

Original Research Article

Diagnostic efficacy of fine needle aspiration cytology in breast lesions

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Abstract

Background: Carcinoma of the breast is a leading cause of death in women and needs to be evaluated at an early stage. FNAC helps in rapid diagnosis of breast lesions and their management.

Objective: To study the diagnostic efficacy of FNAC in breast lesions.

Materials and methods: Three year retrospective study of 105 cases of breast lump was conducted which included cases, where FNAC and histopathological correlation was available. The cytological diagnosis was classified as inflammatory lesions, benign, atypical probably benign, suspicious for malignancy and malignant.

Results: On cytology out of 105 cases, 57 were benign, 7 inflammatory lesions, 34 malignant and 7 were inadequate. Fibroadenoma was the most common benign lesion noted in age group of 21-30 years and infiltrating ductal carcinoma was the most common malignant lesion in 31-40 years age group. Diagnostic accuracy, sensitivity and specificity of this study were 96.93%, 91.89% and 100% respectively.

Conclusion: FNAC of breast lesions is a simple, safe and effective modality in pre-operative assessment of benign and malignant lesions and shows high accuracy, sensitivity and specificity.

Key words

Breast, Fine needle Aspiration Cytology, Sensitivity, Specificity.

Introduction

A lump in the breast is a common complaint in the surgical outpatient department of all major

hospitals with anxiety, regarding a possible malignancy being extremely common. Carcinoma of the breast is a leading cause of

death in women and needs to be evaluated at an early stage. FNAC helps in rapid diagnosis of breast lesions and their management. The technique of FNAC was described by Kun in 1847 and was introduced into clinical practice by Ellis and Martin in 1930. Pre-operative diagnosis of breast carcinoma helps in early institution of the neo-adjuvant therapy. The objective of the study is to study the diagnostic efficacy of Fine needle aspiration cytology in breast lesions and to recognize diagnostic difficulties and pitfalls related to FNAC diagnosis [1, 2].

Materials and methods

A retrospective study was done over a period of 3 years in the Department of Pathology, MGM Medical College, Navi Mumbai, which included

105 cases wherein both fine needle aspiration cytology and histopathology diagnosis were available for correlation. Informed consent from the patient was taken before the FNAC procedure. Fine needle aspiration was performed with 22 gauge needle attached to 10ml disposable syringe. The smears were fixed in alcohol and stained with Papanicolaou, H&E and air dried smears were stained with Giemsa stain. Surgical specimens received were evaluated grossly and fixed in 10% neutral formalin. Sections of 3-5 microns in thickness were cut and stained with H & E stain. Cytology reporting categories were classified as C1- Inadequate, C2 – Benign, C3 - Atypical probably benign, C4 - suspicious for malignancy and C5 - Frankly malignant [3] as per **Figures – 1 to 6**.

Figure - 1 A & B: FNAC smears showing sheathed Microfilariae of *W. bancrofti*, macrophages & plenty of polymorphs in granulomatous mastitis with microfilaria (MGG x10 & PAP x40)

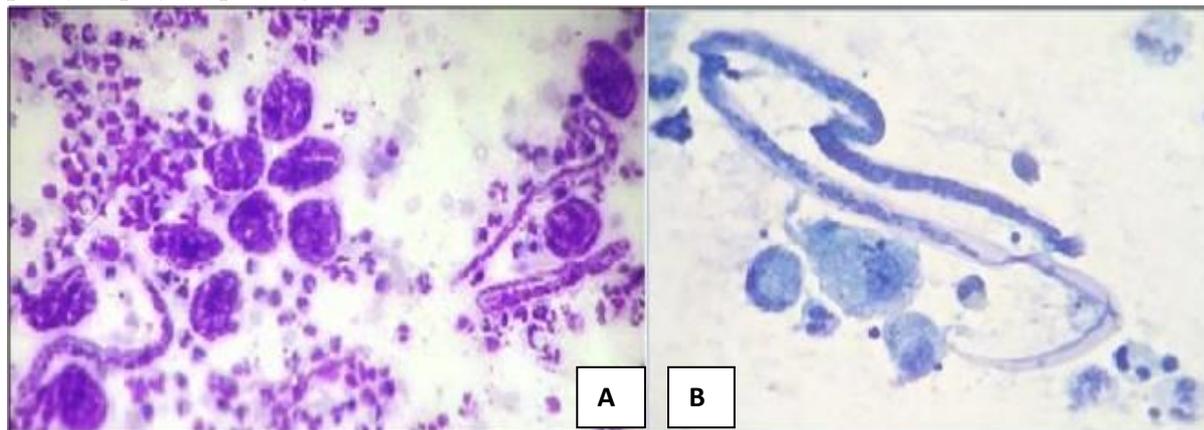


Figure - 2: FNAC smear showing plenty of polymorphs on a dirty background in breast abscess. (PAP, 40X).

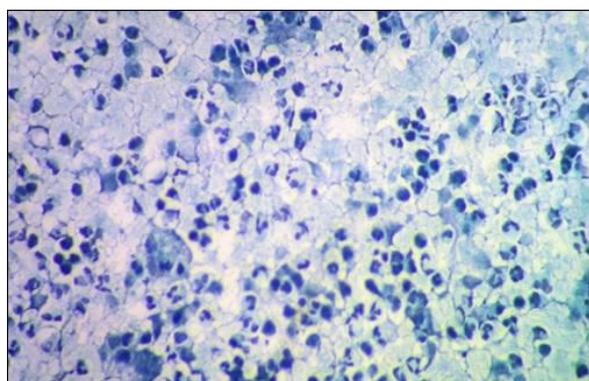


Figure - 3: FNAC smear showing monolayered sheath of benign duct epithelial cells with overlapping myoepithelial cells in fibroadenoma (PAP, 40X).

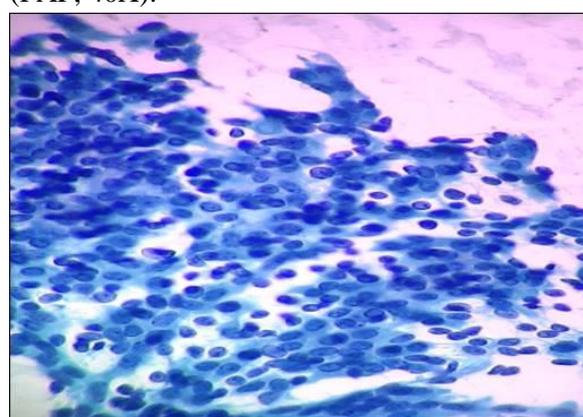


Figure - 4: FNAC smear showing fibromyxoid fragments comprised of both plump and slender spindle cells in phyllodes tumor (H&E, 40X).

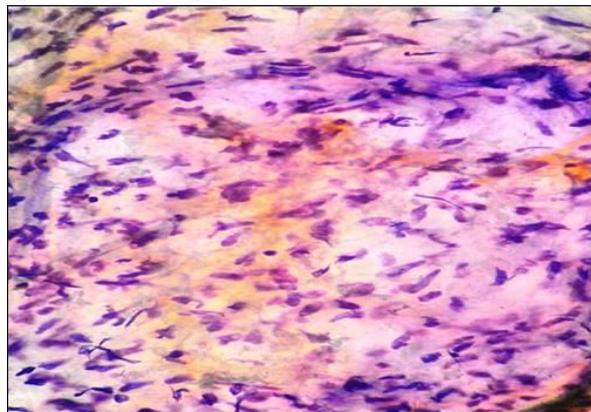


Figure - 5: FNAC smear showing tumor cells in loosely cohesive clusters, with nuclear pleomorphism, increased N:C ratio and few showing binucleation in Ductal carcinoma (PAP, 40X).

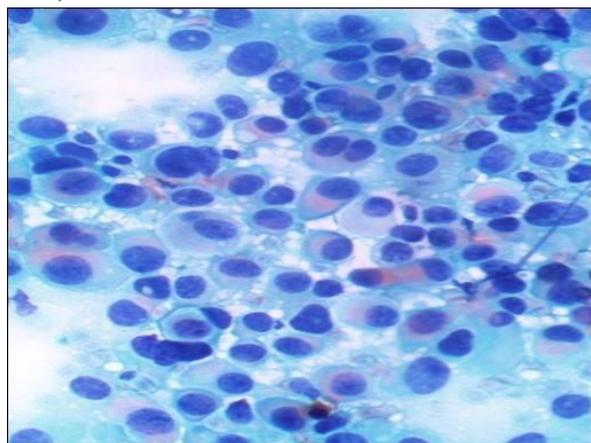
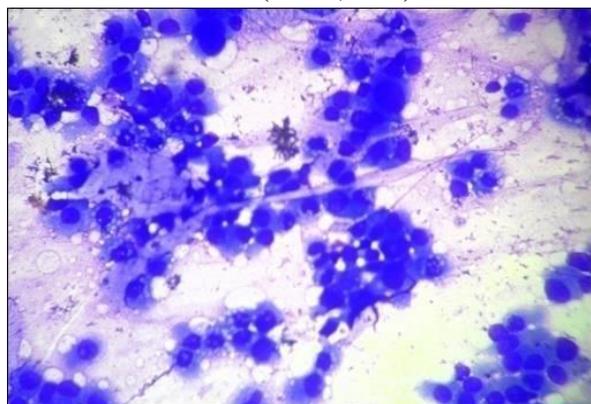


Figure - 6: FNAC smear showing tumor cells in small aggregates, with large central to eccentric nucleus with mild pleomorphism & abundant cytoplasm suspended in pool of mucin in mucinous carcinoma (MGG, 40X).



Results and Discussion

FNAC is a safe, easy and accurate diagnostic procedure for diagnosing breast lesions. The main objective of FNAC is to differentiate benign from malignant lesions which will help the surgeon to decide whether the patient can be managed non-operatively or to be subjected to surgery and in malignant lesions whether chemotherapy or radiotherapy is required. The main objective in our study was to find out the diagnostic accuracy of FNAC in various breast lesions which turned out to be 96.93%. High specificity and high negative predictive value for malignancy suggest that FNAC can help in differentiating benign from malignant pre-operatively. Triple assessment which is a combination of clinical examination, mammography and fine needle aspiration can help in diagnosing breast lesions with high accuracy.

This present study reviews our experience with FNAC of 105 cases of breast lesions over a period of three years. All cases were analyzed on basis of history, clinical presentation, cytological and histopathological findings.

In a total of 105 cases the patients age ranged from 17 - 76 years with an average age of 40.17 years (**Table - 1**). In this study the maximum number of cases of breast lesions were seen in the age group of 31-40 years (27 cases) followed by 21-30 years (22 cases), 41-50 years (21 cases). In similar study done by Pudassaini, et al. [4], breast lesions were most commonly seen in age group 21 to 30 years. Cytology reporting categories were as per (**Table - 2**). In this study, inflammatory breast lesions were commonly seen in age group of 21 - 30 years whereas benign lesions were commonly seen in age group of 21-30 years followed by 11-20 years. Malignant lesions were reported in 31-40 and 61-70 years of age groups (**Table - 3**).

In the present study, right breast was most commonly involved in 55 patients (52.4%) while left breast was involved in 50 patients (47.6%)

(**Table - 4**). Bilateral involvement of breast was not seen in any of the patients in this study. The study done by Malukani K, et al. [5] also showed right breast involvement in 46.5% cases while left in 43.5% cases. In other study done by Aditya Khema, et al. [6] showed left breast involvement in 28 patients while right breast involvement in 22 patients out of a total of 50 cases. Similar study done by Hussain, et al. [7] also showed left breast involvement in 27 cases and right breast involvement in 23 patients out of 50 cases. All the above studies showed that left breast was commonly involved as compared to the right.

Table - 1: Age-wise distribution of all breast lesions.

Age Groups (years)	No. of cases	%
11-20	12	11.4
21-30	22	21.0
31-40	27	25.7
41-50	21	20.0
51-60	11	10.5
61-70	10	9.5
71-80	02	1.9
Total	105	100

Table - 2: Cytology Reporting Categories.

	Cytology Reporting Categories	No. of cases
C1	Inadequate	07
C2	Benign	60
C3	Atypical probably benign	04
C4	suspicious for malignancy	00
C5	Malignant	34

The upper and outer quadrant (53 cases) was the commonest site of lump in this study followed by upper inner (21 cases) and lower outer (8 cases). Aditya khema, et al. [6] in his study had 22 patients with lump in upper and outer quadrant, 10 patients had in upper inner and 9 patients in lower inner quadrant. . Malukani K, et al. [5] also showed upper outer quadrant being commonly involved (48.63%). We also observed 8 cases which showed involvement of more than 1

quadrant, 3 cases showed lump in central quadrant (subareolar) which was similar to the findings observed by Hussain, et al. [7] in their study of 50 cases.

Table - 3: Age wise distribution of Inflammatory, Benign and Malignant breast lesions.

Age Group (years)	Inflammatory	Benign	Malignant
11-20	-	12 (21.1%)	-
21-30	4 (57.1%)	18 (31.6%)	-
31-40	2 (28.6%)	14 (24.6%)	9 (26.5%)
41-50	1 (14.3%)	11 (19.3%)	8 (23.5%)
51-60	-	1 (1.8%)	7 (20.6%)
61-70	-	-	9 (26.5%)
71-80	-	1 (1.8%)	1 (2.9%)
Total	7 (100%)	57 (100%)	34 (100%)

Table - 4: Distribution of lesions Quadrant-wise.

Quadrant	Right	Left
Inner Upper	16	5
Inner Lower	0	6
Outer Upper	29	24
Outer Lower	4	4
Sub-areolar	1	2
Involving > 1 quadrant	3	5
All Quadrant	2	4
	55	50

The final cytological diagnosis on FNAC was categorized as inadequate (C1), benign (C2), atypical probably benign (C3), suspicious probably malignant (C4) and malignant (C5). Out of 105 cases, 60 belonged to C2 category followed by 34 of C5, 07 of C1 and 4 of C3 category. There was no case which belonged to C4 category (**Table - 5**). The most common cytological category reported was C2 (benign) in 60/105 patients. Aslam, et al. [8], in their study reported 31 cases belonging to C2 category, 2 cases each of C3 and C4 category and 23 patients of C5 category. There was no case of C4 category.

Table - 5: Cytological diagnosis of Breast lesions.

Category	Cytological Diagnosis	No. of cases
Inflammatory Lesion	Abscess /Mastitis	2 (1.90)
	Granulomatous Mastitis	5 (4.76)
Benign	Fibroadenoma	44 (41.91)
	Fibrocystic Disease	6 (5.71)
	Mammary Duct Ectasia	1 (0.95)
	Benign Phyllodes	1 (0.95)
	Proliferative Breast lesion without Atypia	1 (0.95)
Atypical probably benign	Proliferative Breast lesion with Atypia	4 (3.81)
Malignant	Ductal Carcinoma.	32 (30.49)
	Mucinous Ca.	1 (0.95)
	Malignant Phyllodes	1 (0.95)
Inadequate	-	7 (6.67)
Total		105 (100)

FNAC is a method which is quick to perform and without any complications. In the present study, the aspirates were adequate in 98 (93.33%) cases and inadequate in 7 (6.67%) cases (**Table - 5**). The recent studies done by other authors showed frequency of inadequate aspirates from 3.3% to 9.1% [9-11]. The unsatisfactory aspirates are influenced by the nature of the lesion and due to lack of technical experience in performing FNA [1, 12]. The rate of inadequate aspirates can be reduced by proper training of the person who performs the FNAC and by the use of Ultrasound guided FNAC [11].

In present study of total 105 cases, 64 cases (60.95%) were non-neoplastic and 34 cases (32.38%) were neoplastic cytologically which was more or less similar findings to Kumar H, et al. [13], where out of 100 patients 65 were non-neoplastic and 35 cases were malignant on

FNAC. The study done by Vala M.T., et al. [14], showed an higher percentage of non-neoplastic lesions (71.24%) and lesser percentage of malignant lesions (28.57%).

The most common benign breast lesion was fibroadenoma (44 cases) with an incidence of 41.91 % of all breast lesions. The commonest age group to be affected was 21 - 30 years followed by 31-40 years and 11 - 20 years. In studies done by Aditya Khema, et al. [6], Qureshi H, et al. [9], Kumar H, et al. [13], Tiwari, et al. [15], Velu A.R.K., et al. [16] and also reported fibroadenoma as the commonest benign lesion on cytology.

The second commonest non-neoplastic lesion was fibrocystic disease (6 cases) with an incidence of 5.71% of all breast lesions. Aditya Khema, et al. [6], Kumar H, et al. [13] and Velu A.R.K., et al. [16] also observed it to be the second commonest non-neoplastic lesion whereas the study done by Bukhari M.H., et al. [17] showed fibrocystic disease to be the commonest non-neoplastic lesion followed by fibroadenoma. The other non-neoplastic lesions in this study were granulomatous mastitis (4.76%), breast abscess (1.9%), mammary duct ectasia (0.95%), benign phyllodes (0.95%) and one case was labeled as proliferative breast lesion without atypia (0.95%).

Amongst the malignant lesions Infiltrating duct carcinoma (IDC) was found to be the most common malignant lesion in age group of 31-40 years (09/34). In our study, out of the total 34 cases after histopathological correlation, 32 cases were of infiltrating duct carcinoma with an incidence of 94.12% of all the malignant lesions. Mucinous carcinoma and Malignant Phyllodes each showed similar incidence of 2.94% of all malignant lesions (**Table – 5, 6**).

The study done by Pudasaini, et al. [4] also showed invasive ductal carcinoma to be the most common malignant lesion in the age group of 41-50 years. They also noted that IDC had an incidence of 46.7% of all malignant lesions.

Table - 6: Age wise distribution of commonest breast lesions on cytology.

Age Groups	Fibroadenoma	Infiltrating Ductal Carcinoma
11-20	13 (29.5%)	-
21-30	17 (38.6%)	-
31-40	9 (20.5%)	9 (28.1%)
41-50	5 (11.4%)	8 (25.0%)
51-60	-	6 (18.8%)
61-70	-	8 (25.0%)
71-80	-	1 (3.1%)
Total	44	32

On cytology, lesions were categorized into C1 to C5 category. In this study lesions belonging to C3 category (4 cases) showed 2 cases of true negative and 2 cases of false negative. C3 category cases were labeled as proliferative breast lesion with atypia which on microscopy showed cohesive groups of cells with marked overlapping and overcrowding exhibiting mild to moderate atypia. Out of these 4 cases, on histopathology examination 2 cases were benign (fibroadenoma and fibrocystic disease), whereas 2 cases were malignant (Infiltrating ductal carcinoma). Malukani K, et al. [5] in their study of 200 patients, 8 cases were labeled as proliferative breast disease with atypia, wherein on histopathological correlation two cases were diagnosed as ductal carcinoma. One case of category C2 (benign phyllodes) was diagnosed as malignant phyllodes on histopathology. The reason for false negativity being sampling error as on histopathology the malignant phyllodes tumor had 2 patterns, one mimicking benign phyllodes tumor and the other demonstrating a pure sarcomatous component leading to false diagnosis. The sampling problem can arise in phyllodes tumor due to the heterogeneous nature of these tumors. Diagnostic accuracy of FNAC in histology correlated cases was as per (Table – 7).

A lump in the breast is accompanied by anxiety or fear of it being cancerous. Hence a quick diagnosis of lump in the breast is essential for further treatment. This study was aimed to assess

the diagnostic efficacy of breast lesions by correlating with the final histopathological diagnosis of all breast lesions and with regards to sensitivity, specificity, positive predictive value, negative predictive value and efficiency of malignant lesions.

Table - 7: Diagnostic Accuracy of FNAC in Histologically correlated cases.

FNAC	HISTOPATHOLOGICAL DIAGNOSIS	
	Malignant	Non-malignant
Malignant	34(TP)	Malignant
Non-malignant	03(FN)	Non-malignant

Sensitivity means proportion of patient with associated carcinoma and a positive predictive result on FNAC for malignancy. Our study revealed Sensitivity of 91.89% which was similar to the finding observed by Qureshi, et al. [9]. The calculated sensitivity rate in different studies is from 83.33% to 98.0% (Table - 9). In this study 3 cases (3.06%) of false negative were observed. In previous studies, done by other authors, false negative percentage was higher and ranged from 4 - 8.3% [6, 9, 18, 19]. The common cause for high false negative diagnosis is malignant tumors which included lobular carcinoma, tubular and low grade DCIS [20].

Specificity means proportion of patient without associated carcinoma and a negative result on FNAC for malignancy. The specificity seen in our study was 100% correlating with other studies of 96.96% to 100% (Table - 9). No false positive cases were observed in this study. False positive diagnosis in aspiration cytology is significantly lower (0 - 0.8%) in incidence compared to false negative cases [6, 9, 18, 19]. The literature shows that common lesions giving false positive results are fibroadenoma, fibrocystic change and pregnancy related hyperplasia. False positive diagnosis should be avoided as mastectomy or other treatment modalities are performed on the basis of FNAC diagnoses. The incidence of false positive and

false negative results can be reduced by proper approach through guided aspiration and accurate interpretation of results.

The positive predictive value indicates the proportion of patient with positive result on FNAC and also on histological confirmation. Similarly, negative predictive value the proportion of patients with negative results on FNAC and no malignancy on histopathological study. The PPV and NPV observed in our study was 100% and 95.31% comparing with the earlier studies PPV and NPV were ranging from

96.77 - 100% and 92 - 100% respectively (**Table - 9**).

On cyto-histopathological correlation out of 98 cases concordance was seen in 95 cases whereas discordance was seen in 3 cases. Out of the total 57 benign lesions on cytology 54 cases showed concordance, whereas 3 cases showed discordance. All the inflammatory and malignant breast lesions showed 100% concordance after histopathological examination. However, 7/105 cases were reported inadequate on cytology which were excluded from the study (**Table - 8**).

Table - 8: Cyto-histopathological Correlation.

Category	Number of Cases	Concordant	Discordant	Total
Benign	57	54 (94.74%)	03 (5.26%)	57
Malignant	34	34 (100%)	00	34
Inflammatory	07	07 (100%)	00	07
Total	98	95	03	98

Table - 9: Comparison of cytological diagnosis with other studies.

Authors	Sensitivity	Specificity	PPV	NPV	Efficiency
Qureshi, et al. [9], 2007	91.66%	96.96%	-	-	-
Bukhari, et al. [17], 2011	98%	100%	97%	100%	98%
Khema A, et al. [6], 2011	96%	100%	100%	95.12%	-
Arjun Singh, et al. [21], 2011	84.60%	100%	-	-	92.30%
Mahajan N.A., et al. [22], 2013	96.66%	98.66%	96.77%	98.66%	98.11%
Kasture J., et al. [23], 2013	98.20%	100%	100%	93.20%	-
Panjvani S.I., et al. [24], 2013	97.82%	100%	-	-	98.90%
Thakkar B., et al. [10], 2014	97.05%	98.78%	97.05%	98.78%	98.27%
Vala M.T., et al. [14], 2014	83.33%	100%	100%	92%	94.20%
Velu A.R.K., et al. [16], 2016	-	-	-	-	96.70%
Kumar H., et al. [13], 2016	94.49%	100%	100%	96.20%	98%
Present study, 2017	91.89	100	100	95.31	96.93

Conclusion

FNAC of breast lump is a known and effective method for determining the various breast lesions with a high degree of accuracy. The accuracy of FNAC depends on triple assessment consisting of clinical examination, radiological findings along with cytological diagnosis by an

experienced cytopathologist thus reducing false negative rate.

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