Original Paper

Comparison of Mammography and Ultrasonography in Evaluation of Breast Masses

Nahar Z[1], Kabir ME[2], Alam T[3], Yasmin S[4], Naowar M[5]

DOI: https://doi.org/10.3329/jafmc.v13i2.41368

Abstract

Introduction: Breast cancer is the most common cancer and second leading cause of cancer deaths in women. Early detection, efficient and accurate diagnosis can reduce the mortality rate.

Objective: To compare the screening accuracy of mammography (MMG) and ultrasonography (USG) in suspected cases of breast masses.

Materials and Methods: This cross-sectional analytical study was carried out in the Department of Radiology and Imaging, Combined Military Hospital, Dhaka from June 2016 to July 2017. A total of 100 clinically suspected case of breast masses aged from 20 to 75 years referred for MMG and USG was selected. Each patient underwent USG and MMG followed by a histopathological examination of the biopsy material taken from the lump lesion. Two cases histopathological report was not found. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and diagnostic accuracy of USG and MMG were compared with histopathology as the gold standard. In order to determine the agreement of diagnoses between USG and MMG, consistency analysis was performed using Kappa-statistics.

Results: Sensitivity, specificity, PPV, NPV and diagnostic accuracy of USG was 58.8%, 98.4%, 77.8%, 85.0% and 83.6% and for MMG 92.0%, 84.5%, 67.6%, 96.8% and 84.7% respectively. Kappa-statistics shows that the two diagnostic modalities had a test agreement in 39.8% cases to differentiate malignant breast tumour from the benign one (k-value=0.398, p>0.05).

Conclusion: Two diagnostic modalities USG and MMG had a fair agreement in the differentiation of malignant breast tumour from the benign.

Key-words: Mammography, Ultrasonography, Breast cancer.

Introduction

Breast cancer is the most common cancer and second leading cause of cancer deaths in women. Its incidence increases with age[1]. Though most breast cancer occurs in women older than 50 years; but 31 per cent of women diagnosed with breast cancer from 1996 to 2000 were younger than 50 years[1,2]. In 2010, approximately 1.75 million new cases of breast cancer were diagnosed worldwide[3]. Important risk factors for female breast cancer include early onset of menarche, late age of menopause, first full-term pregnancy after the age of 30 years, history of breast cancer in mother or sister, personal history of breast cancer, or some time even benign proliferative breast disease. The early sign of breast cancer is an abnormality depicted on a mammogram (MMG) before the women or her physician can feel it[4]. Breast pain is commonly due to benign condition and not usually the first symptom of breast cancer[5]. Breast masses have a varied aetiology, may be benign or malignant. Fibroadenoma is the most common benign breast mass and ductal carcinoma is the most common malignancy. Efficient and accurate radiological evaluation of breast masses can maximize cancer detection and minimize unnecessary investigation procedures and mortality[5].

Significant decrease in breast cancer mortality which accounts for nearly 30% since 1990 is a major success and is due in large part to the earlier detection of breast cancer through MMG screening6. Breast ultrasonography (USG) is considered an effective second-line screening test in the evaluation of women with dense breast tissue on MMG. The American College of Radiology (ACR) established the first edition of the Breast Imaging Reporting and Data System (BI-RADS) lexicon for MMG and USG in an attempt to standardize image interpretation and reporting and to improve communication among radiologist, referring physician and surgeons[7]. The present study was conducted to compare the screening accuracy of MMG and USG in suspected cases of breast masses.

1. **Lt Col Zebun Nahar**, MBBS, MCPS, FCPS, Classified Radiologist, CMH, Dhaka 2. **Brig Gen Md Enamul Kabir**, MBBS, FCPS, Chief Surgeon, CMH Dhaka 3. **Brig Gen Taharul Alam**, MBBS, MCPS, FCPS, Advisor Specialist & Head, Department of Radiology & Imaging, CMH, Dhaka 4. **Lt Col Shamoli Yasmin**, MBBS, DCP MCPS, FCPS, Classified Specialist in Pathology (Histopathologist), AFIP, Dhaka 5. **Dr Maisha Naowar**, MBBS, Intern Doctor, Kurmitola General Hospital, Dhaka.

Materials and Methods

This cross-sectional analytical study was carried out in the department of radiology and imaging, Combined Military Hospital (CMH), Dhaka from June 2016 to July 2017. A total of 100 clinically suspected case of breast masses aged from 20 to 75 years were selected for MMG or USG. Informed consent was obtained from every patient after adequate explanation about the procedure. Each patient underwent USG and MMG examination followed by the histopathological examination of the biopsy material taken from the lump lesion. MMG was performed with MAMMOMAT inspiration-digital machine and USG was performed by using GE volusion ultrasound real-time unit with a 12-MHz linear array transducer. Both the breasts were systematically examined with overlapping scans in a radial and anti-radial pattern from the nipple to the periphery and retro-areolar region and both axillae were separately scanned. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy of diagnosis of USG and MMG were compared with histopathology as the gold standard. For diagnosis of breast masses by USG and MMG, BI-RADS criteria were followed. All the necessary data was collected in a preformed structured data collection sheet. Statistical analysis was done using SPSS for Windows version 20.0 and to determine the agreement of diagnoses between USG and MMG, consistency analysis was performed using Kappa-statistics (k-statistics). For statistical significance p-value < 0.05 was considered significant.

Results

This study revealed that the mean age of the patient was 43.2±12.3 years and ranged from 20–72 years. Nearly one-third (31%) of study subjects were in their 3rd decade of life and 28% in both 4th decade and 5th decade (Table-I).

Table-I: Distribution of the study population by their age (n=100)

Age (years)	Frequency	Percentage
≤ 30	13	13.0
31 – 40	31	31.0
41 – 50	28	28.0
≥ 5	28	28.0

Mean±SD of age=43.2±12.3 years and Age Range=20–72 years

By USG 18 cases were diagnosed as malignant, 57 were benign and 25 cases were normal in contrary by MMG 33 cases diagnosed as malignant 37 cases as benign and 30 were normal. Twenty six cases as malignant, 56 cases as benign and 16 as normal were confirmed by histopathology (Table-II). In comparison to histopathology result, 7 cases were false positive by MMG and 8 cases were true negative by USG.

Table-II: Diagnosis of patients by ultrasonography, mammography and histopathology (n=100)

Type	USG	MMG	Histopathology
Malignant	18 (18%)	33 (33%)	26 (26.6%)
Benign	57 (57%)	37 (37%)	56 (57.1%)
Normal	25 (25%)	30 (30%)	16 (16.3%)

According to histopathology report among the benign lesions, fibroadenoma (39.3%) followed by benign proliferative disease 21.5%. Of the malignant histological types, infiltrating ductal carcinoma comprised 26.9% followed by ductal carcinoma in situ 23.1% and 16(16.3%) were normal report (Table-III).

Table-III: Distribution of patients by their histological types (n=98)

Type	Histopathological Profile	n(%)
Benign (n=56)	Benign breast tissue	10 (17.8)
	Benign proliferative disease	12 (21.5)
	Fibroadenoma	22 (39.3)
	Mastitis or inflammation	9 (16.1)
	Phyllodes tumour	3 (5.3)
Malignant (n=26)	Infiltrating ductal carcinoma	7 (26.9)
	Ductal Carcinoma In Situ	6 (23.1)
	Infiltrating lobular carcinoma	5 (19.2)
	Lobular carcinoma	5 (19.2)
	Mucinous carcinoma	2 (7.7)
	Medullary carcinoma	1 (3.8)

The sensitivity of USG in diagnosing breast cancer was low (58.8%), while its specificity in ruling out malignancy in breast was remarkably high (98.4%). The PPV, NPV and diagnostic accuracy of USG were 77.8, 85 and 83.6% respectively. The MMG had a high (92%) sensitivity and NPV 96.8%, while its specificity and diagnostic accuracy were 84.6 and 84.7% respectively. However, its PPV was moderate (67.7%). The test of agreement between the USG and MMG using kappa-statistics shows that the two diagnostic modalities had a fair agreement in the differentiation of malignant breast tumour from the benign one (k-value= 0.398, p>0.05). The agreement between the two diagnostic modalities was in 39.8% cases (Table-IV).

Table-IV: Association of USG and MMG (n=100)

Components of Accuracy Test	Screening tests		Measures of Agreement	
	USG (%)	MMG (%)	Kappa value	p-value
Sensitivity	58.8	92.0	0.398	>0.05
Specificity	98.4	84.5		
PPV	77.8	67.6		
NPV	85.0	96.8		
Diagnostic accuracy	83.6	84.7		

Discussion

In this study, the patient ages ranged from 20 to 75 years with a mean age of 43.2±12.3 years. This mean age was more than the mean age of 38.3±11.9 years in a study carried out by Kolb TM et al[8]. Histopathological examination of the biopsied specimen of the breast lesion revealed that the most common benign breast lesion was fibroadenoma (22%) which correlates with this study done by E.A. Abdel-Gawad et al[7] who reported that fibroadenoma was the common (26.7%) breast tumour in women under age 30. The most common malignant breast lesions in this study were invasive ductal carcinoma (26.9%) which was not consistent with the study of E.A. Abdel-Gawad et al[7], who reported that the prevalence of invasive ductal carcinoma was 13%. This difference might be due to age difference of patients.

In this study, USG had diagnostic reliability for diagnosing and differentiating between benign and malignant breast lesion 83.6% whereas MMG had the diagnostic reliability 84.7%. A comparison between USG and MMG diagnostic reliability for the detection of breast mass showed there was no significant ($p>0.05$) difference. MMG can be the primary method of detection and diagnosis of breast disease has a proven sensitivity of 92%. It coincides with Obenaucs S et al and Lewin JH et al that, mammography is a well-established diagnostic modality for detection of breast lesion[9,10].

Conclusion

This study recommends that sensitivity of MMG is higher for the detection of breast cancer in comparison to USG. Two diagnostic modalities USG and MMG had a fair agreement in the differentiation of malignant breast tumour from the benign. So, we can come to a conclusion that the diagnostic accuracy for carcinoma of breast improves when MMG will be done in combination with USG.

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