IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 19, Issue 12 Ser.3 (December. 2020), PP 19-24
www.iosrjournals.org

Accuracy of Combined Mammographic and Sonographic Evaluation of Breast Lump than of Either Used Alone.

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Abstract
Background: *Breast cancer is the fifth common cause of cancer deaths and one of the most common causes of cancer death in women. Among imaging techniques mammography (MG) helps in diagnosing asymmetry, neo-density and distortion of fibro-glandular architecture where ultrasonography(USG) plays a key role in differentiating cystic and solid masses. The present study evaluated palpable breast masses using mammography and ultrasound.*
Aim of the study:*The aim of this study was to assess the accuracy of combined mammographic and sonographic evaluation of breast mass than of either used one.*
Methods: *This was a descriptive observational study and it was conducted in the Department of Radiology and Imaging, Bangabandhu Sheikh Mujib Medical University (BSMMU), Bangladesh during the period from January 2015 to December 2015. In total 86 women with breast symptoms such as palpable lumps, pain in the breast and nipple discharge were selected as study people. All the participants were examined by both MG and USG independently. Fine needle aspiration cytology (FNAC) or core cut biopsy was done as per need according to the findings of MG and USG and then the results were correlated with each modality finding.*
Result: *In mammography alone procedure the sensitivity rate was 77.91%, in ultrasonography alone it was 75.58% and in combined procedure it was 97.67%. In mammography 100% sensitivity was found in only phylloidstumour diagnosis but in diagnosis of other breast conditions the sensitivity ratio was >60%. In ultrasonography 100% sensitivity was found in cyst and infection diagnosis but in this procedure in fibroadenoma and carcinoma the sensitivity ratio was <60%. In combined procedure 100% sensitivity was found in phylloidstumour, cyst, infection and fibrocystic mastitis diagnosis and in other breast conditions the sensitivity ratio was >90%. In P value analysis between mammography and sonography we found significant correlation in fibroadenoma diagnosis only, where the P value was 0.016. Besides this, in P value analysis between mammography and MG-USG combined we did not find significant correlation in any field of diagnosis. But in P value analysis between USG and MG-USG combined procedure we found significant correlation in fibroadenoma and carcinoma diagnosis where the P values were 0.001 and 0.031 respectively.*
Conclusion: *This study confirmed that, MG and USG when combined had higher sensitivity than the sensitivity observed for a single modality. The combined MG and USG approach to detect breast diseases is significantly more helpful in accurate evaluation of breast pathologies than when either modality is used alone.*
Key words:*Breast cancer, Mammography, Sonography. Evaluation.*

Date of Submission: 24-11-2020 Date of Acceptance: 08-12-2020

I. Introduction

Breast cancer is the fifth common cause of cancer deaths and one of the most common causes of cancer death in women. Among imaging techniques mammography helps in diagnosing asymmetry, neo-density and distortion of fibro-glandular architecture where USG plays a key role in differentiating cystic and solid masses. The present study evaluated palpable breast masses using mammography and ultrasound. In fact breasts are the secondary sexual characteristic in female which are also the source of nutrition for the neonates. This tender, sensitive and delicate complex structure is constantly under the influence of hormones.[1]Anyaberration in this process leads to the susceptibility to a spectrum of localized pathologies like hyperplastic and neoplastic changes. Common pathologies of female breast include benignlesions like fibroadenomas, simple cysts, fibrocystic diseases, breast abscess, galactocele, ductectasia, enlarged lymph nodes and malignancies[2].Breast cancer is the most common cause of cancer death in women and an overall fifth common cause of cancer deaths in the world. Incidence of breast cancer as per the ICMR (Indian Council of Medical Research) studies show that one in every 22 women is likely to suffer from breast cancer. Incidence has almost doubled in the last 24 years and it is expected to increase per year by 3%. It is responsible for 20% of cancer-related deaths in women.[3]Detection of breast cancer in its earliest possible stage is the ultimate goal in imaging the breast, and the role of the radiologist is therefore vital. Radiology chiefly includes MG (mammography) and USG (ultrasonography) followed by biopsy. The incidence of breast cancer deaths can be reduced by 30 % by the routine screening of healthy women with MG [4]. This is because breast changes like asymmetry, neo-density, distortion of fibro-glandular architecture and micro-calcifications are picked up earlier than lesions that become clinically palpable, or are sometimes detected by self-examination[4].USG plays a key role in diff erentiating cystic and solid masses. It is useful in the evaluation of palpable masses not visible in radiographically dense breasts, abscesses, masses that are not completely evaluable with MG and in young patients susceptible to radiation damage[5].Both the MG and USG methods have been used in attempts to reduce the negative to positive biopsy ratio. Breast cancer mortality has declined since the early 1990sprimarily due to increase in breast cancer awareness, screening and detection of early cancer[6]. The false-negative rate of mammography in the detection of breast cancer has been consistently reported to be approximately 10%, as determined by studies such as the Breast Cancer Detection Demonstration Project[6]. These mammographically occult lesions are generally discovered by physical examination and often occur in women with mammographically dense breasts. Therefore, a negative mammographic result cannot exclude malignancy in women with a palpable mass; the lesion should be biopsied if clinically indicated. The sonographic evaluation of a palpable breast mass is based on three categories. First, if the lesion is a simple cyst, no further workup is required, although aspiration can be done if desired by the patient or physician. Second, if the palpable lesion is a solid mass or complex cyst, further intervention is often required, like fine-needle aspiration or core cut biopsy. Third, if findings from the sonography are negative (No discrete cystic or solid lesions are found to correlate with the palpable mass) and the findings from the mammography are negative, then the treatment of the palpable abnormality is based on the results of the physical examination or screening.

II. Methodology & Materials

This was a descriptive observational study and it was the Department of Radiology and Imaging, Bangabandhu Sheikh MujibMedical University (BSMMU), Bangladesh during the period from January 2015 to December 2015. In total 86 women with breast symptoms such as palpable lumps, pain in the breast and nipple discharge attended the mentioned hospital were selected as study people. All the participants were examined by both MG and USG independently. Fine needle aspiration cytology (FNAC) or core cut biopsy was done as per need according to the findings of MG and USG and then the results were correlated with each modality finding. Some patients showed diff use ill-defined indurations with nipple discharge. All the patients were given adequate explanation about the procedures and consent was obtained. Thehistopathologicalresults were correlated with each modality finding. With the USG examination, cystic and solid masses were also analyzed. Using MG, the patients were analyzed for the parenchymal pattern of the breast according to TABAR'S classification and the histopathologicalfindings correlation of the masses present in them. Masses in the breast were also classified according to the USG predominant pattern. These were cystic, solid and mixed patterns.MG was performed in a stand type Hitachi Holojic which is a radiographic stand to radiograph the subject in a standing or sitting position in combination with mammographic x-ray tube assembly with compression paddle. The cassette used for MG was KodakMin 30 R with single sided screen with ultra-sensitive films with emulsion coated on a single side of size 8X10". Each palpable lesion was evaluated with MG using the film-screen technique. Mediolateral oblique and cranio-caudal images were obtained and assessed carefully. USG was performed on a PHILIPS ENVISOR, real time scanner with a hand held linear electronic array transducer. The transducer could be

operated in the frequency range of 7.5 MHz and was provided with a built-in fluid off set. USG targeted to the palpable lesions were obtained for each patient by a professional breast imaging radiologist. All data were collected, analyzed and disseminated by using MS Office and SPSS version 20 program as per need.

III. Result

In this study 33.72% of the respondents belonged to ≤30 years of age, followed by 31.40%, 22.09% 6.98% and 5.81%belonged 31-40, 41-50, 51-60 and >60 years of ages respectively. In analyzing the sensitivities of mammography (MG) alone, ultrasonography (USG) alone and mammography-ultrasonography combined among the participants we observed in mammography the sensitivity rate was 77.91%, in ultrasonography it was 75.58% and in combined procedure it was 97.67%. In mammography 100% sensitivity was found in only phylloidstumour diagnosis but in diagnosis of other breast conditions the sensitivity ratio was more than 60%. In ultrasonography 100% sensitivity was found in cyst and infection diagnosis but in this procedure in diagnosis of fibroadenoma and carcinoma the sensitivity rate was less than 60%. On the other hand, in combined procedure 100% sensitivity was found in phylloidstumour, cyst, infection as well as fibrocystic mastitis diagnosis and in this procedure in diagnosis of other breast conditions the sensitivity rate was more than 90%. Moreover in P value analysis between mammography and sonography (MG-USG) we found significant correlation in fibroadenoma diagnosis only, where the P value was 0.016. Besides this, in P value analysis between mammography and MG-USG combined we did not find significant correlation in any field of diagnosis. But in P value analysis between USG alone and MG-USG combined we found significant correlation in fibroadenoma and carcinoma diagnosis where the P values were 0.001 and 0.031 respectively.

Table I: Age distribution of participants (N=86)

Age (Years)	n	%
≤30	29	33.72
31–40	27	31.40
41–50	19	22.09
51–60	6	6.98
>60	5	5.81

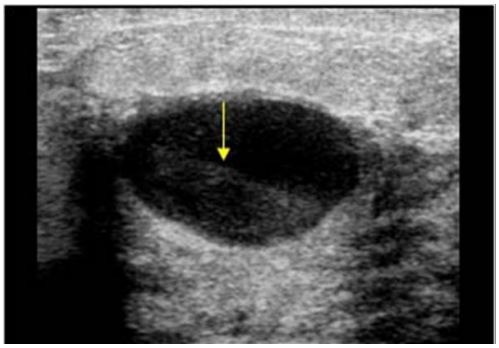

Figure I: Ultrasonography of a benign cyst (Source: Google)

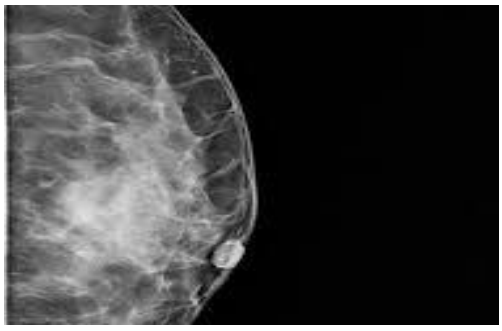

Figure II: Mammographic image of breast cancer (Source: Google)

Table II: Sensitivity of mammography (MG) alone, ultrasonography (USG) alone and mammography-ultrasonography combined (n=86)

Histopathological conditions	n	Mammography alone		USG alone		Combined	
		n	%	n	%	n	%
Fibrocystic mastitis	33	27	81.82	31	93.94	33	100
Infection	7	6	85.71	7	100.00	7	100
Fibroadenoma	19	12	63.16	8	42.11	18	94.74
Cyst	8	6	75.00	8	100.00	8	100
Carcinoma	16	13	81.25	9	56.25	15	93.75
Phylloidstumour	3	3	100.00	2	66.67	3	100
Total	86	67	77.91	65	75.58	84	97.67

Table III: The difference in p-value between MG and USG, MG alone and MG+USG combined, USG alone and MG+USG combined

Findings	MG–USG	MG alone –(MG + USG combined)	USG alone – (MG + USG combined)
Fibrocystic mastitis	0.183	0.085	0.332
Infection	0.283	0.408	0.084
Fibroadenoma	0.016	0.055	0.001
Cyst	0.117	0.306	0.095
Carcinoma	0.328	0.153	0.031
Phylloidstumour	0.078	0.419	0.067
Total	0.122	0.063	0.001

IV. Discussion

The aim of this study was to assess the accuracy of combined mammographic and sonographic evaluation of breast mass than of either used one. Breast cancer is one of the most prevalent cancers in the world among women. Breast masses are common and usually benign, but effective evaluation and prompt diagnosis can rule out malignancy. Masses within the breast are frequently diagnosed by mammography. It is essential to define exactly what constitutes the lesion mass in order to differentiate benign from malignant lesions. Mammography, the primary method of detection and diagnosis of breast disease has a proven sensitivity of 85 % – 95 %[7]. However, additional diagnostic procedures often become necessary in view of its low specificity. Younger women have denser breasts, the use of oestrogen replacement therapy increases breast density and oestrogen replacement therapy use is most common during and shortly after the beginning of menopause and declines thereafter. In addition, dense breast parenchyma and younger age group are associated with lower mammographic sensitivity in some but not all women. Presently non-invasive imaging methods like magnetic resonance imaging (MRI), thermography and colordoppler ultrasound (USG) are being used as adjunctive procedures[7]. Though a definitive diagnosis is possible with non-invasive imaging procedures, for most lesions biopsy/ fine needle aspiration cytology are essential for obtaining reliable results[8]. Patients with palpable breast masses commonly present for imaging evaluation. Unfortunately, false-negative mammographic findings in the setting of a palpable breast mass have been estimated at between 4 % and 12 %[9,10].Therefore, malignancy cannot be excluded when mammographic findings of a palpable mass are negative. Treatment of a palpable mass in this setting is based on the results of physical examination, with aspiration or biopsy performed on clinically suspicious lesions. Sonography is used as an adjunct to mammography to further evaluate palpable masses, especially in women with mammographically dense breasts. Sonography often detects cysts or solid lesions that are obscured on the mammogram by the surrounding fibroglandular tissue and can reduce the number of surgical biopsies required when cysts are identified[9,10]. Although the role of sonography initially was to establish or exclude the cystic nature of a mass, it has expanded with improvements in equipment. Sonographic findings can often confirm a cancer that is obscured mammographically by dense breast tissue. Sonographic technology for breast imaging has dramatically improved in the last decade. With further improvements in sonographic technology and careful prospective real-time evaluation of palpable breast lumps, perhaps the negative predictive value will one day approach 100 %, ideally providing complete confidence for follow-up rather than recommending biopsy of these lesions.MG can help physicians determine whether a lesion is potentially malignant and also screen for occult disease in the surrounding tissue[11]. Radio-opaque ball bearings marks the location of the mass and spot compression and magnification views can clarify the breast mass and determine its density[12]. In this current study, in analyzing the sensitivities of mammography alone, ultrasonography alone and mammography-ultrasonography combined among the participants we observed in mammography the sensitivity rate was 77.91%, in ultrasonography it was 75.58% and in combined procedure it was 97.67%. In mammography 100% sensitivity was found in only phylloidstumour diagnosis but in diagnosis of other breast conditions the sensitivity rate was more than 60%. In ultrasonography 100% sensitivity was found in cyst and infection diagnosis but in this procedure in diagnosis of fibroadenoma and carcinoma the

sensitivity rate was less than 60%. On the other hand, in combined procedure 100% sensitivity was found in phylloidstumour, cyst, infection as well as fibrocystic mastitis diagnosis and in this procedure in diagnosis of other breast conditions the sensitivity rate was more than 90%. Moreover in P value analysis between mammography and sonography (MG-USG) we found significant correlation in fibroadenoma diagnosis only, where the P value was 0.016. Besides this, in P value analysis between mammography and MG-USG combined we did not find significant correlation in any field of diagnosis. But in P value analysis between USG and MG-USG combined we found significant correlation in fibroadenoma and carcinoma diagnosis where the P values were 0.001 and 0.031 respectively.If old films are available, they are compared with the new images. MG is up to 87 percent accurate in detecting cancer[13]. Its specificity is 88 percent, and its positive predictive value may be as high as 22 percent [13]. USG can effectively distinguish solid masses from cysts, which account for approximately 25 percent of breast lesions[14]. When strict criteria for cyst diagnosis are met, USG has a sensitivity of 89 percent and a specificity of 78 percent in detecting abnormalities in symptomatic women.[14] Recurrent or complex cysts may signal malignancy; therefore, further evaluation of these lesions is required[15]. Although USG is not considered a screening test, it is more sensitive than MG in detecting lesions in women with dense breast tissue[14]. It is useful in discriminating between benign and malignant solid masses,[14] and it is superior to MG in diagnosing clinically benign palpable masses (i.e., up to 97 percent accuracy versus 87 percent for MG).[16]It was found from the literatures that MG is a well-established diagnostic modality for the breast. It has high diagnostic yield, but is not 100 % accurate[17]. MG when combined with USG can yield significant improvement in accuracy rates.

Limitations of the Study

This was a single center study with small sample size. SO, the finding may not be generalize in the whole community.

V. Conclusion and recommendations

This observational study confirmed that, MG and USG when combined had higher sensitivity than the sensitivity observed for a single modality. So a combined MG and USG approach to detect breast diseases is significantly more helpful in accurate evaluation of breast pathologies than when either modality is used alone. This study also implies that, USG may be the only modality employed in lactating and pregnant patients as it does not involve ionizing radiation and it may also be used when the density of the breast tissue precludes MG. Similarly, tender breasts with suspected inflammation are examined with USG, owing to the pain caused by compression. The findings of this study may be helpful in the treatment arena of breast cancer and in further studies. But for getting more specific findings we would like to recommend for conducting more studies regarding the same issue with larger sized sample.

Funding Source: Self

Conflict of Interest: None declared.

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Dr. Nasim Sultana, et. al.“Accuracy of Combined Mammographic and Sonographic Evaluation of Breast Lump than of Either Used Alone.”*IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 19(12), 2020, pp. 19-24.