# Role of Mammography Combined with Ultrasonography in Evaluation of Breast Lump

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**Abstract** Breast cancer is one of the major health problems in the world. Specially, in developing countries like ours, it is a major problem as patients present late in hospital. Hence, early diagnosis is important to reduce morbidity and mortality due to breast cancer. Mammography and Ultrasonography are two important imaging techniques to detect breast pathology. This study has been done to evaluate the role of mammography independently and mammography combined with Ultrasonography to diagnose breast lesions. This study was a prospective study conducted in Radiology department of Manipal Teaching Hospital for a period of 18 months. Total of 91 patients of more than 30 years presenting with breast lump were included in study. Mammography was performed in all cases followed by Ultrasonography. Findings were noted according to Breast Imaging Reporting and Data System (BIRADS). FNAC was done for all lumps with or without USG guidance and correlated with imaging findings. Mean age is our study was 44 +/- 7.6 years. Maximum number of patients presenting with breast lump was in the age group of 41-50 years (52.7 %). Benign lump was seen in 74.7 % of patients and malignant lump was seen in 25.3 % of patients. Sensitivity and specificity of mammography in differentiating benign from malignant lesions were 90.9 % and 92.7 % respectively. Mammogram was inconclusive in 15.4 % of patients of age group less than 50 years. Sensitivity and specificity of mammography combined with USG increased to 95.65 % and 95.58 % respectively. Combined USG and mammography has high sensitivity and specificity in diagnosing breast lesions. Hence, these two imaging modalities should be combined for evaluating breast pathology, especially in younger patients with dense breast.

*Keywords*: *Breast lump, Mammography, Ultrasonography*

## 1. Introduction

Breast lump is one of the commonest complaints with which patients present in breast clinics. These patients require proper evaluation and management. Breast cancer is the second most common cancer among women in Nepal [1]. It accounts for 6% of all cancer cases in Nepal [2].

Breast cancer detection in its earliest stage is the main goal of imaging in breast. Mammography and USG followed by FNAC/ biopsy is the standard method for diagnosing a breast lump. Incidence of death due to breast cancer can be reduced by 30 % by routine screening with mammography as it can detect subtle architectural distortion and micro calcifications before lesion becomes palpable [3,4]. Though mammography is considered gold standard for screening and detecting breast cancer, it has some false negative cases especially in patients with dense breast. Hence, USG is useful in such patients with dense breast when mammography is not able to detect lesion [5].

USG also helps in differentiating cystic and solid lesions. This study has been conducted to evaluate the role of mammography and mammography in combination with USG for diagnosing breast lumps.

## 2. Materials and Methods

This was a prospective study conducted in radiology department of Manipal Teaching Hospital, Pokhara during a period of 18 months from September 2013 to March 2015. Patients presenting to department of radiology for mammography with complaints of breast lump were included in the study.

Mammography was performed on all cases. Standard views i.e. Cranio-Caudal and Medio-lateral-oblique views of both the breasts were obtained on a dedicated mammography unit (3000 Nova, Mammomat /Siemens). Additional views or spot compression views were obtained as and when necessary. Mammograms were assessed and interpreted by a radiologist according to the Breast Imaging Reporting and Data System (BI-RADS);

as BI-RADS 0 (Incomplete), 1 (Negative), 2 (Benign Finding), 3 (Probably Benign- short term follow up required), 4 (Suspicious for malignancy) and 5 (Highly suggestive of malignancy).This was followed by breast ultrasound performed using high-resolution ultrasound machine (Logiq P3/ GE) with linear array probe at 7.5 MHz. Ultrasound of both breasts and axillary region was done by a radiologist. On combining mammography and USG findings; final score was given according to BIRADS. Findings were considered benign if score was 2 or 3 and malignant if score was 4 or 5.

FNAC was done in all cases with or without ultrasound guidance depending upon the size and location of the lesion. All slides were stained with MGG stain and PAP stain and reported by a pathologist. When inconclusive report was obtained in FNAC, result of excisional biopsy was followed up. Hence final diagnosis was done on the basis of FNAC/Biopsy findings.

## 2.1. Inclusion Criteria

1. Patients presenting with breast lump
2. Age > 30 years
3. Patients who agreed to give consent

## 2.2. Exclusion Criteria

1. Age < 30 years
2. Pregnant lady
3. Lactating lady
4. Patients who refused to give consent
5. Male patients

## 2.3. Ethical Clearance & Consent of Patients

Prior ethical clearance was obtained from Institutional Ethical Committee and informed written consent was obtained from patient or their attendants in all the cases.

## 2.4. Sample Size

Total of 91 patients presenting to radiology department during a period of 18 months from September 2013 to March 2015 were included in study.

## 2.5. Statistical Analysis

The data were tabulated and results were analyzed by using SPSS 16 software.

## 3. Results

There were total 91 cases in the cohort, out of them benign lump was seen in 74.7 % of patients and malignant lump was seen in 25.3 % of patients. Usually malignant lesion is seen in mammogram as high density radio-opaque lesion with irregular margin (Figure 1).

**Table 1. Showing distribution of cases according to age group**

| Age group in years | Frequency | Percentage |
|---|---|---|
| 31-40 | 31 | 34.1 |
| 41-50 | 48 | 52.7 |
| 51-60 | 9 | 9.9 |
| 61-70 | 3 | 3.3 |
| Total | 91 | 100.00 |

Distribution of cases according to age group is depicted in Table 1.



**Figure 1.** High density radio-opaque lesion with irregular margin suggestive of malignant lesion (BIRADS 5) with right axillary lymphadenopathy

Mean age is our study was 44 +/- 7.6 years. Maximum age of patient was 70 years and minimum was 31 years. Maximum number of patients presenting with breast lump was in the age group of 41-50 years (52.7 %)

Results of mammography according to BIRADS score is given in Table 2.

**Table 2. Showing BIRADS scoring by mammography**

| BIRADS | Number of cases | Percentage |
|---|---|---|
| 0 | 14 | 15.4 |
| 1 | - | - |
| 2 | 23 | 25.3 |
| 3 | 34 | 37.4 |
| 4 | 13 | 14.3 |
| 5 | 7 | 7.7 |
| Total | 91 | 100.00 |

Mammogram was inconclusive in 14 patients (15.4 %). Mammogram was inconclusive in 22.58 % of patients of age group of 31-40 years and in 14.58 % of patients in age group of 41-50 years. None of the mammogram was reported inconclusive in women of more than 50 years of age. This findings show that mammography is more valuable in older patients in whom fatty breast is found, whereas in young patient with dense breast, mammography needs to be combined with some other imaging modality like USG.

Result of breast lesions as per mammography is depicted in Table 3.

**Table 3. Showing Pattern of Breast Lesions**

| | Number of cases | Percentage |
|---|---|---|
| Inconclusive | 14 | 15.4 |
| Benign | 53 | 58.24 |
| Malignant | 24 | 26.37 |
| Total | 91 | 100.00 |

Mammography diagnosed 58.24 % of cases as benign lesions and 26.37 % as malignant.

Correlation between mammography and FNAC/ Biopsy diagnosis is shown in Table 4.

**Table 4. Showing correlation between FNAC/ Biopsy diagnosis and mammography**

| | | FNAC/ Biopsy | | | | Total | |
|---|---|---|---|---|---|---|---|
| | | Malignant | | Benign | | | |
| | Lesion | No | % | No | % | No | % |
| Mammogram | Benign | 2 | 2.6 | 51 | 66.2 | 53 | 68.8 |
| | Malignant | 20 | 25.9 | 4 | 5.2 | 24 | 31.1 |
| Total | | 22 | 28.5 | 55 | 71.4 | 77 | 100.00 |

Sensitivity and specificity of mammography in differentiating malignant from benign lesions were 90.9 % and 92.7 % respectively. Positive predictive value was 83.33 % and Negative predictive value was 96.22 %. Malignant cases were designated as true positive. True positive cases were 25.9 %. Benign cases were designated as true negative (66.2 %).

Findings of breast lesions on combining results of mammography and USG are as shown in Table 5.

**Table 5. Showing results of mammography combined with USG**

| | Number of cases | Percentage |
|---|---|---|
| Benign | 66 | 72.5 |
| Malignant | 25 | 27.5 |
| Total | 91 | 100 |

Mammography with adjunct USG diagnosed 72.5 % of cases as benign lesions and 27.5 % as malignant.

**Table 6. Showing co-relation between FNAC/ Biopsy results and combined mammography and USG**

| | | FNAC/ Biopsy | | | | Total | |
|---|---|---|---|---|---|---|---|
| | | Malignant | | Benign | | | |
| | Lesion | No | % | No | % | No | % |
| Mammogram & USG | Benign | 1 | 1.09 | 65 | 71.42 | 66 | 72.5 |
| | Malignant | 22 | 24.17 | 3 | 3.29 | 25 | 27.5 |
| Total | | 23 | 25.26 | 68 | 74.71 | 91 | 100.00 |

Correlation between FNAC/Biopsy diagnosis and combined mammography with USG is shown in Table 6.

Sensitivity and specificity of mammography combined with USG increased to 95.65 % and 95.58 % respectively in differentiating benign from malignant lesions. Positive predictive value was 88 % and Negative predictive value was 98.48 %. True positive cases were 24.17 % and true negative cases were 71.42 %.

Comparison of sensitivity, specificity, positive predictive value and negative predictive value of mammography and mammography combined with Ultrasonography is shown in Table 7.

**Table 7. Showing comparison between mammography and combined mammography and ultrasonography in diagnosis of breast lump**

| Investigations | Sensitivity | Specificity | Positive Predictive Value | Negative Predictive Value |
|---|---|---|---|---|
| Mammography | 90.9 % | 92.7 % | 83.33 % | 96.22 % |
| Ultrasonography and Mammography | 95.65 % | 95.58 % | 88 % | 98.48 % |

Sensitivity of mammography increased from 90.9% to 95.65%. on combining mammography with Ultrasonography. Similarly, specificity increased from 92.7% to 95.58% on combining mammography with Ultrasonography.

## 4. Discussions

The role of mammography in patients with palpable breast lumps is to rule out malignancy for any palpable abnormality and to avoid further intervention. It helps in detecting mass with malignant features earlier along with screening for synchronous lesions in the ipsilateral and contra-lateral breast.

Sensitivity and specificity of mammography in differentiating benign from malignant lesions were 90.9 % and 92.7 % respectively in present study. Similar results were seen in other studies as well. Duijm et al [6] found that diagnostic mammography had a sensitivity of 92.0% and a specificity of 97.7%. Eltahir et al.[7] obtained similar results of 93.2% sensitivity and 96.7% specificity for symptomatic women. Flobbe et al. [8] found sensitivity of 89% and a specificity of 98% for diagnostic mammography.

A significant number of patients with breast carcinoma may be missed by diagnostic mammogram especially in young patients with dense breast tissue. Sensitivity of mammography in detecting breast cancer declines significantly with increasing breast density. False negative rate of mammography in evaluation of palpable breast lump has been reported high, estimated between 4% & 12% [9,10]. In our study, false negative rate was 2.6 % which is less. This lower value in our study could have been due to exclusion of cases classified as inconclusive (BIRADS 0) according to mammography. USG can be combined with mammography to increase sensitivity and specificity. Our study confirms the higher combined sensitivity and specificity for ultrasonography and mammography for diagnosis of breast masses. Sensitivity and specificity of mammography combined with USG increased to 95.65 % and 95.58 % respectively in present study. In a study by Zonderland et al [11] including 4,811 mammograms with supplementary ultrasonography, sensitivity increased significantly from approximately 83% to 91%. Similarly, Shetty et al. found sensitivity and specificity for a combined mammography and sonography to be 100% and 80.1% respectively [12]. Multiple studies have shown that the false negative rate varies from 0% to

2.6% for a combined mammographic and sonographic evaluation [10,13,14]. In our present study, false negative rate for combined mammography and USG was 1.09 %. Hence, combined mammography and USG is superior to mammography only in evaluation of breast lumps.

## 5. Conclusion

Benign lesions of the breast are more common than malignant ones. Commonest age group for breast lesions ranges from 41-50 years. About 15.4 % of cases were reported as inconclusive by mammography due to dense breast parenchyma in patients of <50 years. Hence, combined imaging modalities of mammography and USG plays an important role in diagnosing and characterizing palpable breast lesions, especially in younger patients with dense breast. Thus, combined imaging helps in avoidance of unnecessary surgical procedures.

## Abbreviations

**USG:** Ultrasonography
**FNAC:** Fine Needle Aspiration Cytology
**BIRADS:** Breast Imaging Reporting and Data System

## Declaration of Conflicting Interests

The authors declare that there is no potential conflicts of interest with respect to the research, authorship and /or publication of this article.

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