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Characterization of Axillary Lymph Nodes Using Conventional Ultrasonography Compared with Histopathological Findings

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Abstract

A cross-sectional, observational study was carried out the Department of Radiology and Imaging, Combined Military Hospital (CMH) at Dhaka Cantonment, Bangladesh, between March and August of 2021. A total of 75 female patients were included presenting with or without axillary swelling referred for ultrasound of breasts and axilla from various surgical and medical departments of the same hospital. B-mode ultrasonography was used as method of choice because of its noninvasiveness and availability in evaluating the axillary lymph nodes. Histopathological diagnosis was considered the gold standard for the diagnosis. The average age was 42.62±8.76 years. In conventional ultrasonography results, 33.3% were benign lymph node, 14.7% were reactive and 52% were metastatic lymph node. Based on the histopathological reports, lymph node involvement was detected in 18(24%) patients with benign, 13(17.3%) patients reactive and 44(58.7%) metastatic. The overall results revealed 79.5% sensitivity, 87.1% specificity, 89.7% PPV and 75% NPV. To summarize, conventional ultrasonography was moderately sensitive with good specificity for diagnosis of axillary lymph node. Further studies with a larger population and intra-operative axillary lymph node are recommended.

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Keywords: Axillary lymph nodes, benign, reactive, metastatic, ultrasonography, histopathology.

Introduction

Lymph node (LN) metastasis is an important prognostic factor for most malignancies because the site and the number of metastatic LNs directly influence the staging of the tumors, and consequently affect selection of a treatment plan and patient's survival rate. Often over-staging leads to unnecessary extended surgical interventions and added morbidity. On the other hand, under staging may lead to an increase in recurrence rate and may shorten the survival time. Hence, it is crucial to choose the right imaging approach for LN evaluation. Therefore an ideal imaging method should be able to clearly detect and display the site, number and structural characteristics of LNs, accurately distinguish the malignant nodes from benign ones. USG is widely available, affordable, easy to interpret, non-invasive and non-radiative method to evaluate the lymphnode.[1]

Sonography is currently the primary imaging modality for pre surgical evaluation of the axillary lymph nodes. However, it is limited by a low negative predictive value, particularly in patients with early-stage breast carcinoma.[2-3] Normal nodes in the axilla show a cup-like hypoechoic rim that represents the lymphoid cortical rim. The thickness of this generally smooth rim is 1 to 2 mm. A fine central fatty hilum is present that demonstrates finer echoes than the surrounding fat. It is thus more difficult to distinguish these

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normal lymph nodes from the adjacent abundant fat. A hypoechoic central area within the central fatty hilum is seen occasionally, which may represent incomplete lipomatosis of the medullary portion of the node.[2] On color doppler, power doppler and 3D sonography, normal axillary nodes showed hilar vascularity or appear avascular and reactive nodes predominantly show hilar vascularity.[4] On spectral doppler sonography, normal and reactive nodes usually show low vascular resistance (by resistive index or RI and pulsatility index or PI),[4] whereas malignant lymph nodes tend to have high RI and PI values.[5] By using colour/power doppler sonography can further characterize lymph nodes as non-neoplastic (Reactive, tubercular) and neoplastic. The non-neoplastic (reactive) nodes show increased central hilar vascularity, with radial symmetry whereas neoplastic (malignant) nodes show absent hilar vascularity and increased peripheral vascularity.[5]

Methods

This hospital based cross-sectional, observational study was conducted in Department of Radiology and Imaging, Combined Military Hospital (CMH), Dhaka Cantonment, Bangladesh, from March to August of 2021. Subjects were selected from clinically suspected female patients presenting with or without axillary swelling referred to Radiology & Imaging Department for ultrasound of breasts and axilla from various surgical and medical departments. A total 75 female patients who are 18 years old or above were included in the study. Ultrasound examinations were performed by linear array transducer of Hitachi Hi Vision Avius® ultrasound machine. Written informed consents were obtained from the patients. Data were collected by interview and physical examination using a structured questionnaire containing all the variables of interest.

Statistical analyses were done using Statistical Packages for Social Sciences (SPSS), version 20.0. The validity of study outcome, accuracy, positive predictive value and negative predictive value of ultrasound in the diagnosis of axillary lymph adenopathy were determined. McNemar test was used to evaluate overall accuracy. A p-value <0.05 was considered as significant. The study was approved by the Ethical Review Committee of Armed Forces Medical Institute (AFMI), Dhaka Cantonment, Dhaka, Bangladesh.

Results

The average age of the patients was 42.62±8.76 years (Table-I).

Table-I: Age distribution of study subject (n=75)

Age groups (in years)	Number of cases	Percentage	Mean± SD
20–30	5	6.7	45.62± 9.76
31–40	22	29.3	
41–50	36	48.0	
51–60	9	12.0	
>60	3	4.0	

In conventional ultrasonography results, 33.3% were benign lymph node, 14.7% were reactive and 52% were metastatic lymph node (Table-II). Based on the histopathological reports, lymph node involvement was detected in 18(24%) patients with benign, 13(17.3%) patients reactive and 44(58.7%) metastatic (Table-III). Correlation of ultrasound and histological findings of study subjects have been shown in tables IV and V (number of false positive and false negative cases). The overall results revealed 79.5% sensitivity, 87.1% specificity, 89.7% PPV and 75% NPV (Table-VI).

Table II: Ultrasonological diagnosis of study subjects (n=75)

USG diagnosis	Number of cases	Percentage
Benign	25	33.3
Reactive	11	14.7
Metastatic	39	52.0

Table-III: Histopathological diagnosis of study subjects (n=75)

Histopathological diagnosis	Number of cases	Percentage
Benign	18	24.0
Reactive	13	17.3
Metastatic	44	58.7

Table-V: Comparison between USG and histopathological findings (n=75)

USG	Histopathological findings		Total
	Positive	Negative	
Positive	35 (TP)	4 (FP)	39
Negative	9 (FN)	27 (TN)	36
Total	44	31	75

Table-VI: Validity test of ultrasound findings in axillary lymph nodes

Validity test	Value (%)
Sensitivity	79.5
Specificity	87.1
PPV	89.7
NPV	75.0
Accuracy	82.0

Table-IV: Correlation of ultrasound and histological findings of study subjects (n=75)

	Benign (n=18)		Reactive (n=13)		Metastatic (n=44)		P value
Number	**No**	**%**	**No**	**%**	**No**	**%**	
1-3	12	66.7	6	46.2	16	36.4	0.004
4-6	6	33.3	7	53.8	28	63.6	
Mean±SD	3.0±1.68		3.53±1.71		4.43±1.46		
Shape							
Round	4	22.2	7	53.8	27	61.4	0.001
Ovoid	6	33.3	5	38.5	12	27.3	
Elongated	8	44.4	1	7.7	5	11.3	
Long/ short axis ratio							
≤2	7	38.9	6	46.2	28	63.7	0.002
>2	11	61.1	7	53.8	16	36.3	
Mean±SD	2.57±1.55		2.40±1.52		1.34±1.22		
Cortical thickening							
1-3	16	88.9	9	69.2	26	59.9	0.001
>3	2	11.1	4	30.8	18	40.1	
Mean±SD	2.11±0.96		2.53±1.19		3.36±1.25		
Margin							
Regular	13	72.2	6	46.2	16	36.3	0.001
Irregular	5	27.8	7	53.8	28	63.7	
Hilum							
Present	2	11.1	5	38.5	27	61.4	0.001
Absent	16	88.9	8	61.5	16	38.6	
Intranodal necrosis							
Present	0	0.0	1	7.7	2	4.5	0.001
Absent	18	100.0	12	92.3	42	95.5	
Mated lymphnode							
Present	0	0.0	1	7.7	5	11.4	0.016
Absent	18	100.0	12	92.3	39	89.6	
Intranodal calcification							
Present	4	22.2	5	38.5	27	61.4	0.027
Absent	14	77.8	8	61.5	17	38.6	

Discussion

This study shows most of the lesions are above the age 40 years and peak incidence in between 41-50 years. The average age was 42.62±8.76 years which was in well agreement with another study done by Gregory *et al.,*[6] as they found, based on conventional ultrasonography results, 41 having benign (54.7%), while 34 (45.3%) with malignant diseases. Based on the histopathological reports, lymph node involvement was detected in 18 (24%) patients with benign, 13(17.3%) patients reactive and 44(58.7%) with malignant disease. These findings are consistent with Rezvani *et al.*[7] as they found lymph node involvement in 26 patients with benign and 30 with malignant disease, while based on ultrasonography results, 33 were diagnosed as having benign (58.9%) and 23 (41.1%) had malignant diseases. These results also matched with a study done by Chang *et al.,*[8] who analyzed 140 visible axillary lymph nodes on conventional ultrasound imaging and all of them underwent elastography. In the present study, 79.5% sensitivity, 87.1% specificity, 89.7% PPV and 75% NPV were observed. Therefore, the findings of the study are more or less similar with the findings of the other previous research.[7,9,10-14] In the study done by Rotim *et al.*[15] shows sensitivity of 72%, and specificity of 85%. The results are in line with the results of the study done by Bedi *et al.*[3] who reported sensitivity, specificity, PPV, NPV, and overall accuracy of 77%, 80%, 36%, 96%, and 80% respectively.[3] Olfatbakhsh *et al.*[16] study found (56%), its specificity was good (88%), and the accuracy was obtained 76%. The sensitivity and specificity of ultrasound were reported as 63.8% and 73.6% by Suniz *et al.*[17] 45% and 85% by Jackson *et al.*[18] 54.3% and 100% by Gipponni *et al.*[19] 58.6% and 89.4% by Feng *et al.*[20] and 72% and 79% by Elmesidy *et al.*[21]

Conclusion

Our data suggests that conventional ultrasonography is a good diagnostic tool and feasible technique for evaluating the axillary lymph nodes status in breast cancer patients. Hence, adding ultrasound evaluation positively impacts the specificity and accuracy of the preoperative axillary nodal status assessment in patients having diagnosed breast cancer.

References

1. *Krishnamurthy S, Sneige N, Bedi DG, Edieken BS, Fornage BD, Kuerer HM, et al. Role of ultrasound-guided fine-needle aspiration of indeterminate and suspicious axillary lymph nodes in the initial staging of breast carcinoma. Cancer. 2002;95(5):982-8.*

2. *Mainiero MB, Cinelli CM, Koelliker SL, Graves TA, Chung MA. Axillary ultrasound and fine needle aspiration in the preoperative evaluation of the breast cancer patient: an algorithm based on tumor size and lymph node appearance. Am J Roentgenol. 2010;195:1261-7.*

3. *Bedi DG, Krishnamurthy R, Krishnamurthy S, Edeiken BS, Le-Petross H, Fornage BD, et al. Cortical morphologic features of axillary lymph nodes as a predictor of metastasis in breast cancer: in vitro sonographic study. Am J Roentgenol. 2008;191(3):646-52.*

4. *Ying M, Ahuja AT. Sonography of neck lymph nodes. I. Normal lymph nodes. Clin Radiol. 2003;58:351-8.*

5. *Ahuja AT, Ying M. Sonographic evaluation of cervical lymphadenopathy: is power Doppler sonography routinely indicated? Ultrasound Med Biol. 2003;29:353-9.*

6. *Gregory A, Denis M, Bayat M, Kumar V, Kim BH, Webb J, et al. Predictive value of comb-push ultrasound shear elastography for the differentiation of reactive and metastatic axillary lymph nodes: A preliminary investigation. PLoS ONE. 2020;15(1):e0226994.*

7. *Rezvani A , Zahergivar A, Iranpour P, Akrami M, Kazemi S. Diagnostic accuracy of axillary ultrasonography compared with intra-operative pathological findings in patients with breast cancer. Asian Pac J Cancer Prev. 2018;19(12):3615-21.*

8. *Chang JM, Won JK, Lee KB, Park IA, Yi A, Moon WK. Comparison of shear-wave and strain ultrasound elastography in the differentiation of benign and malignant breast lesions. AJR Am J Roentgenol. 2013;201(2):W347-56.*

9. *Monib MM, Mikhail MKF, Mansour MG. The Role of Ultrasound Elastography in Evaluation for Axillary Lymph Nodes of Patients with Breast Cancer. Med J Cairo Univ. 2021;89(2):519-27.*

10. *Zhou S, Le J, Gao Y, Chang C. The study of ultrasound guided fine needle aspiration of axillary lymph nodes in breast cancer Chinese J Ultrason. 2017;(12):527-30.*

11. *Ertan K, Linsler C, di Liberto A, Ong FM, Solomayer E, Endrikat J. Axillary ultrasound for breast cancer staging: an attempt to identify clinical/histopathological factors impacting diagnostic performance. Breast Cancer: Basic Clin Res. 2013;7:35-40.*

12. *Zhao Q, Sun JW, Zhou H, Du LY, Wang XL, Tao L, et al. Pre-operative Conventional Ultrasound and Sonoelastography Evaluation for Predicting Axillary Lymph Node Metastasis in Patients with Malignant Breast Lesions. Ultrasound Med Biol. 2018;44(12):2587-2595.*

13. *Choudhary J, Agrawal R, Mishra A, Nandwani R. Ultrasound and color doppler evaluation of axillary lymph nodes in breast carcinoma with histopathological correlation. Int J Sci Stud. 2018;5(10):59-66.*

14. *Fidan N, Ozturk E, Yucesoy C, Hekimoglu B. Preoperative Evaluation of Axillary Lymph Nodes in Malignant Breast Lesions with Ultrasonography and Histopathologic Correlation. Journal of the Belgian Society of Radiology. 2016;100(1):58.*

15. *Rotim T, Kristek B, Turk T. Measurable and unmeasurable features of ultrasound lymph node images in detection of malignant infiltration. Acta Clin Croat 2017;56:415-24.*

16. *Olfatbakhsh A, Haghighat S, Sari F, Beheshtian T, Hashemi EA, Jafari M. The Accuracy of Preoperative Axillary Ultrasound in the Diagnosis of Lymph Node Involvement at Motamed Cancer Institute, Iran. Int J Cancer Manag. 2020;13(4):e96383.*

17. *Suniz J, Jazree J, Tania I, Hoong SM, Farhana F, Kartini R. Is pre-operative axillary ultrasound alone sufficient to determine need for axillary dissection in early breast cancer patients? Medicine. 2021;100(19):e25412.*

18. *Jackson RS, Mylander C, Rosman M, Andrade R, Sawyer K, Sanders T. Normal axillary ultrasound excludes heavy nodal disease burden in patients with breast cancer. Ann Surg Oncol. 2015;22(10):3289-95.*

19. *Gipponi M, Fregatti P, Garlaschi A, Murelli F, Margarino C, Depaoli F. Axillary ultrasound and Fine- Needle Aspiration Cytology in the pre-*

operative staging of axillary node metastasis in breast cancer patients. Breast. 2016;30:146-50.

20. *Feng Y, Huang R, He Y, Lu A, Fan Z, Fan T. Efficacy of physical examination, ultrasound, and ultrasound combined with fine-needle aspiration for axilla staging of primary breast cancer. Breast Cancer Res Treat. 2015;149(3):761-5.*

21. *Elmesidy DS, Eissa MAGAM, Hamed ST, Youssef OZ, Nada OM, Hashem LMB. Axillary lymph node status in BIRADS 4-5 female patients: can shear wave and strain ultrasound elastography help? Egyptian J Radiol Nucl Med. 2021;52:176.*