

COMBINED MAMMOGRAPHIC AND SONOGRAPHIC EVALUATION OF PALPABLE BREAST MASS

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ABSTRACT

INTRODUCTION: Detection and evaluation of breast mass is challenging. Identification of malignancy in earliest possible stage is rewarding. Several radiological diagnostic modalities are available for this purpose including mammography and ultrasonography. The objective of the study was to evaluate the accuracy of mammography and ultrasonography individually and in combination to detect and characterize palpable breast mass and to correlate the imaging findings with histopathology.

MATERIAL AND METHODS: Patients presented with palpable breast lump were examined prospectively. All patients were examined by both mammography and ultrasonography. Fine needle aspiration cytology was done for all findings. Correlations of mammography and ultrasonography findings were done with histopathology.

RESULTS: A total of 42 patients were evaluated. Fine needle aspiration cytology revealed 30 (71.42%) benign and 12 (28.58%) malignant lesions. The sensitivity and specificity for mammography were 83.33% and 93.33% and for ultrasonography were 81.81% and 90.32% respectively. When findings of mammography and ultrasonography were combined, both sensitivity and specificity were increased to 91.66% and 96.66% respectively.

CONCLUSION: Combined mammography and ultrasonography had higher sensitivity and specificity rate than sensitivity and specificity rate observed for either of single modality. This study suggests that any patient who is advised to go for a single modality of investigation should rather be investigated using the combined modality.

KEYWORDS: Breast Mass; Mammogram; Ultrasonography

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INTRODUCTION

Detection and evaluation of breast mass is one of the rewarding areas of radiology. Success in these endeavors depends upon the ability to perceive a possible abnormality, the skill to evaluate it with appropriate investigations like mammogram (MG) and ultrasonography. The goal is to detect breast cancer at the earliest possible stage yet to keep unnecessary biopsies to minimum.¹

Mammography is one of the commonly used 1st line diagnostic investigation for breast mass. Other commonly available investigations like ultrasound is also being used widely for the same.

The traditional role for ultrasound (USG) in breast imaging has been as an adjunct to mammography, mainly differentiating cystic from solid masses. However its use has expanded including screening for malignancy, characterization of benign and malignant masses, local-regional staging, and monitoring response to therapy. In addition, USG has real time capability, making the preferred modality for guiding interventional procedures.² Breast lesions that are initially identified on mammography can be further characterized with ultrasonography. Ultrasound can assist in identifying whether the mammographically detected calcifications are associated with invasive component. When ultrasonography is used to further evaluate mammographic findings, accurate mammographicultrasonographic correlation is required.³

Ultrasound is commonly used as a "secondary test" or as an adjunct to mammography.⁴ In most practices with qualified personnel, sonography is the preferred modality for guiding percutaneous biopsies of suspicious breast masses.^{5,6} Sonography often serves as "an extra view," providing information in addition to spot compression, magnification, rolled, or tangential mammographic views.

The definitive test for the determination of nature of breast lump is histopathology. This study is aimed to evaluate the effectiveness of MG and USG in the diagnosis of breast lump individually and in combination to histopathology as a gold standard test.

MATERIAL AND METHODS

This was a hospital based prospective, comparative study conducted at the department of Radiology from August 2013 to July 2014. The study was conducted after the approval of ethical committee. Patients had to have age more than 30 years of age, clinically palpable mass to be enrolled. Patients referred for screening of breasts, pregnant females with breast lump, patients who refuse to give consent, and whose histopathology report couldn't be traced were excluded. Informed consent was obtained from each patient before enrolling them in the study.

History was taken and relevant examinations were done. The participants underwent both MG and USG examination. MG

was performed with GE healthcare ALPHA ST mammography machine. Two view of each breast were obtained, craniocaudal and mediolateral oblique. USG was performed with GE healthcare LOGIC Q6 PRO ultrasound machine. This was followed by USG guided FNAC examination. The specimens were sent for the histopathology examination. Statistical analyses were done using statistical package for social studies software (SPSS) version 17 for windows. Frequencies and percentage distribution were obtained for applicable variables. Univariate analysis of different variables of MG and USG to the histological findings were done using chi square test. P value was calculated and value <0.05 were considered significant. Specificity and sensitivity of MG and USG individually and in combination to determine the nature of breast lump in relation to histopathological findings as gold standard were calculated.

RESULTS

A total of 42 female participants with palpable breast lump were included in this study. The age of the participants ranged from 30-67 years. The mean age was 39.64±10.23 years. Mean age for benign lesion was 36.47±7.93 years and for malignant was 47.58±11.31 years. A total of 30 (71.43%) had noticed lump for less than 2 months of duration. Pain and discharge was present in 8 (19.04%) and 4 (9.52%) of participants respectively. The clinical characteristics of enrolled subjects are shown in table 1.

Table 1: Clinical Characteristics of participants.

| Characteristics | Frequency | Percentage | |
|------------------|-------------|------------|--------|
| Duration of lump | < 2 months | 30 | 71.43% |
| | 2-18 months | 10 | 23.80% |
| | >18 months | 2 | 4.77% |
| Pain | 8 | 19.04% | |
| Discharge | 4 | 9.52% | |
| Fever | 2 | 4.76% | |
| Weight loss | 0 | 0% | |
| Family history | 2 | 4.76% | |

In 36 (85.72%), masses were found in upper outer quadrant and in 2 (4.76%) cases each, it was in upper inner and lower outer quadrants. In 41 (97.62%) cases, the breast masses were unilateral and only 1 (2.38%) was bilateral. Most of the lesions were single and only 1 (2.38%) was multiple. Characteristics of breast mass is summarized in table 2.

Table 2: Characteristics of breast mass

| Characteristics | Frequency | Percentage | |
|-----------------|-----------------------|------------|--------|
| Site of lesion | Upper outer quadrant | 36 | 85.72% |
| | Upper inner | 2 | 4.76% |
| | Lower outer quadrants | 2 | 4.76% |
| | Lower inner | 0 | 0 |
| | Retroareolar | 2 | 4.76% |
| Laterality | Unilateral | 41 | 97.62% |
| | Bilateral | 1 | 2.38% |
| Multiplicity | Single | 41 | 97.62% |
| | Multiple | 1 | 2.38% |

A total of 38 (90.47%) lesions had increased density in mammogram and 2 (4.76%) had decreased or mixed density. The shape of lesion in mammogram were, oval in 14 (33.33%), round 15 (35.71%), irregular 13 (30.95%) and lobular 0. The margin of lesion were circumscribed in 27 (64.28%), irregular in 4 (9.52%), spiculated in 8 (19.04%), and diffuse in 3 (7.14%). There was no calcification in 22 (52.38%), microcalcification in 4 (9.52%), and macrocalcification in 16 (38.09%), lesions. Among all participants, mammogram showed surrounding halo in 28 (66.66%) number of cases. A total of 21 (50%) had type II breast parenchyma, followed by type I and III in 10 (23.80%). Skin thickening over lesion was present in 4 (9.52%). Distortion of the fibroglandular tissues was present in 9 (21.42%). A total of 27 (64.28%) cases were falling into breast imaging reporting and data system (BIRADS) II, followed 10 (23.80%) into BARDIS V. A total of 2 (4.76 %) patients had BARDIS III and IV score. One (2.38%) case had normal mammogram.

Ultrasound breast revealed 41 (97.61%) of lesions to be hypoechoic and only 1 (2.38%) with mixed echogenicity. Margin of lesion in ultrasound showed 31 (73.80%) of the cases well defined followed by 6 (14.28%) with spiculated margins. Irregular and diffuse margin were seen in 3 (7.14%) and 2 (4.76 %) cases respectively. Ultrasound revealed calcification in 17 (40.47%) cases only. Similarly skin infiltration was present in 3 (7.14%). Internal echoes in breast masses were present in 18 (42.85%). A total of 4 (9.52%) cases had posterior enhancement. Post acoustic shadow was present in 11 (26.19%). Seven (16.66%) out of 42 cases had increased color flow in Doppler studies. Ultrasound revealed significant lymphadenopathy in 4 (9.52%) cases.

Among the total participants, USG diagnosed 31 (73.80 %) as benign and 11 (26.19%) as malignant. Mammography diagnosed 30 (71.42%) as benign and 12 (28.57%) as malignant. Histopathology showed Fibro adenoma in 16 (38.09%) cases, which was the commonest lesion followed by malignant lesions in 12 (28.57%). The histopathological findings are shown in table 3.

Table 3: Different types of breast lesions seen in participants

| Diagnosis | No. of cases | Percentage |
|-----------------------|--------------|------------|
| Fibroadenoma | 16 | 38.09% |
| Malignancy | 12 | 28.57% |
| Fibrocystic changes | 4 | 9.52% |
| Lipoma | 3 | 7.14% |
| Galactocele | 2 | 4.76% |
| Granulomatous disease | 2 | 4.76% |
| Fat necrosis | 1 | 2.38% |
| Breast abscess | 1 | 2.38% |
| Papilloma | 1 | 2.38% |
| Total | 42 | 100% |

Considering histopathological findings as gold standard, Ultrasound had 81.81% sensitivity and 90.32% specificity

where as mammogram had 83.33% and 93.33% sensitivity and specificity respectively. When combined, both sensitivity and specificity of diagnosing malignant lesions increased up to 91.66 and 96.66 % respectively.

Correlation of individual components of mammographic and USG findings with nature of the lesion (benign vs malignant), revealed significant positive correlation with some but not with all the factors, which is shown in table 4 and table 5 respectively.

Table 4: Correlation of type of breast mass (benign versus malignant) with mammographic variables

| Mammographic variables | P value |
|------------------------------|---------|
| Density | >0.05 |
| Shape | >0.05 |
| Margin | <0.01 |
| Calcification | 0.04 |
| Halo | 0.03 |
| Breast pattern | <0.01 |
| Skin thickening | >0.05 |
| Fibroglandular architectures | <0.01 |
| BIRADS | <0.01 |

Table 5: Correlation of type of breast mass (benign versus malignant) with sonographic variables

| Sonographic variables | P value |
|---------------------------|---------|
| Echogenicity of lesion | >0.05 |
| Margin | <0.01 |
| Calcification | >0.05 |
| Skin infiltration | >0.05 |
| Internal echoes | 0.04 |
| Posterior enhancement | >0.05 |
| Posterior acoustic shadow | <0.01 |
| Color flow | 0.14 |
| Lymph node | 0.004 |

DISCUSSION

This cross sectional study was carried out with an aim to evaluate the accuracy of mammography and ultrasound individually and in combination to detect and characterize palpable breast mass with cytopathological correlation.

The mean age was 39.64±10.23 years. Mean age for benign lesion was lower (36.47±7.93 years) compared to malignant (47.58±11.31 years). This finding is in consistence with published literatures.

The breast lesions were more common in upper and outer quadrant. The high proportion of upper outer quadrant carcinomas of the breasts is a reflection of the greater amount of breast tissue in this quadrant. There was no significant correlation of the quadrant with type of lesion. Andrew H.S. Lee showed similar proportions of lesions in this quadrant.⁷

A total of 38 (90.47%) of lesion had increased density. As a solitary feature in lesion analysis, mammographic density is difficult to assess and is limited value for the prediction of the benign and malignant nature of non calcified breast masses as described by Jackson et al.⁸ In this study also, there was no significant correlation of breast density with breast malignancy (p value >0.05).

In the present study, most of the benign lesions had well defined margins. Liberman L et al. reported that benign mass has morphological appearance showing well defined margins (98%) and round or oval shape.⁹ In the literature, margin is regarded as one of the most important feature to differentiate benign and malignant breast lesions. In this study also, margin was statistically significant for malignancy (p value <0.05).

Calcifications were seen in 20 cases in this study. Among them 16 had macrocalcifications (38.1%) and only 4 (9.52%) cases had micro calcifications. Macro calcifications were seen commonly in benign lesions where as micro calcifications were seen in malignant cases. Gary J Whiteman et al found that benign calcifications are typically more common, larger, coarser and more easily identifiable than malignant calcifications in mammography. Malignant calcifications are characteristically pleomorphic or heterogeneous and appear as irregular, linear, branching or granular forms.¹⁰ In this study microcalcifications detected on mammography were associated with malignancy and macrocalcifications with benign lesions (p value <0.01), however calcifications and malignancy had no significance in ultrasonographic findings (p value >0.05).

A total of 9 (21.42%) of participants had architectural distortion and all had malignancy in histopathology. Shaheen R et al. described architectural distortion as the third most-common appearance of breast cancer. In this study there was strong correlation between architectural distortion and malignancy (p value <0.01).¹¹

Posterior enhancement was noted in 4 (9.52%). It did not show any significant correlation with histopathology. There are several published literatures with variable results. Out of 12 malignant cases, 4 cases had lymphadenopathy. None of the benign lesions had enlarged lymph nodes. Whenever lymphadenopathy was present, it was highly significant for malignancy (p value <0.05).

The sensitivity and specificity of mammography was 83.33% and 93.33% respectively. McCavert M et al found mammography to be more sensitive in patients over 50 years compared with those patients less than 50 years. With the increase of fibro glandular density the level of sensitivity with mammography decreases.¹² Findings of this study is similar to literatures.

The sensitivity and specificity of sonography were 81.81% and 90.32% respectively. Candelaria RP et al found that breast ultrasound plays a major role in the identification, diagnosis, and staging of breast cancer.¹³ Malik G et al. found sensitivity of sonomammography was more for benign 92% than malignant lesions 67%, and its specificity was high for malignant lesions (92.4%).¹⁴

When findings of MG and USG were combined, both sensitivity and specificity were increased to 91.66% and 96.66% respectively. Only one patient with palpable lump had both a mammogram and ultrasound reported as normal in

which subsequent histology revealed a carcinoma.

Zonderland HM et al found the sensitivity of mammography for all 4,811 cases was 83%, the specificity was 97%. After USG, the combined sensitivity increased to 91%, with a specificity of 98%. Its contribution to the diagnosis of breast cancer in their study was 7.4%.¹⁵ Shetty MK et al. found sensitivity (14 of 14) and negative predictive value (186 of 186) for a combined mammographic and sonographic assessment were 100% and the specificity was 80.1% (186 of 232). Combined mammographic and sonographic assessment was shown to be very helpful in identifying benign as well as malignant lesions causing palpable abnormalities of the breast.¹⁶ The sensitivity and specificity of combined MG and USG, seen in this study was comparable to the published literatures. Combined diagnostic modality yielded better sensitivity and specificity as compared to individual test.

CONCLUSION

Combined MG and USG had higher sensitivity and specificity rate than sensitivity and specificity rate observed for either single modality. A combined MG and USG approach to detect breast diseases was significantly more helpful in accurate evaluation of breast pathologies than when either modality was used alone. Therefore, we suggest combined modality of investigations for evaluation of breast mass.

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