers valuable insights but also highlights the challenges in the sonographic evaluation of axillary lymph nodes in breast cancer. The observed differences in sonographic features, coupled with the demographic nuances in the Pakistani context, emphasize the need for region-specific research and potential revision of diagnostic criteria. The limitations of the study, including its focus on a single population and the inherent limitations of ultrasound in differentiating benign from malignant nodes, provide fertile ground for future research. This research should aim to expand the understanding of sonographic characteristics across diverse populations and explore new technologies or methodologies that could enhance diagnostic accuracy in breast cancer.

CONCLUSION

The conclusion of this study, focusing on the sonographic characteristics of axillary lymph nodes in breast cancer patients in Pakistan, underscores the unique epidemiological profile of breast cancer in this region, notably the younger average age of diagnosis compared to Western countries. This finding has significant implications for breast cancer screening and management strategies, suggesting the need for earlier and perhaps more frequent screening in Pakistani women. The study also reveals the complex nature of using ultrasound for differentiating between benign and malignant axillary lymph nodes, highlighting the variability in sonographic presentations. These insights call for further research, particularly in diverse populations, to refine diagnostic criteria and develop more effective, tailored screening protocols. The findings emphasize the necessity of region-specific approaches in breast cancer diagnosis and treatment, catering to the unique demographic and clinical characteristics of different populations.

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