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Diagnostic Accuracy of Mammography and FNAC in Comparison to Gold Standard Histopathological Examination in Carcinoma Breast

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Abstract

Context: Screening and diagnostic efforts for breast cancer are critical because the disease has a high rate of successful outcomes with early identification and treatment. The mammography (MG) and fine needle aspiration cytology (FNAC) are individually effective diagnostic modalities for detection of breast pathologies.

Aim: To compare the efficacy of mammography and FNAC in Cancer Breast.

Setting & Design: The prospective study conducted on patients admitted for surgery for Breast lump or symptoms of breast malignancy in surgical wards of JLN Medical College, Ajmer and undergoing surgery for same with an aim to evaluate breast lesions using mammography and FNAC independently and in correlation with gold standard histopathology.

Results: A total number of 100 cases of breast lump studied. The mammography, FNAC and histopathology results were collected and analysed. In present study, Mammography shows Sensitivity – 93.846, Specificity – 82.857, Positive Predictive value – 91.045, Negative Predictive Value – 87.87and Accuracy – 90. FNAC shows Sensitivity – 93.8, Specificity – 97.14, Positive Predictive value – 98.38, Negative Predictive Value – 89.474 and Accuracy - 95

Conclusion: This study confirms that the Mammography and FNAC have significantly higher sensitivity and NPV in detecting the both benign and malignant lesions of the breast. In the present study, FNAC has more accuracy in predicting breast cancer than mammogram. Association between FNAC and Mammography result was calculated to be.717

Key words: Breast lesions; fine needle aspiration cytology; mammography; histopathological examination.

Key message: for successful treatment outcome of carcinoma breast early diagnosis is must.

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Introduction

Of the various breast pathologies, cancers are the most often encountered and are the most dreaded.1, 2 Breast cancers is the second most common cancer in Indian women.[3,4] Based on the National Cancer Registry Programme (Indian Council of Medical Research) (2001–2003), and about 25% of the total cancer cases among Indian women constitute breast cancer. The crude incidence rate of breast cancer at India level is about 85 per 100,000 women per year. Breast cancer is a public health problem as it is the second commonest cancer with increasing incidence (1 in 8 women aged 45-55) in the world. It is the second most common cause of death after lung cancer in the West.[5] Breast cancer is one of the most common causes of death in middle-aged women. Early detection linked to appropriate treatment is currently the most effective strategy to reduce breast cancer mortality. So diagnostic tool for breast cancer has an increased relevance.

Background and Rationale

For most patients mammographic evaluation is the important initial step. Mammography is taken by placing the breast in contact with ultrasensitive film and exposing it to low voltage high amperage X-Rays. In presence of malignancy mammograph reveals stellate or speculated calcifications, nipple changes & axillary adenopathy.

The American college of radiology developed breast imaging reporting and data assessment (BIRADS SCORE)[6] which categorizes mammographic findings as follows.

0	Incomplete	Your mammogram or ultrasound didn't give the radiologist enough information to make a clear diagnosis; follow-up imaging is necessary
1	Negative	There is nothing to comment on; routine screening recommended
2	Benign	A definite benign finding; routine screening recommended
3	Probably Benign	Findings that have a high probability of being benign (>98%); six-month short interval follow-up
4	Suspicious Abnormality	Not characteristic of breast cancer, but reasonable probability of being malignant (3 to 94%); biopsy should be considered
5	Highly Suspicious of Malignancy	Lesion that has a high probability of being malignant (>= 95%); take appropriate action
6	Known Biopsy Proven Malignancy	Lesions known to be malignant that are being imaged prior to definitive treatment; assure that treatment is completed

However there are instances where in the carcinomas are not apparent in mammography (about 5 percent).[1] Therefore the presence of a normal mammogram doesn't exclude the presence of malignancy. Also mammography is a relatively expensive investigation and least accurate in younger patients with dense breasts.

Indications for Mammography

1. Screening for breast cancer.
2. Diagnostic mammography for breast complaints.
3. Screening a conserved breast to r/o multicentricity.
4. Screening the opposite breast in a known case of malignancy.
5. Follow up of women with augmented breasts or breasts with prostheses.

Fine needle aspiration cytology

In detecting the pathological nature of the breast lumps, fine needle aspiration biopsy is a simple and reliable method. With the increase in the incidence of malignant neoplasm of the breast, early detection of the nature of the breast lump acquires added significance. Since this procedure can be done even in the outpatient department and since it does not increase the risk of the spread of the malignancy, it is considered as a new and powerful weapon in the diagnostic armamentarium of the surgeon.

Management of breast cancer requires Tissue diagnosis. It is done in our set up using FNAC (fine needle aspiration cytology). FNAC is least invasive technique for obtaining cell diagnosis and is accurate in the hands of an experienced pathologist FNAC with a 22 gauge needle allows for differentiation between solid and cystic lesion and presence of carcinoma cells if any. FNAC doesn't distinguish insitu and invasive breast cancer. Also FNAC can result in false negative test due to sampling errors. Classification based on FNAC[7,8] is as follows:

Class 1	Inadequate, unsatisfactory
Class 2	Benign cell present
Class 3	Probably benign
Class 4	Suspicious for malignancy
Class 5	Malignant cell present

In fact neither mammography nor FNAC is gold standard in detecting breast cancer. This study is conducted to compare the diagnostic ability of these 2 modalities i.e. mammography & FNAC in diagnosing breast cancer as assessed by the histopathology reports.

Objective of the study

1. To compare the efficacy of mammography and FNAC in predicting positive HPR result in Cancer Breast.
2. Determine sensitivity and specificity of each method.

Material and Methods

Patients were women who admitted for surgery for Breast lump or symptoms of breast malignancy in surgical wards of Jawaharlal Medical College &attached group of hospitals, Ajmer and undergoing surgery for same in year 2012-2014 (for a period of 2 years).

Inclusion Criteria: All patients more than 40 years admitted with breast lump undergoing surgery for it.

Exclusion criteria

1. Male breast lumps.
2. Age less than 40.
3. Had undergone lumpectomy/excision in same side.
4. Patient not willing to consent.
5. Patient not having mammogram.

Sample size

Cases of breast lump that undergo Excision/ Mastectomy from General Surgery wards during the study period fitting the inclusion criteria.

Formula for sample size = $Z_{\alpha}^{2} \frac{P\,Q}{[D(S + C - 1)]2}$

P =Proportion of Breast malignancy (For age more than 40 years 60% Breast lump are malignancy so P=60)

Q= 100-p

Z_{α}= 1.96 when α error is 5%

D is 20% of P

S-Sensitivity (Sensitivity for FNAC-80 %{.8})

C-Specificity (Specificity for FNAC-98 %{.98})

Substituting all value will be 99.3 that is almost 100. Sample size is 100

Results

A total number of 100 cases of breast lump above 40 years of age studied [table 1].The mamomography, FNAC and histopathology results were collected and analysed. In present study, Mammography detect benign 33 and malignant 67 cases [table 2] and shows Sensitivity – 93.846, Specificity – 82.857, Positive Predictive value – 91.04, Negative Predictive Value – 87.87 and Accuracy – 90 [table 2, 4 and 5]

Table 1: Results obtained by Mammogram, FNAC, HPR.

Age(Years)	Benign	Malignant	Total
40-50	30	25	55
51-60	4	22	26
61-70	1	13	14
71-80	0	5	5
	35	65	100

Table 2: Mammogram

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid BENIGN	33	33.0	33.0	33.0
Malignant	67	67.0	67.0	100.0
Total	100	100.0	100.0	

FNAC detect 38 benign and 62 malignant cases [table 3] and shows Sensitivity – 93.8, Specificity – 97.14, Positive Predictive value – 98.38, Negative Predictive Value – 89.474 and Accuracy – 95 [table 3, 4 and 6] in our study.

Table 3: FNAC

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid BENIGN	38	38.0	38.0	38.0
MALIG NANT	62	62.0	62.0	100.0
Total	100	100.0	100.0	

FNAC- fine needle aspiration cytology

In the present study, FNAC has more accuracy in predicting breast cancer than mammogram. Association between FNAC and Mammography result was calculated to be.717.

Table 4: HPR

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid BENIGN	35	35.0	35.0	35.0
MALIG NANT	65	65.0	65.0	100.0
Total	100	100.0	100.0	

HPR- histopathological report

Table 5: Mammogram and HPR cross tabulation.

	HPR		Total
	BENIGN	MALIGNANT	
BENIGN	29	4	33
	82.9%	6.2%	33.0%
MALIGNANT	6	61	67
	17.1%	93.8%	67.0%
Total	35	65	100
	100.0%	100%	100.0%

HPR histopathology report

Chisquare : 60.537; P<0.001

Sensitivity	93.846
Specificity	82.857
Positive Predictive Value	91.045
Negative Predictive Value	87.87
Accuracy	90

Table 6: FNAC and HPR Cross Tabulation.

	BENIGN		Total
MALIGNANT	38	4	38
	38.0%	6.2%	38.0%
	62	61	62
	62.0%	93.8%	62.0%
	35	100	100
	100.0%	100.0%	100.0%

FNAC- fine needle aspiration cytology, HPR-histopathology report.

Sensitivity	93.80
Specificity	97.14
Positive Predictive Value	98.380
Negative Predictive Value	89.474
Accuracy	95

Discussion

In a patient with breast lump, clinician ascertains the nature of the lump clinically. Thereafter ideally patient must undergo mammography. The classification of breast imaging followed the BIRADS (Breast Imaging Reporting and Data System).[6] Also mammography must be followed by FNAC for tissue diagnosis before definitive treatment. FNAC classification followed the Cytologic Category Code System.[7,8] The study included the cytological findings in breast lump in 100 patients. Mammography and FNAC findings were compared with histopathological findings in all patients. Age of patient in our study ranged from 40 to 80years. The commonly affected age group was 41–50 years. This was similar to the study conducted by Khan et al.[9]

In our study, Mammography detect benign 33 and malignant 67 cases and shows Sensitivity – 93.846, Specificity – 82.857, Positive Predictive value – 91.045, Negative Predictive Value – 87.87and Accuracy – 90.In another conducted by Pushpakant Tiwari,Suvendu Ghosh,Vijender Kumar Agrawal entitled Evaluation of breast lesions by digital mammography and ultrasound along with fine needle aspiration cytology correlation shows the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of mammography in detecting carcinoma breast were 77.77%, 97.72%, 87.5%, and 95.55%, respectively.[10]

FNAC detect 38 benign and 62 malignant cases and shows Sensitivity – 93.8, Specificity – 97.14, Positive Predictive value – 98.38, Negative Predictive Value – 89.474 and Accuracy – 95 in our study. The accuracy rate in study by Frable, 1976 is 92.0%.[11]

In another study by Mulazim Hussain et al in Research Article entitled Use of Fine-Needle Aspiration in the Evaluation of Breast Lumps shows sensitivity, specificity, accuracy, negative predictive value, and the positive predictive value of FNAC was 98%, 100%, 98%, 100%, and 97%, respectively.[12]

Conclusion

FNAC is a rapid and relatively safe procedure which allows early diagnosis. The accuracy of the FNAC depends on the representative material present on the smears, the staining of the cytology slides and the experience of the pathologist reporting theses aspiration cytology. This study confirms that the Mammography and FNAC have significantly higher sensitivity and NPV in detecting the both benign and malignant lesions of the breast. In the present study, FNAC has more accuracy in predicting breast cancer than mammogram. Association between FNAC and Mammography result was calculated to be.717

Declarations
Funding -Nil.
Conflicts of interest -There are no conflicts of interest.
Ethical approval – Not required

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