

Diagnostic Accuracy of Gray Scale Sonography for the Detection of Malignant Breast Tumour

Showkat Ara^{1*}, A. F. M. Arshedi Sattar², Syed Md. Sazzad Kamal³, Md. Durrul Huda⁴, Md. Abdullah Yusuf², Md. Shahidul Islam⁵

¹Department of Neuroradiology & Imaging, National Institute of Neurosciences & Hospital, Dhaka, Bangladesh

²Department of Microbiology, National Institute of Neurosciences & Hospital, Dhaka, Bangladesh

³250 Bedded General Hospital, Jessor, Bangladesh

⁴Department of Radiology & Imaging, Institute of Health Technology, Rajshahi, Bangladesh

⁵Department of Radiology & Imaging, Sheikh Hasina Medical College, Tangail, Bangladesh

Email: *munny199@gmail.com, afmasattar@yahoo.com, skamal_bsmmu@yahoo.com, durruldr68@gmail.com, ayusuf75@yahoo.com, shahid_bd123@yahoo.com

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Abstract

Background: Gray scale sonography is an important diagnostic tool for the detection of malignant breast tumour. **Objective:** The purpose of the present study was to find out the diagnostic validity gray scale sonography to detect malignant lesions of breast. **Methodology:** This cross-sectional study was carried out in the department of Radiology and Imaging, in collaboration with the department of Surgery and Pathology at Banghabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, from July 2008 to June 2009 for a period of one year. Women presented with clinically suspected breast mass from outpatients' department (OPD) or inpatient department (IPD) were purposively selected and was Ultrasonographic diagnosis. 2-D Real-Time B-Mode Ultrasonographic examinations were done using high frequency (7.5 MHz) linear transducer. **Result:** Test of validity was done for color Doppler Sonographic findings in evaluation of benign and malignant breast lesion. Out of 50 cases, 23 cases were true positive; 4 cases were false negative; 1 case was false positive; 22 cases were true negative confirmed by histopathology. Here sensitivity and specificity of Gray scale ultrasonography were 85.18% and 95.0% respectively. Here accuracy of Gray scale study was 90.0%. Positive predictive value was 95.83% and negative predictive value was 84.61%. **Conclusion:** Gray scale ultrasonography is a useful method in the differentiation between benign and malignant breast masses.

Keywords

Gray Scale Ultrasonography, Breast Tumour, Diagnostic Accuracy

1. Introduction

Breast lesions particularly breast cancer causes some 20.0% of cancer death among females [1]. Breast cancer is the commonest cause of death in middle-aged women in western countries. Currently, one of every nine women in United States of America would develop breast cancer in their life time [2]. And virtually remain stable over the past thirty years, now being about 27 per one lac. In developing countries, it accounts for 1% to 3.0% of death [3]. Specifically, in Bangladesh, breast lesions particularly breast cancer is common clinical problem. In Bangladesh, remarkable increase of breast cancer has occurred in recent year. National Institute of cancer research from 1996 to 2000 showed cervical cancer ranked 1st and breast cancer ranked 2nd and the management of patients with carcinoma breast can be improved if a definitive diagnosis is obtained preoperatively by Radiological Examination [4].

The result of this study was to focus a new approach to reduce the frequency of unnecessary biopsies. Gray scale ultrasonography (USG) can detect breast mass very early due to visualization of marginal contour, calcification and echo-pattern of very small mass [5]. It can contribute to the survival benefit obtained by early breast cancer detection [6]. For developing country like Bangladesh Gray scale ultrasonography can be an easy, non ionizing, non invasive, time relieving, low cost diagnostic tool which can reduce unnecessary biopsies and surgical procedures and thus reducing morbidity and financial burden to the patient.

The purpose of this study was to assess the overall diagnostic accuracy of Gray scale USG to identify the malignant breast lesion.

2. Methodology

This study was performed in the Department of Radiology and Imaging at Banghabandhu Sheikh Mujib Medical University (BSMMU), Dhaka from July 2008 to June 2009 for a period of one (01) year. Patients presented with palpable breast lesions who were admitted in the surgery units of BSMMU and were diagnosed clinically as having solid breast lumps were selected as study population. The objective of the study was discussed in details with the patients before their decision to enroll themselves into the study. A detailed clinical history was taken from the patients about their symptoms like lump, duration of complains, pain, nipple discharge, nipple retraction etc. Relevant physical examinations were also done in all the cases. The patients were underwent Gray scale sonography by standard procedure [7]. Malignancy of breast lesions was detected pre-operatively. The findings were also interpreted first by the investigator and to eliminate bias the findings were confirmed by a radiologist of the department. Excision biopsy or mastectomy was done in all cases. Their postoperative findings were noted and were correlated with sonological findings. Tissues of surgically removed tumors were sent to the Department of Pathology. Their histopathology reports were collected and were then correlated with the gray scale so-

nography findings. All this information was collected in a pre-designed data collection sheet. All the collected data was compiled and tabulated on master sheet. Statistical analyses were carried out by using the Statistical Package for Social Sciences version 16.0 for Windows (SPSS Inc., Chicago, Illinois, USA). A descriptive analysis was performed for all data. The quantitative observations were indicated by frequencies and percentages. Chi-square test and test of validity was done for color Doppler sonographic findings in evaluation of benign and malignant breast lesion. A p value was considered to be statistically significant if <0.05 . The sensitivity, specificity, positive predictive value, negative predictive value and accuracy were calculated for the test by standard formula [4].

3. Results

Twenty three cases found truly malignant and 4 (four) cases were found benign as confirmed by histopathology; while of the 23 benign cases (USG diagnosis), 22 were found benign as detected by FNAC and 1(one) were found malignant which was confirmed by excisional biopsy. So, finally 28 cases were diagnosed malignant and 22 cases were benign. Thus, out of 50 cases 22 patients diagnosed as benign and 28 cases were diagnosed as malignant after performing excisional biopsy. In malignant and benign tumor more than 1.4 cm was found in 18 cases in each. Irregular margin was found more in malignant tumor than benign which was 16 (80%) and 10 (38.47%) cases respectively (Table 1).

The patients suspected as malignant or benign lesion in breast by gray scale sonology were correlated with histopathological diagnosis. Out of the 50 cases 27 (54%) cases were malignant and 23 (46%) cases were benign in histopathological findings. On the other hand, 24 (48%) cases were suspected as malignant and

Table 1. Distribution of all parameters compared to histopathological report (n = 50).

Criteria	Malignant n (%)	Benign n (%)	P Value
Size			
>1.4 cm	18 (75%)	18 (69.24%)	0.001
≤1.4 cm	6 (25%)	8 (30.76%)	
Margin			
Irregular	16 (80%)	10 (38.47%)	0.001
Regular	4 (20%)	16 (61.38%)	
Internal Echo			
Hypoechoic	4 (16.66%)	18 (69.23%)	0.001
Hyperechoic	0 (0%)	5 (19.23%)	
Heterogenous	20 (83.34%)	3 (11.54%)	
Calcification			
Present	18 (75%)	3 (11.53%)	0.001
Absent	6 (25%)	23 (88.47%)	

rests of the 26 (52%) cases were suspected as benign in gray scale sonography. Among the 24 cases, which were suspected as malignant by gray scale sonology, one case was benign in histopathological examination. Four (4) cases were found malignant in histopathology among the suspected benign cases, which were diagnosed by gray scale sonography (Table 2).

Sensitivity, specificity, positive predictive value, negative predictive value and accuracy were 85.2%, 95.0%, 95.8%, 84.6% and 90.0% respectively (Table 3).

The ROC curve was calculated (Figure 1) and was found that area under the curve (AUC) was 0.096 (95% CI 0.002 to 0.189) which was statistically significant ($p = 0.0001$) (Table 4).

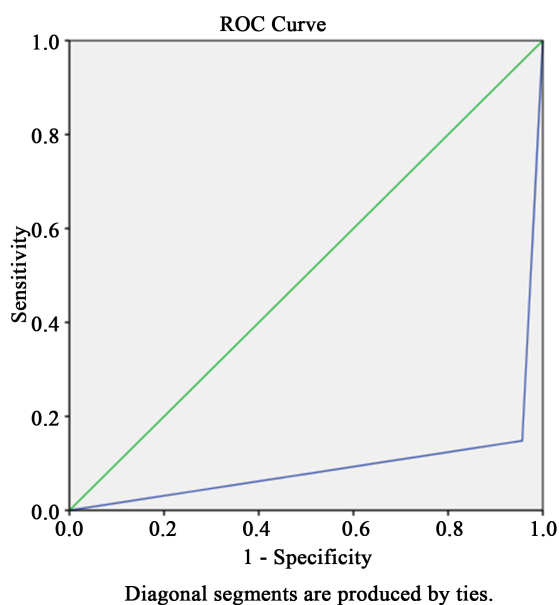


Figure 1. ROC curve of the gray scale sonography.

Table 2. Association between gray scale sonography and histopathology in evaluation of malignant and benign lesion (n = 50).

Gray Scale Sonography	Histopathological Diagnosis		Total
	Malignancy Present	Malignancy Absent	
Malignant	23	1	24
Benign	4	22	26
Total	27	23	50

Table 3. Sensitivity, specificity, accuracy, positive and negative predictive values of the gray scale sonography in diagnosis of breast lesion.

Validity Test	Value
Sensitivity	85.2%
Specificity	95.0%
Positive Predictive Value	95.8%
Negative Predictive Value	84.6%
Accuracy	90.0%

Table 4. Area under the curve.

Area	P value	Asymptotic 95% Confidence Interval	
		Lower Bound	Upper Bound
0.096	0.0001	0.002	0.189

The test result variable(s): Gray Scale Sonography has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased. a. Under the nonparametric assumption; b. Null hypothesis: true area = 0.5.

4. Discussion

Ultrasonography in Gray scale has been shown to be effective modality in detection breast malignancy. Gray scale evaluation has become an important investigation and is considered as most important complementary method to mammography. Thus it could be concluded that Gray scale sonography increase chance of detection of malignancy. This method prospective study was carried out in the department of Radiology and Imaging, BSMMU, hospital in collaboration with the departments of surgery and pathology department of BSMMU during the period of July 2008 to June 2009.

Gray scale Ultrasonography is very useful in the differentiation between benign and malignant breast masses [7] [8] [9] [10]. The distribution and morphology of lesions in solid breast masses seen at Gray scale ultrasound is a potentially important feature to be considered along with other sonographic criteria to predict the likelihood of malignancy [11]. Characteristic sonographic findings of benign tumors include a round or oval, slightly hypo echoic lesion with smooth borders, homogeneous internal echo, no central posterior acoustic shadowing and normal surrounding tissue [12] [13] [14] [15] [16]. The typical features of malignancy include irregular shape, irregular margins, hypoechogenicity and central posterior acoustic shadowing.

Validity of gray scale sonography of diagnostic modality in evaluation of suspected malignant lesion has been calculated by sensitivity, specificity, positive and negative predictive values. The validity of gray scale sonography and histopathological findings were correlated by calculating sensitivity, specificity, accuracy, positive and negative predictive values by using the standard formula.

Preoperative detection of breast malignancy by Gray scale sonography and its validity by determining sensitivity, specificity, accuracy, positive predictive value and negative predictive value. The age of patients ranged from 25 to 69 years. They were divided into 5 age groups. Maximum numbers of patients with solid breast lesions were found in the 50 - 59 years age group. Among the 50 patients 46% (23 cases) were proved to be benign lesions and 54% (27 cases) were diagnosed as malignant lesions. Sensitivity, specificity, accuracy, positive predictive value (PPV) and negative predictive value (NPV) were 92.59%, 86.95%, 90%, 89.28% and 90.90% respectively. Similar result is reported in other studies [7] [17].

The study findings indicate that Gray scale sonography is sensitive, specific and accurate diagnostic tool then they used as a single modality in detection of

malignant breast lesions. Limitations of the study were short period, small sample size, inflammatory lesions in breast that give increase RI index. Gray scale sonography were performed by a single radiologist of the department, so there was chance of bias. There are some limitation of this study. This is a single centred study. Furthermore sample size is small. Updated and technologically advanced USG is not used.

5. Conclusion

Gray scale sonography of solid breast lesions is a sensitive, specific and accurate modality in detecting malignant solid breast lesions. In the present study, it is observed that Gray scale evaluation has a high sensitivity and accuracy. So, it can be concluded that gray scale sonography can be used as a sensitive diagnostic tool in the detection of malignant solid breast lesions. However, further research on this subject may be encouraged on large number of patients in multiple tertiary levels.

Conflicts of Interest

There is no conflict of interest to any of the authors of this article.

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