



A Study of Diagnostic Utility of FNAC and Mammography in Breast Lumps

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Abstract

Mammography and Fine needle aspiration cytology (FNAC) are safe, reliable and time saving modalities done on out patient basis with little discomfort to patient for diagnosing nature of breast lumps.

Aims: *The aim was to evaluate diagnostic utility of mammography and FNAC individually and the combined together.*

Methods and Material: *This prospective study was carried in Department of pathology, Prathima institute of medical sciences, Nagunur, Karimnagar. Inclusion criteria was all those cases which were neoplastic in nature for which both FNAC and Mammography was done in same patient followed by histopathological examination and later statistical efficacy/ accuracy was calculated for both.*

Results: *In present study 64 cases were evaluated. The sensitivity, specificity, PPV and NPV for mammography and FNAC was calculated individually and the combined and by comparing the findings with histopathology. It was observed in the present study on combining the diagnostic modalities in the same patient all parameters were increased.*

Conclusions: *Diagnostic accuracy is high for both modalities. Considering patient's comfort, lack of requirement of anesthesia, rapid analysis and reporting and an absence of false positive results makes FNAC an ideal initial diagnostic modality in breast lumps. Mammography is very effective tool in screening breast lumps. Combinations of various diagnostic modalities increase the diagnostic accuracy for breast lumps with increase in all parameters.*

Keywords: *breast lumps, mammography, fine needle aspiration cytology.*

Introduction

A palpable breast lump is a common diagnostic problem to a clinician. Mass in the breast, whether benign or malignant is a cause of concern to the patient. Sometimes it is difficult to determine whether a lump is benign or malignant just by clinical examination in which case a method for definite diagnosis at the outpatient clinic is needed. This method should be accurate, easy to perform, reproducible and acceptable to patients.

Fine needle aspiration cytology (FNAC) is a minimally invasive technique that can be performed in outpatient clinic under palpation guidance and the results are available faster than that of biopsy.¹

With the introduction of mammography, it is being increasingly used for the evaluation of breast lumps. But this method is fraught with its own disadvantage and a large number of cases are reported as indeterminate or suspicious. Presently

radiological imaging in combination with needle aspiration makes it possible to reduce unnecessary surgical excision of benign breast lesion to a minimum.

Before introducing any diagnostic modality, its efficacy/accuracy and predictive value has to be evaluated. This provides the practitioner with an estimate of the reliability of the test. This further helps to triage patient care regarding further work up, if required, and management. Hence, this study was undertaken to evaluate the diagnostic utility of individual methods i.e. FNAC and Mammography, and also their combined efficacy/accuracy in the evaluation of breast lumps.

Subject and Methods

- 1) To study the utility of FNAC in Breast lumps.
- 2) To study the utility of Mammography in Breast lumps.
- 3) To study the diagnostic utility of both FNAC and Mammography combined together within same patient by comparing their diagnostic accuracy with histopathological findings.

The present study comprises of patients who presented with breast lumps to surgical department followed by sequential evaluation by radiology and pathology department of Prathima Institute of medical sciences, Karimnagar over a period of 34 months from January 2015 to October 2017. Prior Institutional Ethical committee permission was obtained for the study.

Methods of Selection

Inclusion Criteria

- 1) All those cases for which both FNAC and Mammography is done in same patient followed by histopathological examination from January 2015 to October 2017.
- 2) Neoplastic lesions

Exclusion Criteria

- 1) All those cases for which either FNAC or Mammography or both are not done in

same patient from January 2015 to October 2017.

2) Non- Neoplastic lesions.

After obtaining detailed clinical history, physical examination was performed and impression was noted by the clinicians. After this, patients were referred for mammography and then FNAC. Mammography was performed in the Department of Radiology, using a "Siemens Mammomat 3000 Nova" unit. For each case, both cranio-caudal and mediolateral views were obtained. The mammograms were reported by the Radiologists as per the Breast Imaging Reporting and Data System (BIRADS)² published by American College of Radiology. For the purpose of statistical analysis, categories 2 and 3 were considered benign and categories 4 and 5 were considered malignant. Category 6 lesions were not included in the study.

After mammography, the patient was referred to the Department of Pathology for FNAC. The cytology smears were reported by the pathologists using the 5-scale reporting system of the UK Royal College of Pathologists³. C1-Acellular, C2-Benign, C3-Likely benign but with some atypia, C4-Suspicious of malignancy, C5-Malignant. In this study, categories C2 and C3 were considered benign and C4 and C5 were considered malignant for statistical analysis.

All the cases underwent surgery which included lumpectomy and modified radical mastectomy depending on type of lesion and the specimens were sent for histopathological examination. The histopathologic report was considered the gold standard with which mammographic and cytologic diagnoses were compared.

Results and Observations

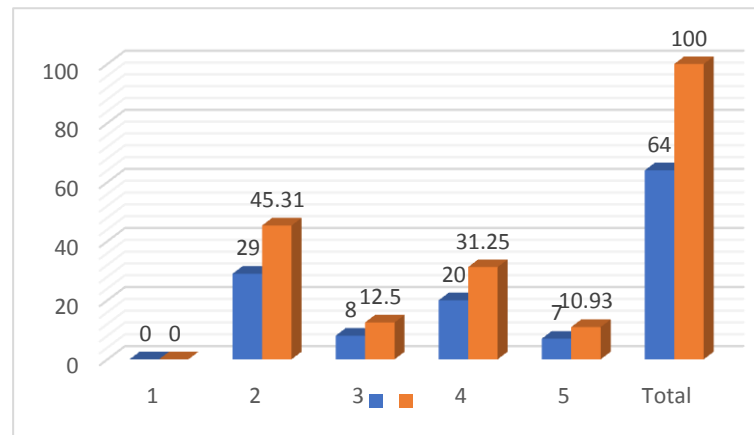
The present study comprises of 64 cases of neoplastic breast lumps which were evaluated by mammography and FNAC during a period of 34 months in department of pathology PIMS, Karimnagar.

The age of patients ranged from 16 to 75 years, with a mean age of 39.18 years. The maximum

number of lesions were seen in the age group of 31-40 years (29.68%), followed by 21-30 years (18.75%) and 51-60 years (17.18%). In the present study, out of 64 cases, only 1 (1.56%) cases occurred in a male and the remaining 63 (98.43%) cases were in females. The male to female ratio was 1:63. Among the 64 cases of breast neoplasms, it was observed that left breast

was more commonly involved comprising of 32 cases (50%). Right breast was involved in 30 cases (46.85%) and bilateral involvement of breast was seen in only 2 cases (3.12%). In the present study most, common quadrant involved is upper outer (56.25%), followed by lower outer quadrant (15.62%) with least involvement of lower inner quadrant (1%).

Chart 1. Distribution of cases based on mammographic diagnosis (BIRADS 1-5)

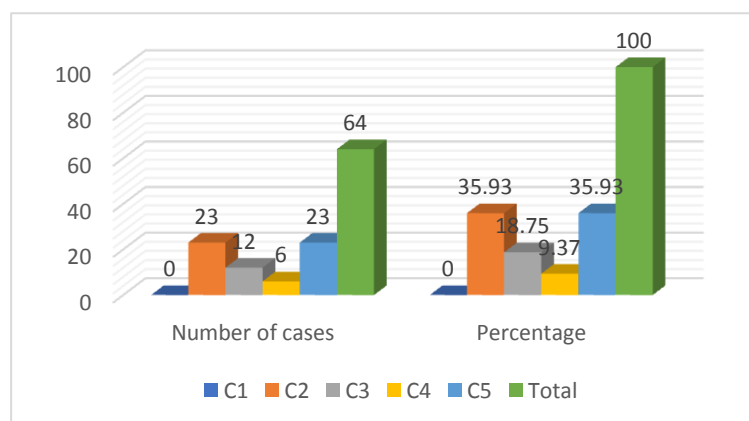


Among the 64 cases of breast neoplasms, 29 cases were of BIRADS category 2, 20 of category 4 and 8 cases each of categories 3 and 7 cases of category 5. (Chart 1) Hence 37 cases were benign and 27 cases showed malignant findings.

FNAC of 64 cases revealed 23 cases in category C2, 23 cases in C5, 11 cases of C3 category and 7 cases of C4 category (chart 2). No cases were in

C1 category i.e. the aspirate was not inadequate for opinion. The inadequacy rate for FNAC in this study was 0%. Out of the 64 cases 35 cases were benign and 29 were malignant. Benign lesions were those which were of categories C2 or C3 and lesions which were under C4 or C5 categories were considered malignant.

Chart 2 Distribution of cases based on FNAC diagnosis (Category 1-5)



On histopathology, fibroadenoma was diagnosed in 26 cases, 27 cases were of invasive carcinoma

and 4 cases of DCIS were noted. There were 6 cases of benign complex fibroadenomas and 1

case of phyllodes tumor. Of the 64 breast neoplasms, 33 (51.56%) were benign and 31 (48.43%) were malignant. Among the 31 cases of malignant neoplasms of breast, 21 cases were infiltrating ductal carcinoma – not otherwise specified (IDC-NOS), 4 were ductal carcinoma in

situ (DCIS) and 3 cases each of invasive lobular carcinoma, mucinous carcinoma.

Comparison of diagnostic modalities

Histopathologic study was considered gold standard and the diagnoses of mammography and FNAC were compared with it.

Table 1 Comparison of various diagnostic modalities

Modality	Benign	Malignant	Normal	Inadequate	Total
Mammography	37	27	-	-	
FNAC	35	29	-	-	64
Histopathology	33	31	-	-	64

Comparison of mammography with histopathology

Mammographically, 37 cases had benign features and 27 cases showed features of malignancy. Among the mammographically benign 37 cases, 33 were confirmed benign on histopathology and 4 cases turned out to be malignant. The malignant cases included 4 cases of DCIS.

All 27 cases which showed features of malignancy on mammography were confirmed as malignant on histopathology.

Comparison of FNAC with histopathology

On cytology, no cases were reported as inadequate, 35 were benign and 29 cases were malignant. Among the 35 cases of cytologically benign neoplasms, histopathology confirmed the

benign nature in 32 cases while 3 cases turned out to be malignant. These 3 cases were diagnosed as DCIS. Out of 29 malignant cases, 28 were confirmed as malignant on histopathology whereas 1 case reported as benign which included one case of fibroadenoma with ADH. The case was reported as suspicious of malignancy cases and were given C4 category of UK reporting system

Comparison of mammography and FNAC combined with histopathology

By using these two modalities, 60 cases out of 64 were concordant i.e. both mammography and FNAC reported them as either benign or malignant which included 32 benign and 28 malignant neoplasms.

Table 2 Comparison of mammography and FNAC combined with histopathology

Mammography +FNAC	Histopathology Diagnosis		Total
	Benign	Malignant	
Benign	32	2	34
Malignant	0	26	26
Total	32	28	60

The non-concordant cases included histopathologically proven 3 malignant and 1 benign case. Malignant cases were 2 DCIS cases and one IDC, out of which one DCIS was given as benign on FNAC (C3) and malignant (4) on mammography. Other case was given malignant on FNAC (C4) and benign (3) on mammography, and one case of IDC was given as benign on

mammography (3) and malignant on FNAC (C4). Hence all malignant cases were given as malignant by one of the modalities in non-concordant cases. One benign case was of fibroadenomas with ADH which was reported as BIRADS 3 on mammography and suspicious for malignancy on FNAC as C4 category.

Chart 3 Comparison of diagnostic modalities

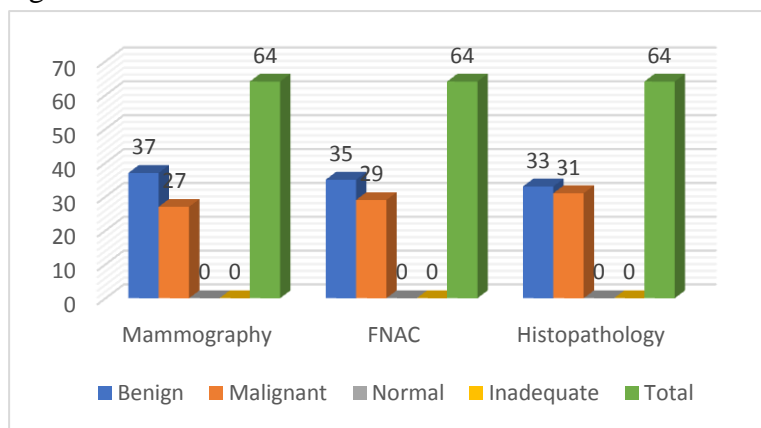


Table 3: Various Parameters and comparison of diagnostic modalities

Parameters				Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)	
Mammography diagnosis	HP diagnosis		T	27/ (27+4)	33/ (33+0)	27/27	33/37	(33+27)/64	
	B	M							
	B	33	4						37
	M	0	27						27
T	33	31	64	87.09	100	100	89.18	93.75	
FNAC diagnosis	HP diagnosis		T	28/ (28+3)	32/ (32+1)	28/29	32/35	(32+28)/64	
	B	M							
	B	32	3						35
	M	1	28						29
T	33	31	64	90.3	96.96	96.55	91.42	93.75	
Mammography + FNAC	HP diagnosis		T	26/ (26+2)	32/ (32+0)	26/26	32/32	(32+26)/60	
	B	M							
	B	32	2						34
	M	0	26						26
T	32	28	60	92.3	100	100	100	96.6	

*B-benign, M-malignant, T-total, HP- histopathology, PPV- positive predictive value, NPV- negative predictive value

Discussion

In the evaluation of breast masses, the three commonly used preoperative methods are mammography, ultrasonography and fine needle aspiration cytology. With growing awareness in the general population, especially about breast pathologies, a lady with a breast lump is one of the commonest presentations in outpatient departments.⁴

Mammography is a primary method of detection and diagnosis of breast disease with sensitivity of 85% - 95%. But the false negative findings in mammography in evaluation of palpable breast mass is high, estimated between 4% & 12%.⁵The

BIRADS lexicon was first developed in 1993 for reporting mammography

Mammography is the most commonly used imaging method and is the only currently known means of proven effectiveness especially in patients with non-palpable carcinoma.⁶Based on the knowledge of the predictive values of the different categories, the BIRADS system determines that management recommendations should be suggested.⁷ The current recommendations advocate A PPV between 25% and 40% for breast cancer considering the lesions that are referred for biopsy.⁸ The results of mammography sensitivity measurements range

from 68% to 88%.⁹ According to Kerlikowske et al., sensitivity achieved 98% in fat containing breasts, decreasing to 63% in extremely dense breasts.⁹

In the study developed by Kolb et al., mammography accuracy was 98.6%.⁸ In another study conducted by Shrestha M K et al the sensitivity and specificity of sono-mammography in differentiating benign from malignant lesions using the BIRADS score was 78.9 and 95% respectively.¹⁰ Shumaila S M et al in their study have reported sonomammography to be positive in 66 (90%) and sonomammography to be positive in 68 (93%) out of 73 cases.¹¹

Fine-needle aspiration cytology is a rapid and effective method for the primary categorization of

palpable breast lumps into benign, malignant, atypical, suspicious, and unsatisfactory categories.¹² The most significant advantage of FNAC is the high degree of accuracy, rapid results, and a less invasive procedure than a tissue biopsy. Fine needle aspiration of the masses of breast to obtain material for cytological analysis has become an accepted procedure. No complication has so far been reported. Needle track implantation of the tumour is rare and metastatic dissemination has never been substantiated.¹³

Present study aimed to see the accuracy of FNAC and mammography in the diagnosis of benign & malignant palpable breast lesions and to study their correlation.

Table 4: Comparison of the efficacy of the various diagnostic modalities in different studies

Studies	Mammography				FNAC			
	Sen (%)	Spec (%)	PPV (%)	NPV (%)	Sen (%)	Spec (%)	PPV (%)	NPV (%)
Mande N et al. ¹⁴	73.1	98.5	99	64.4	73.9	98.5	99	65
Abdulrahman Saleh Al-Mulhim et al. ¹⁵	87.5	97.3	87.5	97.3	91.7	100	100	98.3
Philip J Draw et al. ¹⁶	87.6	86.4	86.2	87.7	79.1	97	96.2	82.8
Rahman MZ et al. ¹⁷	82.7	90.3	75	93.7	97.22	99.4	97.2	99.4
Present study	87.09	100	100	89.18	90.32	96.96	96.55	91.42

In the present study, the sensitivity, specificity, PPV and NPV for mammography was observed to be 87.09%, 100%, 100% and 89.18% respectively and the same for FNAC were 90.32%, 96.96%, 96.55% and 91.42% respectively. FNAC showed higher sensitivity (90%) higher NPV (91.42%) whereas other parameters were found to be higher in mammography.

In guidelines for reporting breast FNAC, the National Breast Cancer Screening Programme suggests acceptable values for complete sensitivity >80%, specificity >60%, false-negative rate <5%, and false-positive rate <1%¹⁸

Shin et al. (2006)¹⁹ assessed the relative accuracy of mammography, ultrasonography and MRI and found that the agreement rates about the residual tumour, as measured by mammography, ultrasonography and MRI and then compared with the pathological results, were 39%, 54% and 77%, respectively. Present study showed quite high sensitivity comparable to this study.

G. Gurung et al showed the sensitivity and specificity of mammography was 88.9% and 95.53% respectively.²⁰ present study showed less sensitivity and higher specificity. Another study conducted by P.K. Tiwari et²¹ al for analyzing

diagnostic accuracy of mammography in breast lumps observed the sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of mammography in detecting Carcinoma breast is 77.77%, 97.72%, 87.5% and 95.55% respectively.

Nakayama et al (1995)²² went through a study on 599 breast masses for evaluation of aspiration biopsy cytology and other combined preoperative tests in the diagnosis of breast cancer. They have found 87.3% sensitivity and 92.3% specificity in FNAC whereas combined tests of mammography, ultrasonography and FNAC results sensitivity and specificity of 96.2% and 94.9% respectively. In the present study combining mammography and FNAC gives the higher result than that of others and combined tests. comparative analysis of the effectiveness of preoperative diagnostic techniques in breast mass was made by Sovtsov and Mikhaiova (1998)²³. They found 82%, 88.3% and 69.35% sensitivity respectively for mammography, ultrasonography and FNAC. It shows that FNAC has got relatively less sensitivity than that of mammography and ultrasonography. But the present study shows higher sensitivity for FNAC.

In the present study on combining the diagnostic modalities in the same patient all parameters of sensitivity (92.8%), specificity (100%), PPV (100%), NPV (94.1%) and accuracy (96.6%) were increased (table 3). However, most studies indicate that with experience, the frequency of false negative and false positive results can be minimized. Some authors emphasize the importance of supplementing mammography with FNAC²⁴. After combining the diagnostic modalities and comparing the results in cases which were concordant i.e. both modalities reported them as benign or malignant and later were compared with histopathology and the statistical values were calculated for these cases in relation to ability of tests to correctly diagnose malignant neoplasms.

In discordant cases which included three malignant cases and one benign case, the

malignant ones were two cases of DCIS and one IDC-NOS as confirmed on histopathology. One case of DCIS was reported as ADH (benign, C3) on FNAC which was given BIRADS score of 4. The possible reason of discordance in this case could be attributed to multifocal nature of DCIS and perhaps was missed on the aspiration and other area of ADH was aspirated. In such cases it was advisable to consider the BIRADS score as it is suggestive towards the malignant nature of lump and repeated aspirations should be done so as not to miss the malignancy.

In other case of DCIS which was reported as benign on mammography with BIRADS score of 3 indicating benign nature and was reported as positive for malignancy on cytology as C4 and biopsy was advised which was later reported as DCIS. In such case asymmetric density on mammography was not indicative of malignant nature. Likewise, IDC-NOS was given BIRADS score of 3 and was reported as positive for malignancy on FNAC. In all the malignant cases one of the diagnostic modalities reported them as malignant. One benign case was of fibroadenomas with ADH which was reported as BIRADS 3 on mammography and was reported on FNAC as suspicious for malignancy (C4 category) was advised for biopsy. The possible cause of this discordancy and false positive result on FNAC was likely due to atypia seen in ADH with absence of bare bipolar nuclei in the aspirate which could be aspirate from the wrong site and not sufficient aspirate from the lesion.

Hence both the modalities are prone to errors individually and proper screening of slides and expertise of the relevant expert also affect the results of the interpretation. In the present study when both modalities viz., FNAC and Mammography are combined and considered together even in discordant cases gives as indicated above provides valuable information on the nature of lesion and hence helps in coming to a proper diagnosis. So, both modalities when used individually provide valuable assessment about the nature of lesion/lump and when these

modalities are used in combination the diagnostic utility improves in patients presenting with breast lumps.

Conclusion

Benign neoplasms of the breast are more common than malignant ones. FNAC is highly sensitive with high PPV. Diagnostic accuracy is high for both modalities. Mammography has the lower sensitivity and higher specificity. FNAC is a very effective diagnostic aid and is easy and safe to perform. Considering patient's comfort, lack of requirement of anesthesia, rapid analysis and reporting and an absence of false positive results makes FNAC an ideal initial diagnostic modality in breast lumps. Mammography is very effective tool in screening breast lumps. Combinations of various diagnostic modalities increase the diagnostic accuracy for breast lumps with increase in all parameters. Unnecessary biopsy of benign neoplasms can be avoided since these lesions can be managed conservatively. If malignancy is one of the two diagnoses, it should be favored and further investigations must be performed. Multidisciplinary approach reduces the errors in diagnosis. Histopathology was the gold standard for many years in the diagnosis of breast lump but is an operative measure. This study shows that FNAC and mammography should be done in case of palpable breast lumps to rule out malignancies.

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