

Mammographic Evaluation of Breast Mass & Comparison with Histopathological Findings

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Abstract

Objective: To evaluate the diagnostic performance of Mammography in the diagnosis of benign and malignant breast mass.

Method: This Cross-sectional type of study was carried out in the Radiology & Imaging department of Sir Salimullah Medical College and Mitford Hospital, Dhaka, during July 2013 to June 2015, to determine the value of mammography in evaluation of breast mass, and also to determine the sensitivity, specificity, accuracy, PPV and NPV of mammography in the diagnosis of benign and malignant breast mass in comparison to the histopathological findings. For this purpose clinically suspected as having breast mass, referred in the above mentioned hospitals and enrolled for surgical management were included in this study. Mammography were done in all these patients and they were followed up from the admission upto the post operative tissue diagnosis of breast mass in respective pathology departments for histopathological correlation

Results: Almost one third (31.6%) patients were age belonged to 46-50 years and the mean age was found 47.8±6.4 years. A total of 41 patients had mass only among them, 3 (7.3%) were malignant and 38 (92.7%) were benign patients. Six patients were mass with spiculation, among them all (100.0%) were malignant patients. Five patients were mass with macro calcification; among them all (100.0%) were benign patients. Two patients were mass with micro calcification, among them all (100.0%) were malignant patients. Three patients were mass with spiculation, micro calcification and enlarged axillary lymph node; among them all (100.0%) were malignant patients. Out of 57 patients, on histopathological diagnosis 29 (50.9%) were fibroadenoma, 6 (10.5%) were fibrocystic change, 4 (7.0%) were cyst, 4 (7.0%) were abscess and 1 (1.8%) were galactocele. They were benign lesion of breast. Histopathological diagnosis of invasive ductal carcinoma, invasive lobular carcinoma and medullary carcinoma were 8 (14. %), 4 (7.00%) and 1 (1.8%) respectively. Mammography malignant was found 14 cases out of which 10 (76.9%) malignant and 4 (9.1%) benign evaluated by histopathology. Mammography benign was found 43 cases out of which 3 (23.1%) malignant and 40 (90.9%) benign evaluated by histopathology. The sensitivity was 76.9%, specificity 90.9%, accuracy 87.7%, positive predictive values 71.4% and negative predictive values 93.0% in mammography for identification of breast mass.

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Conclusion: Mammography is a cost effective, available and less time consuming procedure to see location of lesion, density of the lesion, margin of the lesion, glandular pattern of the breast etc and thereby to help a surgeon for operative planning and thus decreasing patient's morbidity and mortality. Mammography is highly sensitive, specific, reliable and useful method in the differentiation of malignant and benign breast masses. It can be used to plan subsequent appropriate management in majority of cases. Further studies can be undertaken by including large number of patients.

Introduction

Breast cancer is one of the common diseases among the females in the world. Generally about 25% of woman's are affected by breast cancer, in that 20% leads to lethal cancers. It is one the leading cause of death due to cancer in women. Breast cancer can be reduced by: giving birth to child before 30, Breast-feeding, Limiting alcohol intake, maintaining a healthy weight, exercising regularly. Breast cancer that forms in tissues of breast, usually ducts (tubes that carry milk to nipple) and lobules (glands that make milk).¹

In Bangladesh remarkable increase of breast cancer has occurred in recent year. National Institute of cancer research from 1996 to 2000 showed cervical cancer as ranked 1st and breast cancer ranked 2nd in females. The management of patients with carcinoma

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breast can be improved if a definitive diagnosis is obtained preoperatively by Radiological examination and/or needle biopsy/cytology. Public awareness of the potential benefits of early detection of breast cancer has increased dramatically in recent years, and more women are now seeking the advice of a physician immediately after detecting a breast mass.²

Among these the common causes of breast masses are fibroadenoma, fibrocystic disease and carcinoma.³ Breast carcinoma is the most common cancer among women between 40 to 55 years of age. Common forms of breast cancer are medullary carcinoma, mucinous carcinoma, tubular carcinoma, inflammatory breast cancer, Paget's disease of the nipple, phylloides tumor, lipoma, galactocele etc.⁴

Mammography has been the "gold standard" in breast cancer detection for >40 years. Limitations in its ability to detect both small and lobular breast cancers, poor resolution in dense breasts, and a lack of significant improvement in cancer detection, despite digital mammography and computer aided diagnosis, has inevitably lead to a search for other modalities to improve the detection of breast cancer.⁵

Although it is seen as the best examination technique for the early detection of breast cancer reducing mortality rates by up to 25%, their interpretation requires skill and experience by a trained radiologist.⁶

Women who present with breast symptoms or who have palpable findings on clinical examination are usually investigated with breast imaging, which generally consists of mammography or breast sonography or both. The choice of primary breast imaging in examining women with symptoms is partly based on age. However, despite the importance of age in clinical practice, little evidence exists as to the appropriate age (or age range) that delineates the choice of initial diagnostic breast imaging in symptomatic women. In the absence of evidence, experts suggest that women younger than 35 years be examined with sonography, and women 35 years and older be examined with mammography, as the primary breast imaging modality.⁷

A comprehensive review of the literature found little evidence about the comparative age-specific accuracy of mammography and breast sonography in symptomatic women.⁸ That study found that sonography was more sensitive than mammography in women younger than 62 years, the so-called crossover age, and mammography was more sensitive than sonography in women older than 62 years. However, the study's authors acknowledged that the nonindependent interpretation of the two tests and the analysis used may have led to underestimation of the sensitivity of mammography, and that the crossover age may be as early as 48 years.⁹ For a valid comparison of the accuracy of two tests, the tests need to be interpreted independently (without knowledge of each other) in the same subjects.¹⁰

Houssami et al. reported that the sensitivity of mammography increased substantially in women older than 50 years. Sonographic sensitivity of 81.7% was not significantly greater than mammographic sensitivity of 75.8%. However, in women 45 years old or younger, the sensitivity of sonography was 13.2% (95% confidence interval, 2.1-24.3%) greater than that of mammography. The specificity of both tests was approximately 88.0%.¹¹

Methodology

This cross sectional study was carried out in the Radiology and imaging department of Sir Salimullah Medical College, Dhaka from July 2013 to June 2015 after approval of ethical committee. During the study period 57 patients from 35 to 60 years of age, referred for mammographic evaluation of breast mass, which were further evaluated with histopathological findings. Mammographic findings were evaluated by the researcher and a senior Radiologist. Patients who underwent operation, histopathological reports were collected. Out of 60 patients, two patients refused to undergo operation and one patient lost histopathology report. Finally mammographic findings of 57 patients were compared with histological findings.

Data were collected in a pre-tested questionnaire by taking history, examining the patients clinically, the finding and interpretation of the Mammography. Histopathological diagnoses were considered as gold standard of diagnostic criteria. The data were collected by the researcher herself. Statistical analyses were carried out by using the Statistical Package for Social Sciences version 20.0 for Windows (SPSS Inc., Chicago, Illinois, USA).

Procedure for mammography:

The women was escorted to the changing room, where she was undressed from the waist up and change into the screening center gowns after taking proper history and clinical examination. She was asked to wipe off any deodorants, perfumes or powders that she had used that day, as these can mimic micro calcification on the film. The peak kv used for mammogram was low of kvp of around 24-30 kv and mAs varies depending on the breast tissue density. All mammogram were done using the film screen technique and consist of at least 2 views for each breast (CC & MLO). Supplemental views were obtained when considered necessary for adequate visualization. Markers were used to indicate the side and view demonstrated on that particular film. This was done for a reference point to understand the orientation of the breast, especially in the CC view. Compression paddle was handled carefully to reduce the discomfort level of the patient. After processing of film mammogram was viewed in optimum lighting condition. A powerful magnifying glass was used to get a better look at suspected pathology. Final interpretation of mammogram was taken with the help of radiologist of department of Radiology and Imaging (SSMCH). All patients were undergoing excision or biopsy of the mass lesion. Histopathological slides was prepared and

examined in the department of Pathology of Sir Salimullah Medical College and Mitford Hospital, Histopathological slides was interpreted by an experienced pathologist in the department of pathology, Sir Salimullah Medical College and Mitford Hospital.

Results

Table 1: Distribution of the patients by age (n=57)

Age (in years)	Number of patients	Percentage
35-40	7	12.3
41-45	10	17.5
46-50	18	31.6
51-55	13	22.8
56-60	9	15.8
Mean±SD	47.8±6.4	
Range (Min-max)	(35-60)	

Table 2: Distribution of the patients by mammographic findings (n=57)

Mammographic findings	Number of patients	Percentage
Glandular pattern		
Pre dominantly glandular	27	47.4
Mixed glandular and fatty	30	52.6
Number of lesion		
Single	56	98.2
Multiple	1	1.8
Density		
Dense	56	98.2
Radio lucent	1	1.8
Margin		
Well define	36	63.2
Spiculated	9	15.8
Ill define	8	14.0
Lobulated	1	1.8
Irregular	3	5.2
Mass	57	100.0
Perilesional halo	13	22.8
Architectural distortion	11	19.3
Calcification	10	17.5
Skin & nipple change	10	17.5
Enlarged lymph node	3	5.3

Table 3: Distribution of the patients by mammographic diagnosis (n=57)

Mammographic diagnosis	Number of patients	Percentage
Benign	43	75.4
Firbroadenoma	31	58.4
Fibrocystic disease	5	8.8
Cyst	4	7.0
Abscess	2	3.5
Galactocele	1	1.8
Malignant	14	24.6

Table 4: Distribution of the patients according to mammographic findings with malignant and benign lesion (n=57)

Mammographic findings	n	Malignant (n=14)		Benign (n=43)	
		n	%	n	%
Mass only	41	3	7.3	38	92.7
Mass with spiculation	6	6	100.0	0	0.0
Mass with macro calcification	5	0	0.0	5	100.0
Mass with micro calcification	2	2	100.0	0	0.0
Mass with spiculation, micro calcification and enlarged axillary lymph node	3	3	100.0	0	0.0

Table 5: Distribution of the patients by histopathological diagnosis (n=57)

Histopathological diagnosis	Number of patients	Percentage
Benign	44	77.2
Firbroadenoma	29	50.9
Fibrocystic change	6	10.5
Abscess	4	7.0
Cyst	4	7.0
Galactocele	1	1.8
Malignant	13	22.8
Invasive ductal carcinoma	8	14.0
Invasive lobular carcinoma	4	7.0
Medullary carcinoma	1	1.8

Table 6: Comparison between mammography with histopathology (n=57)

Mammography	Histopathology				Total
	Malignant (n=14)		Benign (n=43)		
	n	%	n	%	
Malignant	10	76.9	4	9.1	14
Benign	3	23.1	10	90.9	43
Total	13		14		57

Table 7: Sensitivity, specificity, accuracy, positive and negative predictive values of the mammography evaluation for prediction of breast mass.

	Mammography
Sensitivity	76.9%
Specificity	90.9%
Accuracy	87.7%
Positive predictive value	71.4%
Negative predictive value	93.0%

Discussion

This cross-sectional type of study was carried out with an aim to determine the benign and malignant nature of breast mass by mammography and diagnosis of breast mass by histopathology and also to evaluate the diagnostic performance of mammography in the evaluation of benign and malignant breast mass in comparison to the histopathological findings. In this present study, a total of 57 patients were included, among which almost one third (31.6%) patients were age belonged to 46-50 years. The mean age was found 47.8 ± 6.4 years with range from 35 to 60 years. Houssami et al.¹¹ and Nascimento et al.¹² found that the mean age of subjects was 44.9 ± 8.7 years varied from 27 to 55 years and 49 ± 12 years varied from 37 to 61 years respectively, which are is consistent with the current study. Yunus et al.¹³ showed the mean age was 48 years varied from 30-80 years. The above findings are comparable with the current study Out of 57 patients, 43 (75.4%) were benign lesions and only 14 (24.6%) malignant lesions. Mammographic findings of 31 (54.4%) patients were fibroadenoma, 5 (8.8%) were fibrocystic disease, 4 (7.0%) were cyst, 2 (3.5%) were abscess, 1 (1.8%) were galactocele and 14 (24.6%) were malignant lesions. Fibroadenoma 12.7%, simple cyst 4.8%, Breast Abscess 1.2%. Galactocele 1.2%, Breast malignancies cases 18.1%.¹⁴ In another study Nascimento et al.¹² found that 58.3% lesions were benign and 41.7% were malignant. In this present study it was observed that 41 patients had only mass among them, 3 (7.3%) were malignant and 38

(92.7%) were benign patients. Six patients were mass with spiculation, among them all (100.0%) were malignant patients. Five patients were mass with macro calcification, among them all (100.0%) were benign patients. Two patients were mass with micro calcification, among them all (100.0%) were malignant patients. Three patients were mass with spiculation, micro calcification and enlarged axillary lymph node, among them all (100.0%) were malignant patients.

In this current study it was observed that benign and malignant lesion were 44 (77.2%) and 13 (22.8%) respectively. Out of 57 patients, histopathological diagnosis of 29 (50.9%) were fibroadenoma, 6 (10.5%) were fibrocystic change, 4 (7.0%) were cyst, 4 (7.0%) were abscess and 1 (1.8%) were galactocele. All of them are benign lesion of breast. Histopathological diagnosis of invasive ductal carcinoma, invasive lobular carcinoma and medullary carcinoma were 8 (14.0%), 4 (7.0%) and 1 (1.8%) respectively. In Houssami et al.¹¹ study reported that the histologic types of cancer in the 240 patients were invasive ductal 70.0%, ductal in situ 14.0%, invasive lobular 9.0%, tubular 4.0%, medullary 1.0%, and other types 1.2% and no histology 0.8%. Biopsies of 115 breast masses detected at mammography were performed by Nascimento et al.¹² and found sixty-seven of these lesions (58.3%) were benign and 48 (41.7%) were malignant.

In this series out of all cases 14 were diagnosed as malignant breast mass by mammography, among them 10 (76.9%) were confirmed by histopathology. They were true positive. Four cases were diagnosed as having as malignant breast mass by mammography but not confirmed by histopathology. They were false positive. Out of 43 cases of benign breast mass which were confirmed by mammography, three (23.1%) were confirmed as malignant breast mass and 40 (90.9%) were benign breast mass by histopathological findings. They were false negative and true negative respectively. Nascimento et al.¹² found 58.3% and 41.7% lesions were benign and malignant respectively.

In this current study evaluation of breast mass by mammography showed that the sensitivity was 76.9%, specificity 90.9%, accuracy 87.7%, positive predictive values 71.4% and negative predictive values 93.0%. Houssami et al.¹¹ mentioned that mammographic sensitivity was 75.8%. Mammography is nearly 87% accurate in detecting cancer^{15,16,17} its specificity is 88% and its positive predictive value may be as high as 22% (Barlow et al. 2002). But the false negative findings in mammography in evaluation of palpable breast mass is high, estimated between 4.0% & 12.0%¹⁸. Nascimento et al.¹² mentioned in their study that the sensitivity was 68%, specificity 76%, and accuracy 75%. NPV 76% and PPV was 51% observed by first observer. Another observed found sensitivity 87.0%, specificity 44.0%, accuracy 62.0%, NPV was 83% and PPV 53% observed by second observer. So, overall diagnostic accuracy correlates well with other studies.

Conclusion

It was found that mixed glandular and fatty, single lesion, dense, and well defined margin were commonly found in mammography. Fibroadenoma was more common in benign lesion. Fibroadenomas were more common among the benign lesions and invasive ductal carcinoma among the malignant lesions in Histopathological diagnosis. Mammography is cost effective, available and less time consuming procedure to see location density, margin of lesion, glandular pattern of the breast etc. and thereby helping surgeon for operative plan and decreases patient's morbidity and mortality. Therefore it can be concluded that mammography is highly sensitive, specific and useful method in the differentiation of malignant and benign breast masses. It can be used to plan the subsequent appropriate management in majority of cases. Further studies can be undertaken by including large number of patients.

References

1. Abinaya, S, Sivakumar, R, Karnan, M, Shankar, M, Karthikeyan, M, 'Detection of breast cancer in mammograms - a survey', International Journal of Computer Application and Engineering Technology, 2014; vol. 3, no. 2, pp. 172-178.
2. WHO, 'Cancer Registry Report: National Institute of Cancer Research and Hospital 2005-2007', National Institute of Cancer Research and Hospital, 2009; pp. 1-21.
3. Cotran, RS, Kumar, V & Robbins, SL, 'The breast', In: Robbin's Pathological Basis of Disease, 6th edition, W.B Saunders company, Philadelphia; 1999; pp. 1093-1114.
4. Imaginis, 'Advanced in mammography and other breast imaging methods', 2006; Available from <http://www.imaginis.com/mammography/advances-in-mammography-and-other-breast-imaging-methods-1>
5. Malik, SS, Akhter, T & Malik, SA, 'Mammographic-sonographic co-relation in the diagnosis of breast lump', Biomedica. 2008; vol. 24, pp. 147-151.
6. Bovis, K and Singh, S, 'Detection of Masses in Mammograms Using Texture Features', Proceedings of the International Conference on Pattern Recognition (ICPR'00), IEEE, 2000; pp. 267-270.
7. Dixon, JM & Mansel, RE, 'Symptoms, assessment, and guidelines for referral', In: Dixon JM, ed. ABC of breast diseases, 2nd ed. London: BMJ, 2000; pp. 3-7.
8. Irwig, L & Macaskill, P, 'Evidence relevant to guidelines for the investigation of breast symptoms', Sydney, Australia: National Breast Cancer Centre, 1997; pp. 5-18.
9. Houssami, N, Ciatto, S, Irwig, L, Simpson, JM & Macaskill, P, 'The comparative sensitivity of mammography and ultrasound in women with breast symptoms: an age-specific analysis', Breast, 2002; vol. 11, pp. 125-130.
10. National Health and Medical Research Council, 'How to review the evidence: systematic identification and review of the scientific literature', Canberra, A.C.T, Australia: Commonwealth of Australia, 2000; pp. 62-63.
11. Houssami, N, Irwig, L, Simpson, JM, McKessar, M, Blome, S & Noakes, J, 'Sydney Breast Imaging Accuracy Study: Comparative Sensitivity and Specificity of Mammography and Sonography in Young Women with Symptoms', AJR, vol. 180, 2003; pp. 935-940.
12. Nascimento, JHR, Silva, VD & Maciel, AC, 'Accuracy of mammographic findings in breast cancer: correlation between BI-RADS classification and histological findings', Radiol Bras. vol. 43 no. 2, 2010; pp. 91-96.
13. Yunus, M, Ahmed, N, Masroor, I & Yaqoob, J, 'Mammographic Criteria for Determining the Diagnostic Value of Microcalcifications in the Detection of Early Breast Cancer', J Pak Med Assoc. vol. 54, no. 1, 2004; pp. 24-29.
14. Taori, K, Dhakate, S, Rathod, J, Hatgaonkar, A, Diswal, A & Wavare, P et al., 'Evaluation of Breast Masses Using Mammography and Sonography as First time Line Investigations', Open Journal of Medical Imaging, 2013; vol. 3, no. 1, pp. 40-49.
15. Osuch, JR, Reeves, MJ, Pathak, DR and Kinchelov, T, 'BREASTAID: Clinical Results from Early Development of a Clinical Decision Rule for Palpable Solid Breast Masses', Annals of Surgery, 2003; vol. 238, no. 1, pp. 728-737.
16. Berg, WA, Campassi, CI and Ioffe, OB, 'Cystic Lesions of the Breast: Sonographic-Pathologic Correlation', Radiology, vol. 227, no. 1, 2003; pp. 183-191.
17. Kolb, TM, Lichy, J and Newhouse, JH, 'Comparison of the Performance of Screening Mammography, Physical Examination, and Breast US and Evaluation of Factors that Influence Them: An Analysis of 27,825 Patiluations,' Radiology, vol. 225, no. 1, 2002; pp. 165-175.
18. Dennis, MA, Parker, SH, Klaus, AJ, Stavros, AT, Kaske, TI and Clark, SB, 'Breast Biopsy Avoidance: The Value of Normal Mammograms and Normal Sonograms in the Setting of a Palpable Lump', Radiology, vol. 219, no. 1, 2001; pp. 186-191.