

# Cytomorphological patterns of breast lesions diagnosed on fine-needle aspiration cytology in a tertiary care hospital

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## Abstract

**Background:** Fine-needle aspiration cytology (FNAC) has been established as a highly accurate diagnostic technique over the past few decades. It is a rapid, reliable, and safe initial diagnostic tool used for both non-neoplastic and neoplastic breast lesions.

**Objectives:** To study the cytomorphological patterns of various breast lesions diagnosed on Fine Needle Aspiration cytology.

**Materials and Methods:** This study was carried out on 100 patients who presented with palpable lumps in breast in the Department of Pathology, MM Institute of Medical Sciences and Research, Mullana, Ambala, Haryana, from October 2012 to September 2014 and were subjected to an FNAC procedure after obtaining a detailed history and conducting a general physical and local examination. Cytological diagnosis was made and histopathological correlation was made, wherever available.

**Results:** Cytologically, the lesions were categorized as inflammatory 11 (11%), benign 10 (10%), fibroepithelial lesions 30 (30%), atypical probably benign 2 (2%), suspicious (probably malignant) 3 (3%), malignant 39 (39%), and unsatisfactory 5 (5%). Of these 100 cases, 30 cases (30%) were available for histopathological examination. The most common benign lesion in this study was fibroadenoma (26/40; 65%) and the most common malignant lesion was infiltrating ductal carcinoma (33/39; 84.61%).

**Conclusion:** Diagnosis of breast lump based on FNAC should be practiced as there is high correlation with histopathological finding. FNAC should be used as a routine diagnostic procedure due to its cost effectiveness, thus maximizing the availability of effective health care to patients with breast lesions.

**KEY WORDS:** Cytology, breast lumps, histopathology, malignancy


## Introduction

Diseases of breast mainly present as palpable masses, nipple discharge, or abnormalities on imaging studies. However, most of these are benign with the exception of

carcinoma of breast, which is the leading cause of morbidity and mortality.<sup>[1]</sup> In India, breast carcinoma is the second most common malignant neoplasm (next to cervical cancer) in females, comprising 22.2% of all new cancer diagnoses and 17.2% of all cancer deaths.<sup>[2]</sup>

The management of breast disease needs a deliberate, synchronized diagnostic and treatment strategy. Fine-needle aspiration cytology (FNAC) is an important diagnostic tool for the preoperative diagnosis of palpable and non-palpable breast lesions.

The procedure has advantages in that it provides rapid and accurate diagnosis and serves a cost-effective tool for the treatment of breast masses.<sup>[3]</sup> It differentiates cysts from a solid tumor and can be used as a therapeutic procedure when a cyst is encountered. Whenever a malignancy is diagnosed,

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it permits participation of the patient in the decision-making process. It also provides a psychological relief to the patients once diagnosed with benign breast lesions. In addition, it is useful for evaluation of local chest wall recurrences and permits a number of ancillary studies such as hormone receptor analysis, flow cytometry, and molecular studies. The advantages of the FNA procedure also include a fairly precise diagnosis, exceptional patient acceptance, and also a minimal to no morbidity.<sup>[4]</sup>

Therefore, the study aimed to determine the extent to which the FNAC report could be relied upon to decide a definitive surgical procedure for management of the patient without resorting to any other cumbersome diagnostic procedure.

### Aims and Objectives

To study the cytomorphological patterns of various breast lesions on FNAC.

### Material and Methods

A total of 100 cases of palpable breast lumps referred to the cytology section of pathology department for FNAC were included in the study. FNAC under ultrasonography guidance was undertaken wherever necessary. The final diagnosis and clinical data were recorded and correlated with special reference to age, site of lesion, chief complaints, clinical investigations, and metastasis, if any.

### Results

#### Age and Sex Distribution

The age range of 100 patients included in this study was 10–85 years. The most affected age group was 31–40 years. Among all cases, 2 (2%) were male and 98 (98%) were female patients [Table 1].

#### Anatomical Distribution of Lesions in both Breasts

In 47 cases, the lesions were located in the right breast and in 51 cases these were located in the left breast. In two cases, bilateral lesions were observed [Table 2].

#### Presenting Symptoms

Thirty-seven cases of breast lumps had associated pain, 17 cases presented with discharge from the nipple, and 23 cases had associated axillary lymphadenopathy [Table 3].

#### Anatomical Quadrant Distribution of Breast Lesions

The mass was located in the upper outer quadrant in 59 cases, in the upper inner quadrant in 11, and in the lower outer quadrant in 9 cases. It was located in the lower inner quadrant in 6 and in the subareolar region in 10 cases. The mass was diffuse and involved all the quadrants in five cases [Table 4].

**Table 1:** Age distribution

Age group (years)	No. of cases	Percentage
10–20	5	5
21–30	23	23
31–40	31	31
41–50	20	20
51–60	12	12
61–70	8	8
>70	1	1
Total	100	100

**Table 2:** Anatomical distribution of lesions in both breasts (right and left)

Side	Cases	Percentage
Right	47	47
Left	51	51
Bilateral	2	2
Total	100	100

**Table 3:** Clinical presentation

Clinical presentation	No. of cases
Pain	37
Discharge	17
Axillary lymphadenopathy	23

**Table 4:** Breast mass, quadrant distribution

Quadrant	No. of cases	Percentage
All	5	5.0
Lower inner	6	6.0
Lower outer	9	9.0
Subareolar	10	10.0
Upper inner	11	11.0
Upper outer	59	59.0
Total	100	100.0

**Table 5:** Cytological spectrum of breast lumps on FNAC

Cytological diagnosis	No. of cases	Percentage
Inflammatory	11	11
Benign breast lesions	10	10
Fibroepithelial lesions	30	30
Atypical/Probably benign	2	2
Suspicious of malignancy	3	3
Malignancy	39	39
Unsatisfactory	5	5

#### Adequacy of the Aspirate

Of the 100 cases, in 95 cases, the aspirates were adequate for interpretation and in 5 cases they were inadequate with very scanty cellularity or were only hemorrhagic.

**Table 6:** Distribution of inflammatory lesions

Cytological diagnosis	No. of cases
Acute mastitis/abscess	3
Granulomatous mastitis	2
Tuberculous mastitis	3
Fat necrosis	1
Duct ectasia	2
Total	11

**Table 7:** Distribution of benign breast lesions

Benign breast lesions	10	10%
Fibrocystic disease	3	3%
Simple cyst	1	1%
Galactocele	2	2%
Gynecomastia	2	2%
Intraductal papilloma	2	2%
Fibroepithelial lesions	30	30%
Fibroadenoma	26	26%
Benign/Low-grade phyllodes	4	4%

**Table 8:** Distribution of malignant lesions

Malignancy	N	%
Ductal	33	33%
Colloid	1	1%
Medullary	2	2%
Metaplastic	2	2%
Malignant phyllodes	1	1%
Total	39	39%

**Table 9:** Cyto-histopathological correlation of 30 cases of breast lesions of the present study

Cytological diagnosis	Histopathological diagnosis		Total
	Malignant	Benign	
Malignant (14)	13	01	14
	(a: true positive)	(b: false positive)	(a+b)
Benign (16)	02	14	16
	(c: false negative)	(d: true negative)	(c+d)
Total (30)	15	15	30
	(a+c)	(b+d)	(a+b+c+d)

The cytological diagnoses included inflammatory (11%), benign (10%), fibroepithelial (30%), atypical (2%), suspicious (3%), malignant (39%), and unsatisfactory cases (5%).

**Table 10:** Comparison of cytological findings of the present study with the various other studies

Studies	Total cases	Benign cases, n (%)	Atypical cases, n (%)	Malignant cases, n (%)	Suspicious cases, n (%)	Unsatisfactory cases, n (%)
Khan <i>et al.</i> <sup>[5]</sup>	74	24 (32.4)	03 (4.1)	41 (55.4)	06 (8.1)	0 (0)
Yusuf <i>et al.</i> <sup>[8]</sup>	200	109 (54.5)	20 (10)	44 (22)	27 (13.5)	0 (0)
Panjvani <i>et al.</i> <sup>[9]</sup>	222	150 (68.18)	01 (0.45)	69 (31.08)	02 (0.90)	00 (00)
Chokshi <i>et al.</i> <sup>[10]</sup>	407	293 (22.59)	08 (1.96)	70 (17.19)	08 (1.96)	28 (6.87)
Present study	100	51 (51)	02 (2)	39 (39)	03 (3)	05 (5)

Among 11 cases [Table 6], the maximum cases were of acute mastitis and tuberculous mastitis (three cases each). Duct ectasia and granulomatous mastitis shared equal incidence (two cases each).

Among benign lesion [Table 7] including the fibroepithelial lesions, maximum cases were that of fibroadenoma (26 cases). Benign phyllodes tumor was present in four cases; three cases were that of fibrocystic disease. Galactocele, gynecomastia, and intraductal papilloma shared an equal incidence of two cases each. A single case was that of simple cyst.

Among 39 cases of malignant lesions [Table 8], maximum cases were of ductal carcinoma (33 cases). Medullary and metaplastic carcinomas shared an equal incidence of two cases each. Colloid carcinoma and malignant phyllode tumor also shared equal incidence of one case.

### Cyto-histopathological Correlation

Only 30 cases underwent a surgical procedure and could be correlated with histopathological examination (HPE). Of total 30 cases that were correlated histologically, 1 case of cytologically diagnosed fibroadenoma (FA) was reported as tubular adenoma on HPE. Another case reported as fibroadenoma on cytology examination was found as invasive ductal carcinoma on HPE, thus giving a false-negative result (FNR).

Another FNR was a case of benign phyllodes tumor on cytology examination, which was finally diagnosed as invasive ductal carcinoma. One case, which was diagnosed as suspicious of malignancy on cytology, was diagnosed as atypical ductal hyperplasia on HPE, thus giving a false-positive result. The sensitivity of present study was 86.67% and in other studies it was 83%–98.5% [Table 9].

### Discussion

Our study included the FNAC material of 100 breast lump cases in which the cytomorphological features were studied in detail, followed by surgery in 30 cases either in the form of lumpectomy or a definitive surgical procedure like mastectomy. The age of the patients ranged from 10 to 85 years with majority of malignant cases in the 41–50 year age group. A study conducted by Khan *et al.*<sup>[5]</sup> showed similar results with most affected age group being 41–50 years [Tables 12 and 13].

**Table 11:** Cyto-histopathological correlation of benign lesions of present study with other studies

Study	Total no. of cases	No. of benign lesion (%)	Histological diagnosis, n (%)	
			Benign	Malignant
Khan et al. <sup>[5]</sup>	74	24 (32.4)	23 (95.83)	01 (4.17)
Yusuf et al. <sup>[8]</sup>	200	109 (54.5)	99 (90.82)	10 (9.17)
Panjvani et al. <sup>[9]</sup>	91	46 (50.55)	45 (97.83)	01 (2.17)
Chokshi et al. <sup>[10]</sup>	161	88 (54.6)	87 (98.8)	01 (1.13)
Present study	30	16 (53.3)	14 (87.5)	02 (12.5)

**Table 12:** Comparison of false-positive and false-negative rates of different studies

Studies	Total no. of cases	False-positive rate (%)	False-negative rate (%)
Yusuf et al. <sup>[8]</sup>	200	1.2	12
Panjvani et al. <sup>[9]</sup>	91	00	2.17
Nggada et al. <sup>[15]</sup>	220	1.9	2.9
Present study	30	6.67	13.33

**Table 13:** Comparison of the sensitivity and specificity of present study with other studies

Studies	Total cases	Sensitivity (%)	Specificity (%)
Khan et al. <sup>[5]</sup>	74	95.83	100
Yusuf et al. <sup>[8]</sup>	200	81	99
Panjvani et al. <sup>[9]</sup>	91	97.82	100
Kochhar et al. <sup>[21]</sup>	52	98	100
Erra et al. <sup>[22]</sup>	440	93.8	79.6
Day et al. <sup>[23]</sup>	258	83	92
Present study	30	86.67	93.33

In majority of the cases, mass was located in the left breast in the upper outer quadrant and least in the lower inner quadrant. This was in accordance with other studies in literature.<sup>[6,7]</sup> FNAC results were divided into inflammatory, benign, fibroepithelial lesions, atypical/indeterminate/probably benign, suspicious of malignancy, malignant, and unsatisfactory categories.

In 95 cases, the aspirates were adequate for diagnosis, and 5 cases were inadequate for interpretation where no diagnosis was made.

Nguansangiam et al.<sup>[11]</sup> found 4.2% of unsatisfactory smears that needed further repeat aspiration or core/incisional biopsy for analysis. Unsatisfactory samples can be due to insufficient experience of the pathologist, radiologist, or clinician who performed FNA or due to the nature of lesion itself.

### Inflammatory Lesions (11 Cases)

Of the inflammatory lesions, a single case of acute mastitis presented with a short history of mass in the breast with tenderness and redness. Out of five cases in our study

categorized as granulomatous pathology, three cases were found to have ZN positivity and were thus reported as tuberculous mastitis. Of the two cases that were labeled as granulomatous mastitis, one patient had excision of mass and HPE confirmed a nontuberculous granulomatous mastitis. More and more cases of tuberculous mastitis are being diagnosed by FNAC because tuberculosis is prevalent in India and most of the time clinically and radiologically it mimics carcinoma of breast.

### Fibroepithelial Lesions (30 Cases)

Fibroadenoma was the most common benign tumor observed in the mentioned group (26 cases) with an age range from 10 to 40 years. Two cases had bilateral disease. The aspirates were moderately to highly cellular. A background shower of bare nuclei is an important diagnostic feature of FA.

Lopez-Ferrer et al.<sup>[12]</sup> stated that FA may be accompanied by changes such as atypical multinucleated giant cells and mild epithelial atypia, which may lead to an erroneous diagnosis of malignancy. Three cases of FA aspirates showed cyst macrophages. Six cases (23%) showed apocrine metaplasia—the so-called complex features. A diagnosis of FA on these cases was based on the characteristic cell clusters showing a typical antler horn pattern. FA and fibrocystic disease may share many indistinguishable cytological features. Care has to be exercised in these cases with clinical correlation, amount of bare nuclei in the background (numerous in FA), and presence of characteristic antlers.<sup>[12]</sup>

A single case of cytologically diagnosed FA was reported as tubular adenoma on HPE. Another case of FA was finally diagnosed as invasive ductal carcinoma on HPE. Four cases of benign phyllodes tumor were reported at cytology. The smears showed hypercellular stromal fragments interspersed with clusters of benign ductal cells. Of these, two patients underwent surgery (excisional biopsy). In one case, the histopathology showed a benign phyllodes tumor with the stroma showing aggregates of multinucleated giant cells and another case was diagnosed as invasive ductal carcinoma, thus giving another FNR. The most common cause of an FNR is aspiration miss. The high number of FNR recorded by this study may be predominantly due to sampling error and/or inadequate sampling.<sup>[13]</sup>

### Benign Breast Lesions (10 Cases)

In this category, three cases were diagnosed as fibrocystic. The age ranged from 35 to 40 years. These cases showed epithelial cells generally arranged in tight, cohesive honey-comb groups. Apocrine cell clusters and cyst macrophages were seen in plenty with few ductal epithelial cells.

There were two cases of gynecomastia in this category. The age groups were 35 and 85 years.

Gynecomastia is easily diagnosed at cytology when a male patient comes with a subareolar mass. The main problems in diagnosis of gynecomastia are getting an adequate material and its painful nature. An indication for FNAC is to rule out malignancy.<sup>[14]</sup>

Two cases of intraductal papilloma were diagnosed on cytology. Age group was 50–70 years. Both the cases were confirmed as intraductal papilloma on HPE [Table 11].

The table shows good cytohistological correlation in concordance with other studies.

### Atypical/Indeterminate/Probably Benign (2 Cases)

There were two patients aged 26 and 44 years. Atypia at cytology is characterized by crowding of nuclei, overlapping of nuclei, and nuclear enlargement.

### Suspicious of Malignancy (3 Cases)

One case, which was diagnosed as suspicious of malignancy on cytology, was diagnosed as atypical ductal hyperplasia on HPE, thus giving a false-positive result. The false-positive rate might be attributable to cytomorphological feature overlap of benign and malignant lesions and to errors of interpretation.

### Malignancy (39 Cases)

In this category, there were 33 cases of ductal carcinoma of breast. The age ranged from 22 to 70 years. All cases presented with a lump in the breast. Sixteen cases also had axillary lymphadenopathy. Thirteen of these patients underwent surgery and the diagnosis of ductal carcinoma, not otherwise specified was confirmed in 12 of them on HPE. Singh *et al.*<sup>[16]</sup> reported that invasive ductal carcinoma is the most common breast malignancy and is found in the age group of 41–60 years. The present study shows similar findings; of two cases of medullary carcinoma (MC), surgery was performed in one case that was confirmed as MC of breast. MC comprises 1%–7% of invasive breast carcinomas.<sup>[17]</sup> Ridolfi *et al.*<sup>[18]</sup> described criteria for the diagnosis of MC in 1977 that included presence of five elements, namely syncytial growth pattern in at least 75% of the areas examined, microscopic circumscription, high nuclear grade, lymphoplasmacytic infiltrate, and absence of tubular differentiation.

Another female patient of colloid carcinoma was 62 years old. The reported incidence of colloid carcinoma is 1%–4% of all breast cancers.<sup>[17]</sup> The smears were identified by a characteristic background mucin and chicken wire blood vessels. Such cases are usually mistaken as an FA mammographically.

In this study, there were two cases of metaplastic carcinoma. Cytology in one of the cases showed osteosarcomatous differentiation consisting of sarcomatous cells and multinucleated giant cells, which was confirmed by HPE.

Metaplastic carcinomas are quite unusual, accounting for only 0.2% of breast malignancies.<sup>[19]</sup> It is a heterogeneous group of breast malignancy characterized by a mixture of carcinoma with areas of spindle, squamous, chondroid, or osseous metaplasia/differentiation.<sup>[20]</sup>

A single case of malignant phyllodes tumor was a female patient of 50 years. Phyllodes tumor accounts for fewer than 0.3% of all breast lesions. Cytological distinction of phyllodes tumor from FA has been predominantly based on assessment of the cellularity of the stromal lesions.

### Sensitivity and Specificity

The sensitivity of 86.67% and specificity of 93.33% obtained in our study were in accordance to sensitivity of 81%–98% and specificity of 79.6%–100% reported in various studies, as shown in Table 13.

The high rate of sensitivity and specificity highlights the usefulness of FNAC as a preoperative diagnostic tool in the management of palpable breast lesions.

### Conclusion

This study showed that FNAC helps in preoperative evaluation of breast lumps without surgical intervention. It is an ideal tool for follow up in cases of recurrence of breast lesions. However, some difficulties and limitations need to be mentioned about the procedure, viz. both false-negative and false-positive results can occur, which can be avoided by experience and expertise of cytopathologist. The overlapping features of different lesions can also cause cytodifferential errors. So it is concluded that FNAC should be used as a routine diagnostic procedure due to its cost effectiveness and quick results, thus maximizing the availability of effective health care to patients with breast lesions.

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