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Original Research Article

Analysis of Fine Needle Aspiration Cytology (FNAC) and Histopathological Correlation of Breast Lesions with Significance of Cytological Scoring System in Breast Tumors

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Abstract

Introduction: With growing awareness in the general population, patients with breast lumps are commonly approaching the clinicians. Fine needle aspiration cytology (FNAC) is accepted as the most sensitive, safe and cost effective procedure for diagnosing lesions of breast. Proliferative diseases of breast (PBD) encompass a number of histologic lesions having a variable risk factor for the development of carcinoma. One approach to resolve the diagnostic difficulties posed by PBD on FNAC has been to apply an objective scoring system proposed by Masood et al [1].

Materials and Methods*:* A two year prospective study of 350 cases was conducted. Fine needle aspiration procedure, fixation & staining were performed by standard procedures. Cytological scoring by Modified Masood et al scoring system and correlation between cytological scoring category & histological diagnosis was done.

Results: Adequacy of FNAC was 94.3% (330/350). Out of 330 cases, 280 were neoplastic and 50 were non-neoplastic. Cytological scoring was done on all 280 cases but histology was available in total 217 cases. Cytohistological correlation of neoplastic lesions was observed in 94.5% cases using cytological scoring system.

Conclusion*:* FNAC is accepted as the most sensitive, specific, accurate, safe and cost effective procedure for diagnosing lesions of breast preoperatively and avoiding unnecessary surgical interventions like diagnostic excision or incisional biposy. The scoring system was useful in aspirates with cytodiagnosis of proliferative breast disease with atypia, as it helped in separating out a proportion of non-atypical cases. It should be implemented in routine cytological reporting.

Keywords: Biopsy; Fine-Needle; Risk Factors; Fibrocystic Breast Disease; Cytodiagnosis.

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Introduction

With growing awareness in the general population, a lady with a breast lump is one of the commonest presentations in outpatient departments. In modern women, the breasts have acquired an important emotional significance. When disease develops in the breasts, it results in anxiety for the patient and the family as well. The breast lesions have been concealed by many women because of the cosmetic considerations and social stigma. Diseases of the breast are not only a medical problem but also a socioeconomic one. Spectrum of lesions of breast is wide, ranging from nonneoplastic lesions to high grade carcinomas. Most of nonneoplastic lesions of breast presenting as breast lump appear neoplastic, making clinical diagnosis difficult.

Proliferative diseases of breast encompass a number of histologic lesions having a variable risk factor for the development of carcinoma [1-5]. On fine needle aspiration cytology (FNAC) these lesions are usually categorized into proliferative breast disease (PBD) without atypia and proliferative breast disease with atypia (PBDA) as it is not possible to exactly delineate various histological entities [6-8].

Though FNAC of breast is a highly sensitive and specific modality for distinguishing benign and malignant lesions, its role in delineation of proliferative lesions of breast as stated above is debatable [9]. However, it is important to distinguish PBD with atypia from cases of PBD without atypia due to differences in prognosis and management. Risk of development of carcinoma is 1.5-2.0 times, 4.0-5.0 times and 8.0-10.0 times for PBD without atypia, PBD with atypia and in-situ-carcinoma respectively [5].

The modern trend towards more conservative surgery and individualised treatment has increased the significance of cytological scoring system of breast tumours.

One approach to resolve the diagnostic difficulties posed by PBD on FNAC has been to apply an objective scoring system. Reviewing the literature of FNAC scoring system recently different proposals by various workers have been suggested [10-12]. The scoring system proposed by Masood et al [6] is the most widely tested of the scoring systems. This study was undertaken to test the usefulness of the scoring system proposed by Masood et al and its efficacy was assessed by correlating cytological scoring category obtained by this method with histopathological diagnosis.

The efficient categorising of breast lesions on FNAC would allow assessment of PBD with atypia, so the most suitable treatment could be selected immediately and the morbidity associated with over-treatment of these low grade tumours could be avoided. Assessment of prognosis of tumor by cytological scoring would therefore be beneficial for both patients and clinicians.

Objectives

1. To study spectrum of lesions of breast in patients presenting with breast lump.
2. To evaluate efficacy of FNAC in lesions of breast.
3. To test the utility of cytological scoring system proposed by Masood et al [1] by correlating it with histopathological diagnosis.

Methodology

This was a prospective study done over a period of two years. The female patients presenting with breast lump attending outdoor as well as indoors departments were selected randomly for the present study. Total numbers of patients included in the study were 350.

Clinical history of symptoms related to the breast such as lump, mastalgia, nipple discharge, retraction etc. was taken. Breast was examined for lump with special reference to site, size, tenderness, mobility, consistency and fixation to underlying chest wall.

Informed consent was taken before the interventional procedures. FNAC was performed with disposable 23-25 gauge (<0.7 mm) and 10 ml syringe. Air dried and wet fixation done and slides stained by H&E, Papanicolaou and Giemsa stain. Morphological evaluation was performed for sampling adequacy, cellularity and diagnostic interpretation.

Cytological scoring was done by Modified Masood et al scoring system (Table 1 & Figure 1-4).

Masood et al (1991) [1] proposed a scoring system to differentiate proliferative and nonproliferative breast diseases in fine-needle aspirates (Table 2). In this system all neoplastic lesions, both benign as well as malignant are scored based on each of six parameters and categorized based on total score obtained.

Modified Masood et al Scoring System:

Category	Total score
Non -proliferative breast disease (NPBD)	6-9
Proliferative breast disease without atypia (PBD)	10-14
Proliferative breast disease with atypia (PBDA)	15-18
Carcinoma (CA)	19- 24

In this study histology was possible in 247 cases. The surgical specimens received were evaluated grossly, and trimming was done according to the procedure described by Rosai [9].

The sections were taken from representative areas. The tissue was fixed in 10% buffered formalin and then processed by the routine paraffin embedding techniques [10]. Sections were cut at 4-5 microns thickness and stained with hematoxylin and eosin.

Data was analysed for sampling adequacy, utility and efficacy. Correlation between cytological scoring categories and histopathological diagnosis of neoplastic

lesions was done. Data was analysed to find out utility parameters of the FNAC procedure.

Observations and Results

Fine needle aspirations were done on 350 randomly selected female patients presenting with breast lump. Of 350 total cases 20 cases had inadequate aspirates. Therefore the adequacy of FNAC procedure was 94.3% (330/350). These 20 cases were excluded from further evaluation in the study.

Out of 330 cases, 280 were neoplastic and 50 were nonneoplastic cytologically. Histopathological diagnosis was available in total 247 cases (Table 3). Of which 30 were non-neoplastic and 217 were neoplastic.

Cytological scoring was done on all 280 neoplastic lesions (184 benign and 96 malignant) by Modified Masood et al scoring system. Out of these, in 217 (142 benign and 75 malignant) cases histological diagnosis was available. On histology, 138 were benign and 79 were malignant. Correlation between cytological scoring categories and histological diagnosis of neoplastic lesions was done.

In the present study, youngest patient was 16 years and oldest patient was 72 years old. Proliferative breast diseases were common in 2nd to 3rd decade of life, whereas carcinomas were common in 5th to 6th decade of life. Youngest patient of cancer was 45 years old and oldest patient was 72 years. (Table 4 & Figure 5)

Among 8 bilateral neoplastic lesions, 3 cases were diagnosed on histology as infiltrating lobular carcinoma (Figure 6), 2 cases as fibroadenomas (Figure 7), one case as fibrocystic disease and 2 cases categorized as proliferative breast disease on cytology whose histopathology was not available.

In the present study, it was observed that incidence of carcinoma was more common on left breast (51.2%) compared to right breast (46.4%) (Table 5 & Figure 8).

Upper outer quadrant was commonly involved (52.1%), followed by central (15.6%),upper inner quadrant (13.5%), lower outer (11.5%), lower inner (5.2%) and only 2.1% carcinoma had diffuse lesion.

Cytological scoring was done on all 280 neoplastic lesions (184 benign and 96 malignant). Out of these, in 217 (142 benign and 75 malignant) cases histological diagnosis was available. In the present study, Proliferative breast disease (PBD) comprised the maximum number of cases i.e. 148 out of 280 (52.8%), followed by carcinoma (96 cases) and Proliferative breast disease with atypical (24 cases). Remaining 12 cases were categorized as non -proliferative breast disease (NPBD) (Table 6-12).

As histopathology was available in 217 out of 280 neoplastic cases, cytohistological correlation of neoplastic lesions was studied in 217 cases (Table 13).

The overall cytohistological correlation of neoplastic lesions using cytological scoring system was found to be 94.5% (Table 13).

Table 1: Parameters of Masood et al scoring system

Parameters	Score 1	Score 2	Score 3	Score 4
I. Cellular arrangement	Monolayer	Nuclear overriding	Overriding & clustering	Loss of cell cohesion
II. Presence of myoepithelial cells	Many	Moderate	Few	Absent
III. Cellular pleomorphism	Absent	Mild	Moderate	Conspicuous
IV.Anisonucleosis	Absent	Mild	Moderate	Conspicuous
V. Nucleoli	Absent	Rare macronucleoli	Frequent macronucleoli	Predominant macronucleoli
VI. Clumped chromatin	Absent	Rare	Occasional	Frequent

Table 2: Lesions corresponding with the categories of Masood et al scoring system

Cytological Scoring Categories	Histopathological Diagnosis
Non -proliferative breast disease (NPBD)	Fibroadenosis, fibrocystic disease.
Proliferative breast disease without atypia (PBD)	Fibroadenoma, sclerosing adenosis, fibrocystic disease with florid ductal hyperplasia, duct papilloma, usual epithelial hyperplasia
Proliferative breast disease with atypia (PBDA)	Atypical ductal hyperplasia, Atypical lobular hyperplasia
Carcinoma (CA)	In situ and invasive carcinoma

Table 3: Distribution of different lesions of breast

Types of lesions	No of cases on cytology (%)	No of cases in which histological diagnosis available (%)
Non-neoplastic	50 (15.2)	30 (12.1)
Neoplastic	280 (84.8)	217 (87.9)
Total	330 (100)	247 (100)

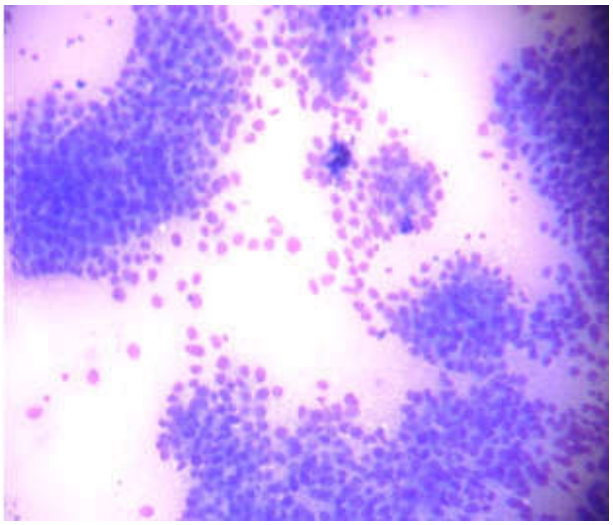

Fig. 1: FNA photomicrograph showing monolayer cellular arrangement, many myoepithelial cells and absence of cellular pleomorphism: Score 6- Category: NPBD (Geimsa X100)

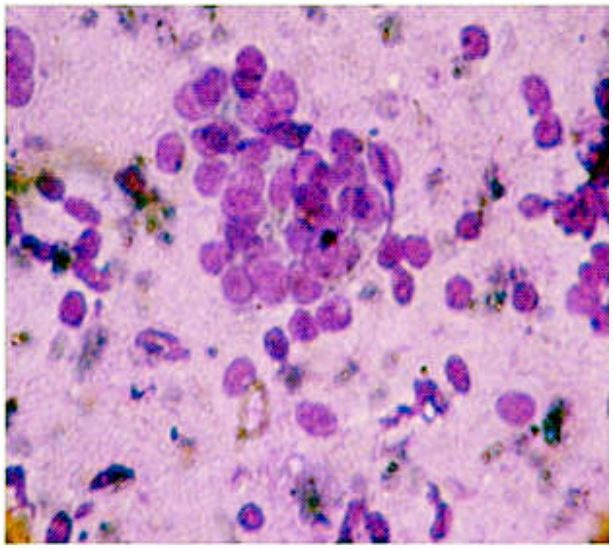

Fig. 3: FNA showing cellular overriding & clustering, absent myoepithelial cells, mild cellular pleomorphism , mild anisonucleosis, rare micronucleoli & occasional clumped chromatin :Score 16 -Category: PBDA (Geimsa X400)

Table 4: Age- wise distribution of neoplastic cases of breast lump in study group

Age in years	Neoplastic (%)
11-20	29 (10.7%)
21-30	65 (23.2%)
31-40	78 (27.9%)
41-50	43 (15%)
51-60	32 (11.4%)
61-70	30 (10.7%)
71-80	03 (1.1%)
Total	280 (84.8%)

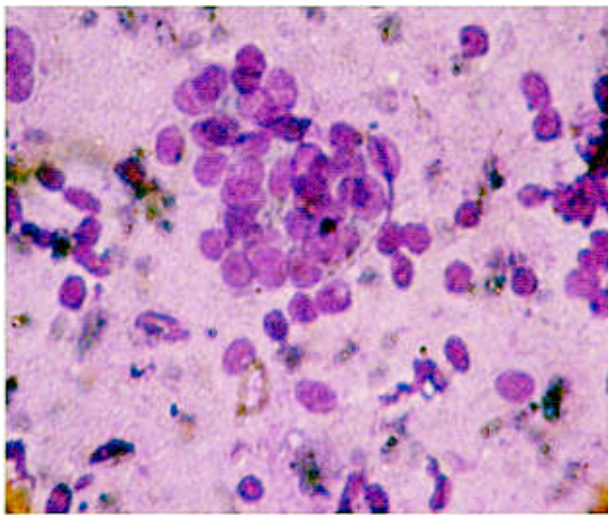

Fig. 2: FNA showing cellular overriding & clustering and moderate myoepithelial cells and absence of cellular & nuclear pleomorphism, rare micronucleoli: Score 11- Category: PBD (Giemsa X400)

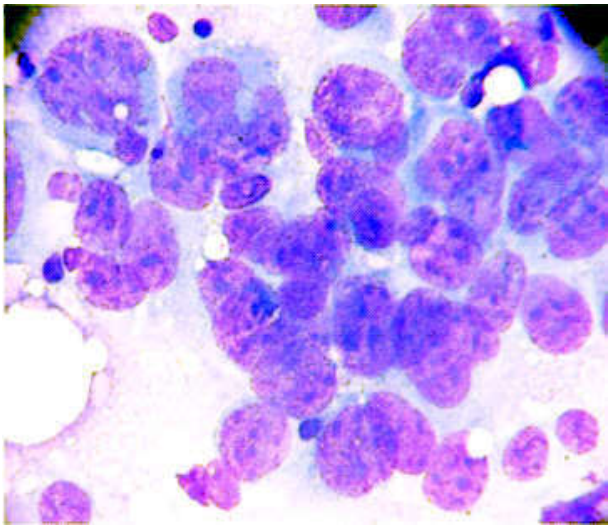

Fig. 4: FNA showing loss of cell cohesion, absent myoepithelial cells, conspicuous cellular pleomorphism, conspicuous anisonucleosis, predominant macronucleoli and frequent clumped chromatin: Score 24 –Category: Carcinoma (Geimsa X400)

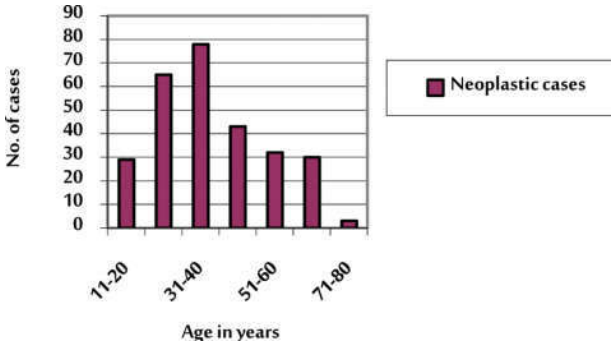

Fig. 1: Age distribution of breast lesions

Table 5: Location wise distribution of neoplastic cases of breast lump in study group

Side of breast	Neoplastic (%)
Right breast	129 (46.1)
Left breast	143 (51.1)
Bilateral	08 (2.8)
Total	280 (84.8)

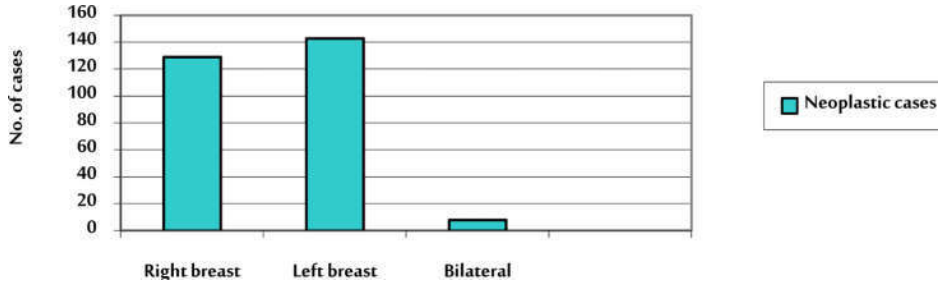

Fig. 1: Location breast lump

Table 6: Distribution of cases according to cellular arrangement

Score	No of cases	Percentage
(Monolayer)	23	8.6
(Nuclear overriding)	137	48.9
(Nuclear overriding & clustering)	67	23.6
(Loss of cell cohesion)	53	18.9
Total	280	100

Table 7: Distribution of cases according to presence of myoepithelial cell

Score	No of cases	Percentage
(Many)	62	22.1
(Moderate)	87	31.1
(Few)	72	25.7
(Absent)	59	21.1
Total	280	100

Table 8: Distribution of cases according to cellular pleomorphism

Score	No of cases	Percentage
(Absent)	26	9.3
(Mild)	124	44.3
(Moderate)	86	30.7
(Conspicuous)	44	15.7
Total	280	100

Table 9: Distribution of cases according to anisonucleosis

Score	No of cases	Percentage
(Absent)	24	8.6
(Mild)	138	49.2
(Moderate)	73	26.1
(Conspicuous)	45	16.1
Total	280	100

Table 11: Distribution of cases according to clumped chromatin

Score	No of cases	Percentage
(Absent)	55	19.7
(Rare micronucleoli)	111	39.6
(Frequent micronucleoli)	48	17.1
(Predominant macronucleoli)	66	23.6
Total	280	100

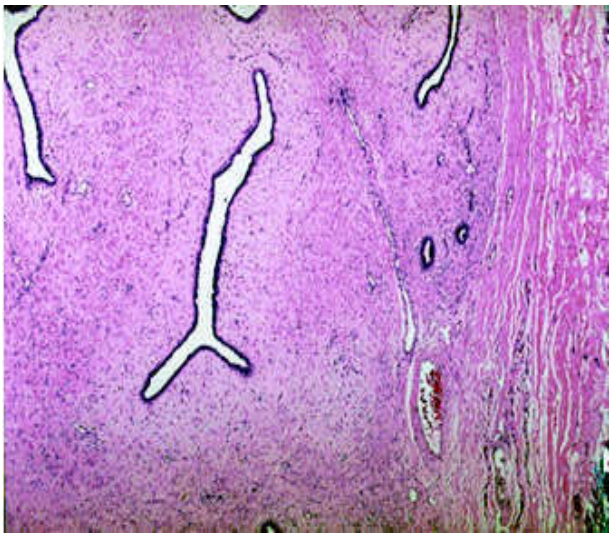

Fig. 5: Photomicrograph showing compressed ducts with surrounding hypercellular stroma in pericanalicular fibroadenoma. (H & E X100)

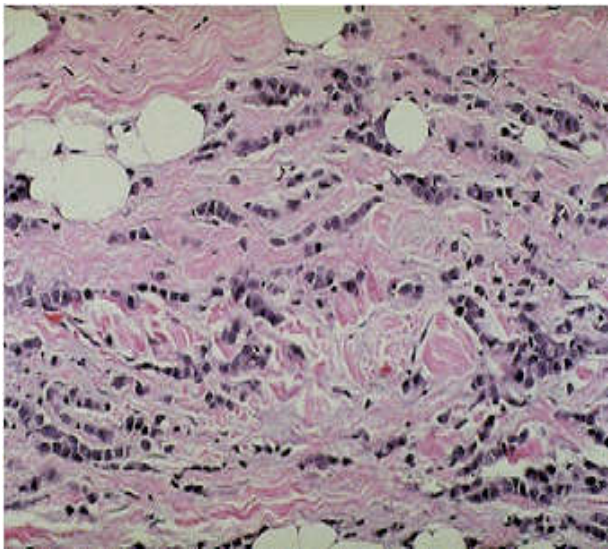

Fig. 6: Photomicrograph showing small, uniform tumour cells and round nuclei with mild pleomorphism arranged in "Indian file pattern" in Invasive lobular carcinoma of breast. (H & E X 400)

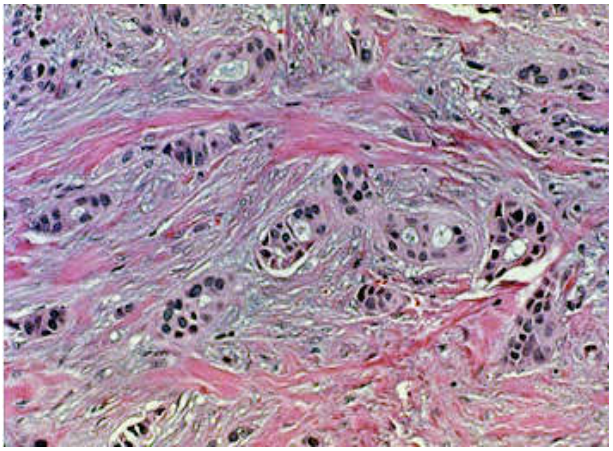

Fig. 7: Photomicrograph showing large, pleomorphic cells arranged in cords and tubules infiltrating dense fibrous stroma in Invasive ductal carcinoma of breast. (H &E X400)

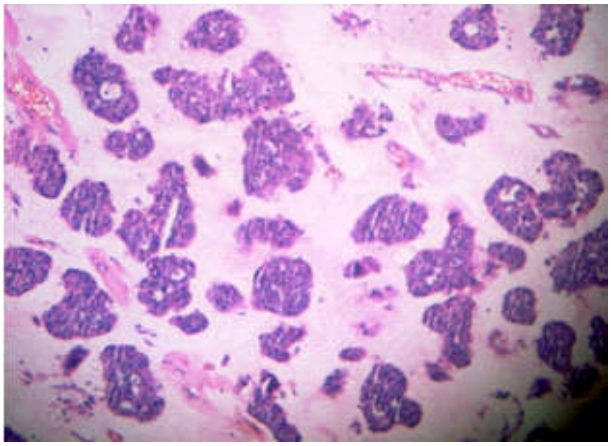

Fig. 10: Photomicrograph showing abundant bluish mucin in background. Clusters of well differentiated tumour cells are seen floating in pools of mucin in Colloid or mucinous carcinoma of breast. (H & E X 400)

Table 12: Categorization of cases according to total score on cytology

Cytological scoring category	Total Cytological Score	No of cases (%)	Histological diagnosis available (%)
Non -proliferative breast disease (NPBD)	6-9	12 (4.3)	10 (4.6)
Proliferative breast disease without atypia (PBD)	10-14	148 (52.8)	112(51.6)
Proliferative breast disease with atypia (PBDA)	15-18	24 (8.6)	20 (9.2)
Carcinoma (CA)	19-24	96 (34.3)	75 (34.6)
Total no. (%)		280 (100)	217 (100)

Table 13: Correlation between cytological scoring category and histopathological diagnosis

Cytological scoring category	Histological diagnosis		
	Concordant cases	Discordant cases	Total
NPBD	08 (80%)	02 (20%)	10
PBD	106 (94.6%)	06 (5.4%)	112
PBDA	16 (80%)	04 (20%)	20
CA	75 (100%)	0(0%)	75
Total	205 (94.5%)	12 (5.5%)	217

Cytohistological correlation was 80% in NPBD, 94.6% in PBD without atypia, 80% in PBD with atypia and 100% in carcinoma cases.

Out of 10 cases of NPBD on cytology, 8 (80%) cases were correlated with histopathological diagnosis and two (20%) were discordant and diagnosed as fibroadenoma (PBD) on histopathology (Table 14).

Out of 112 cases categorised as PBD without atypia on cytology; 106 (94.6 %) cases were correlated with histopathological diagnosis, while 6 cases were discordant. Out of 6 discordant cases, two (1.8%) were diagnosed as atypical ductal hyperplasia (PBD with atypia) on histopathology; and four (3.6%) were diagnosed as fibroadenosis (NPBD) on histopathology.

Out of twenty cases categorized as PBD with atypia on cytology, 16 (80%) were correlated with histopathological diagnosis and four (20%) were discordant. In discordant cases included two cases of DCIS and one each case of mucinous carcinoma and lobular carcinoma.

Out of seventy five cases of carcinoma categorized on cytology, all (100%) were correlated with histopathological diagnoses as carcinoma.

In the present study four cases of carcinoma were falsely categorized as benign (false negative) on cytology and no false positive case was observed on cytology (Table 15).

Utility parameters of cytological scoring system (Modified Masood et al) in diagnosing malignant lesions:

Table 14: Cytohistological correlation of neoplastic lesions utilizing cytological scoring system in study group

Cytological scoring category	Histopathological diagnosis				
	NPBD	PBD	PBDA	CA	Total
NPBD	8	2	0	0	10
PBD	4	106	2	0	112
PBDA	0	0	16	4	20
CA	0	0	0	75	75
Total	12	108	18	79	217

Table 15: Cytohistological correlation of benign and malignant lesions in study group

Cytology	Histopathology		
	Malignant lesions	Benign lesions	Total
Malignant lesions	75 (True positive)	0 (False positive)	75
Benign lesions	4 (False negative)	138 (True negative)	142
Total	79	138	217

- Sensitivity : 94.9%
- Specificity : 100%
- Positive predictive value : 100%
- Negative predictive value : 97.1%
- Diagnostic accuracy : 98.1%

Discussion

Fine needle aspiration is a safe, atraumatic method for the diagnosis of lesions of breast and be done as an outpatient procedures. The risk of complications is extremely low [11]. Russ et al [12] encountered only an occasional ecchymosis in his series of 257 breast FNACs. In the present study no complications have occurred. Berg and Robbins [13]concluded in their study that there was no reason to consider FNAC detrimental to patients.

Adequacy of FNAC Procedure

In the present study, overall sampling adequacy of FNAC procedure was 94.3% (330/350 cases) (Table 16). Out of 20 acellular aspirations in 8 cases subsequent biopsy were done and these included cases of hypertrophic adipose tissue (2 cases), fibroadenosis (2 cases), sclerosing adenosis (2 cases), one each case of mucinous carcinoma, infiltrating duct carcinoma with desmoplasia. In remaining 12 cases histology was not available. All the inadequate cases [20] were excluded from further evaluation in the study. Findings correlate with previous studies.

Cytological Scoring of Neoplastic Lesions

As the risk of development of breast carcinoma in patients with atypical hyperplasia is 4-5 times that of general population; hence the recognition of proliferative breast disease with atypia significantly impacts on the patient's subsequent management [1]. To overcome the difficulty, Masood et al [1] proposed a cytological scoring system considering all neoplastic lesions i.e. both benign as well as malignant lesions. In the present study cytologic preparation of 280 fine needle aspirations were studied. Histopathology was available in 217 out of 280 neoplastic cases (Table 3). The cytological findings were then

Table 16: Sampling adequacy of FNAC procedure in various studies

Sr. No.	Various studies	Sampling adequacy of FNAC procedure
1	Russ et al[43]	93%
2	Palombini et al[51]	94.9%
3	Strawbridge et al[54]	67.7%
4	Present study	94.3%

Table 17: Comparison of correlation between cytological scoring category and histopathological diagnosis in various studies

Sr. No	Various Studies	Correlation between Masood et al scoring and histological diagnosis
1	Mridha et al[5]	75.8%
3	Sneige et al[6]	73.3%
4	Present study	94.5%

Table 18: Utility parameters of FNAC in diagnosing malignant lesions in various studies

Parameters	Palombini et al[3]	Zajdela et al[7]	Wollenberg et al [8]	Present study
Sensitivity	95.7%	91.9%	65%	94.9%
Specificity	89.6%	95.8%	100%	100%
Positive predictive value	95.9%	97.4%	89.6%	100%
Negative predictive value	–	–	–	97.1%
Diagnostic accuracy	94%	93.3%	91.3%	98.1%

compared to the reported histopathological diagnosis and the data was statistically analysed. A high degree of concordance was found between the cytological scoring and the histopathological diagnosis. This study suggests that it is possible to apply a cytologic scoring system to further subclassify proliferative lesions of breast.

Cellular Arrangement

In the present study, majority of the cases 48.9% (137 out of 280 cases) showed nuclear overriding irrespective of their cytological category (Table 6).

Masood et al et [1] observed that cellular arrangement was an influential feature. Mridha et al [5] study on 62 proliferative lesions, utilising Masood et al [1] scoring system observed that majority of the cases 41.9% (26 cases) showed nuclear overriding and clustering, 29% showed nuclear overriding, 27.4% showed loss of cell cohesion and only 1.6% showed monolayer arrangement of cells.

Frost et al [14] observed monolayer cellular arrangement in 46% cases of NPBD and 63% of PBD. Nuclear overlap with median score of 2 was seen in both NPBD and PBD.

Presence of Myoepithelial Cells

In the present study, 22.1% cases showed many myoepithelial cells, 31.1% cases showed moderate and 25.7% showed few myoepithelial cells. In 21.1% cases showed absence of myoepithelial cells (Table 7).

Mridha et al [5] study on 62 proliferative lesions, utilising Masood et scoring system observed that majority of the cases (33.9%) showed many myoepithelial cells, 20.9% showed moderate and 22.6% showed few myoepithelial cells. In remaining 22.6% cases showed absence of myoepithelial cells.

Masood et al et [1] observed that presence of myoepithelial cells was an influential feature in scoring of proliferative lesions. Sneige et al [6] studied proliferative lesions utilising Masood et system, found that presence of myoepithelial cells was a influential cytological feature.

Frost et al [14] applied criteria of myoepithelial cells within the epithelial groups and was assessed as presence or absence and were recognized as having spindled to ovoid nuclei that were smaller and darker that the epithelial cell nuclei. They found myoepithelial cells in 96% of NPBD and 91% of PBDs on air dried smears.

Cellular Pleomorphism

In the present study, majority of cases i.e. 124 out of 280 (44.3%) showed mild cellular pleomorphism, while 30.7% cases showed moderate cellular pleomorphism and 15.7% cases showed conspicuous cellular pleomorphism. In remaining 9.3% cases showed no cellular pleomorphism (Table 8).

Mridha et al [5] observed that, 51.6% cases with mild cellular pleomorphism, 30.6% showed moderate cellular pleomorphism, 14.5% showed conspicuous cellular

pleomorphism . Remaining 3.2% cases showed absence of cellular pleomorphism.

Frost et al [14] observed median score of 1.5 in NPBD and 2.0 in PBD on air dried smears.

Anisonucleosis

In the present study, majority of cases i.e.138 out of 280 (49.2%) showed mild anisonucleosis, 26.1% showed moderate anisonucleosis and 16.1% showed conspicuous anisonucleosis. In remaining 8.6% cases showed absence of anisonucleosis (Table 9).

Mridha et al [5] study observed majority of cases (50%) with mild anisonucleosis, 32.3% showed moderate anisonucleosis and 14.5% showed severe mild anisonucleosis. In remaining 3.2% cases there is no anisonucleosis seen.

Frost et al [14] observed nuclear pleomorphism with median score of 2.0 in NPBD and 3.25 in PBD.

Nucleoli

In the present study, 39.6% of the cases showed cells with rare micronucleoli, 17.1% with frequent micronucleoli, 23.6% with predominant macronucleoli, while in remaining 19.7% cases showed absence of nucleoli (Table 10). It was observed that cases with higher scores showed prominent, pleomorphoic nucleoli; while in lower scores nucleoli were indistinct or just noticeable. Thus the findings are in agreement with other studies.

Mridha et al [5] observed majority of cases (53.2%) had rare micronucleoli, 6.5% had frequent micronucleoli, 3.2% had had predominantly macronucleoli and remaining 37.1% had absence of nucleoli.

Masood et al[1] and Sneige et [6] al also observed that the appearance of nucleoli was one of the most influential cytological features. Frost et al [14] observed macronucleoli in 12% PBD compared to 58% in PBD with atypia.

Clumped Chromatin

In the present study, in 36.1% cases clumped chromatin seen rarely, in 23.6% cases occasional clumped chromatin seen and in 27.5% cases frequent clumped chromatin noted. In the remaining 12.8% cases chromatin was not clumped (Table 11).

Mridha et al [5] study observed 46.7% cases in which clumped chromatin seen rarely, in 32.3% occasional clumped chromatin seen and in 12.9% frequent clumped chromatin noted. In the remaining 8.1% chromatin was not clumped.

Masood et al [1] used multiple regression analysis to assess the significance of each of these six cytological features. They noted that every feature had a significant relation to the histological diagnosis. They also observed that the scoring system did not improve with exclusive of certain features or weighing others.

Categorization of Cases according to Total Score on Cytology

In the present study, Proliferative breast disease (PBD) comprising the maximum number of cases i.e. 148 out of 280 (52.8%), followed by carcinoma (96 cases) and Proliferative breast disease with atypia (24 cases). Remaining 12 cases were categorized as non -proliferative breast disease (NPBD) [Table 12].

Comparison of Correlation between Cytological Scoring Category and Histopathological Diagnosis:

The cytohistological correlation in the present study is compared with other previous studies.

In the present study, histopathology was available in 217 out of 280 neoplastic cases (Table 3). Therefore total 217 cases were studied for cytohistological correlation of neoplastic lesions (Table 13 & 14).

The overall cytohistological correlation of neoplastic lesions using cytological scoring system was found to be 94.5% (Table 13).

Out of 10 cases of NPBD on cytology, 8 (80%) cases were correlated with histopathological diagnosis and two (20%) were discordant and diagnosed as fibroadenoma (PBD) on histopathology.

Out of 112 cases categorised as PBD without atypia on cytology; 106 (94.6 %) cases were correlated with histopathological diagnosis, while 6 were discordant. Out of six discordant cases two (1.8%) were atypical ductal hyperplasia (PBD with atypia); and four (3.6%) were fibroadenosis (NPBD) on histopathology (Table 13 & 14).

Twenty cases were categorized as PBD with atypia on cytology, of which 16 (80%) were correlated with histopathological diagnosis and four cases (20%) were discordant [false negative] (Table 13 & 14). In discordant cases included two cases of ductal carcinoma in situ and one each case of mucinous carcinoma and lobular carcinoma.

In the present study a case of mucinous carcinoma was falsely categorized as proliferating breast disease with atypia (false negative) and not as carcinoma (Table 15). Cytologically mucinous carcinoma showed poor cell yield, abundant background mucin and usually inadequate aspirations [15]. Atypical cells in small solid aggregates, run single files and singly, cellular monomorphism and mild nuclear enlargement and pleomorphism [15.16]. Therefore mucinous carcinoma showed lower score than carcinoma.

A case of infiltrating lobular carcinoma (Figure 4) was falsely categorized as proliferating breast disease with atypia (false negative) (Table 15). Cytology of infiltrating

lobular carcinoma showed very poor cell yield. Cells arranged in single, in small clusters or short single files are common [17,18]. Individual cells had scanty indistinct cytoplasm, small dark nuclei with mild pleomorphism and hence lower score was obtained than carcinoma.

Two cases of ductal carcinoma in situ were falsely categorized as proliferating breast disease with atypia (false negative) and not as carcinoma. Cytology of these two cases of ductal carcinoma in situ showed lower score than carcinoma. Smears showed moderate cellularity, small sheets of cohesive cells, few single cells, nuclear overriding and clustering, mild to moderate nuclear atypia and absence of myoepithelial cells [11].

Out of seventy five cases of carcinoma categorized on cytology, all (100%) correlated with histopathological diagnoses as carcinoma (Table 13 & 14, Figure 9 & 10). In the present study 94.5% concordance was observed between cytological scoring by Modified Masood et al and histopathological diagnosis (Table 17).

Mridha et al [5] observed 75.8% (47/62 cases) concordance between histological diagnosis and modified Masood et al scoring system.

Masood et al [1] observed high degree of concordance between the cytological scoring system and the histological diagnosis.

Sneige et al [6] found 73.3% concordance between Masood et al cytological scoring category and histological diagnosis. They observed 63.6% concordance in DCIS cases, 77.8% in atypical ductal hyperplasia and 80% in usual ductal hyperplasia.

Frost et al [14]observed cytohistologic correlation was in 58% of NPBD, 47% of PBD, and 82% of PBDA/DCIS cases. Only low and intermediate grade DCIS were misclassified cytologically.

Thomas et al [19] found 53 diagnoses of PBD with or without atypia and 34 were excised. Nine of the 10 (90%) aspirates designated as PBD without atypia were in agreement with histological findings. The other case was nonproliferative. Fifteen of the 24 cases diagnosed as PBD with atypia were in concordance with histological findings (63%), one was nonproliferative, seven were PBD without atypia (29%), and one (4%) proved to be carcinoma.

The sensitivity of breast FNAC ranges from 90-95% and positive predictive value of a malignant diagnosis is approximately 99% [36]. In the present study inadequacy rate of FNAC was 5.7%. Previous studies have shown the percentage of inadequate material to vary between 5-30 [2,3,8].

In the present study, sensitivity of cytological scoring system was 94.9 % and specificity was 100%, positive predictive value was 100%, negative predictive value was 97.1% and diagnostic accuracy was 98.1%(Table 18).

Palombini et al [3] observed sensitivity of FNAC of breast lesions was 95.7%, specificity was 89.6%. Positive predictive value was 95.9% and diagnostic accuracy of FNAC was 94%.

Zajdela et al [7] observed sensitivity of FNAC of breast lesions was 91.9%, specificity was 95.8%. Positive predictive value was 97.4% and diagnostic accuracy of FNAC was 93.3%.

Wollenberg et al [8] observed diagnostic accuracy of FNAC of breast lesions. They observed sensitivity was 65%, specificity was 100%, positive predictive value was 89.6% and overall diagnostic accuracy was 91.3%.

It was found that in cases with cytodiagnosis of fibroadenoma, proliferative breast disease without atypia and carcinoma, scoring system offered no advantage over cytomorphology. The scoring system was useful in aspirates with cytological diagnosis of proliferative breast disease with atypia, as it helped in separating out a proportion of non-atypical cases, improving the diagnostic efficiency in subsequent biopsy.

Summary and Conclusion

The present study was carried out to study spectrum of lesions of the breast, assess feasibility of cytological scoring system on proliferative lesions of the breast and to determine to what extent histological diagnosis can be predicted by preoperative cytological scoring. The youngest patient was 16 years and oldest patient was 72 years old. Proliferative breast diseases were common in 2nd to 3rd decade of life, whereas carcinomas were common in 5th to 6th decade of life. Lesions of the breast were found more frequently in the left breast (51.2%) than in right breast (46.4%). Incidence of carcinoma was common in upper outer quadrant (52.1%). Proliferative breast disease (PBD) comprised the maximum number of cases i.e. 148 out of 280 (52.8%), followed by carcinoma (96 cases), Proliferative breast disease with atypia (24 cases) and non -proliferative breast disease (12 cases). Out of 217 cases, correlation between cytological scoring category and histological diagnosis was found to be 94.5%. Histological diagnosis was predicted accurately on FNAC in 80% of nonproliferative lesions, 94.6% of proliferative lesions without atypia, 80% of proliferative lesions with atypia and 100% of carcinoma cases. Sensitivity of cytological scoring system was 94.9 % and specificity was 100%, positive predictive value was 100%, negative predictive value was 97.1% and diagnostic accuracy was 98.17%. FNAC is accepted as most sensitive, specific, accurate, safe and cost effective for diagnosing lesions of breast preoperatively and avoiding unnecessary surgical interventions like diagnostic excision or incisional biopsy. Most of our findings are correlating with other previous studies.

Scoring system should be applied in a stepwise manner after cytodiagnosis (cytomorphological assessment). In cases with cytological diagnosis of fibroadenoma, proliferative breast disease without atypia and carcinoma, scoring system offered no advantage over cytomorphology. The scoring system was useful in aspirates with cytodiagnosis of proliferative breast disease with atypia, as it helped in separating out a proportion of non-atypical cases, improving the diagnostic efficiency in subsequent biopsy. As cytological scoring is easy to assess, accurate and reproducible, it should be included in FNAC reports of all proliferative breast lesions.

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