Original Research Article

Study of breast lesions in cytology and its histopathological correlation

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ABSTRACT

Background: Breast cancer is commonly diagnosed malignancy in females and is leading cause of death. Malignant lesions mostly occur after menopause. Fine needle aspiration cytology is minimally invasive technique, used in triple test and produces speedy results. It can able to differentiate between benign and malignant lesions of breast lump. Our study aims to categorize the breast lesion and to correlate FNAC with histopathological studies.
Methods: This retrospective study was done in department of pathology from July 2021 to May 2023.107 cases were undergone FNAC and slides were examined and lesions were categorized. Tissue biopsies were obtained, processed and histological sections were made and examined. The FNAC findings were correlated and analyzed with histological findings.
Results: Right breast lesions (55%) were more in our study than left breast lesions (42%). Totally 77 cases were diagnosed as benign lesions by FNAC of which 37 cases were biopsied and histological diagnosis of all cases shown as benign category. 6 cases were diagnosed as proliferative breast disease with atypia of which only one case was received for biopsy and diagnosed as atypical ductal hyperplasia. 12 cases were diagnosed as malignancy and 6 biopsies were received with 5 cases were diagnosed as malignant lesions. Sensitivity and Specificity of FNAC in breast lesions were 100% and 97.43% respectively.
Conclusions: FNAC is rapid and valuable tool with high sensitivity, specificity and low false positivity. It is useful in preoperative evaluation and avoids unnecessary surgical intervention.

Keywords: Fibroadenoma, FNAC, Invasive ductal carcinoma, Triple test, Yokohama reporting system

INTRODUCTION

Most commonly diagnosed cancer in females is breast cancer and is the leading cause of death worldwide.[1] Breast cancer constitutes around 11.6% of cancers and overall it is the second most common cancer.[2] Breast lesions are common in younger age group with incidence peaks at fourth and fifth decades. Malignant lesions commonly occur after menopause. Breast lump is a common diagnostic challenge among surgeons, so it is essential to differentiate benign and malignant breast lesions by a pathologist.

Fine needle aspiration cytology technique is simple, inexpensive, minimally invasive and produces speedy result. Roussel et al in 1989 showed Needle track seeding of cancer cells is low, when 22gauge needles are used for aspiration.[3] FNAC aids in distinguishing benign from malignant lesions and plays a role in Triple test along with physical examination and radiological imaging. Most countries use FNAC as first-line pathological investigation in both screening and in symptomatic patients.[4] If FNAC is combined with cell block preparations, it yield more diagnostic accuracy, especially in resource limited settings.[5]

Cytological assessment prevents unnecessary biopsy in most of the cases. FNAC do not form a definitive diagnosis in all cases but categorization of disease and differential diagnosis are possible. For this, histopathological examination of breast lesion from tissue biopsy is required for correlation and adequate diagnosis and proper management. Present study aimed to categorize the breast lesion and to study the accuracy and correlation of FNAC with histopathological findings.

METHODS

This is a retrospective study done in department of Pathology, Government Ramanathapuram medical college and Hospital. The study was done for a period of two years from July 2021 to May 2023. Patients of 10 to 100 age group and both sexes, who presented with complaints of palpable breast swelling with or without nipple discharge, ill-defined swelling and pain as requested by the surgeon were included in the study. Patients on neoadjuvant chemotherapy, recurrence of tumors following previous surgeries/chemoradiotherapy and metastatic cancer to the breast were excluded from the study.

FNAC was done for 107 cases with various breast lesions using 23 G needle, fixed to 5ml syringe. After aspiration, material was expressed on clean 2 to 3 glass slides and smeared gently. The smeared slides were fixed immediately in 99% isopropyl alcohol in coplin jar and stained with Hematoxylin and Eosin. If fluid was aspirated, sediment was smeared and then stained with H&E. For inadequate smears, FNAC was repeated one more time. The radiological findings were noted. Stained slides were examined under light microscope. The lesions are categorized according to IAC Yokohama reporting system. The categories are: C1-Insufficient, C2-Benign, C3-Atypical, C4-Suspicious of malignancy, C5 – Malignancy.

Biopsies obtained were fixed in overnight 10% formalin. Then the tissues were grossed and representative areas were taken and processed through automatic tissue processor and finally sections were made on glass slides. The slides were stained with H&E and findings were observed through light microscope. The microscopic findings of FNAC were correlated with the histopathological findings and were recorded. Statistical analysis was done.

RESULTS

The maximum number of cases diagnosed as benign lesions by FNAC were belonged to 10 to 40 years age group and malignant cases were seen in above 40 years of age (Table 1). In our study, the right sided breast lesions were seen in 55% of cases, left sided breast lesions were seen in 42% of cases and bilateral breast lesions were seen in 3% of cases (Figure 1).
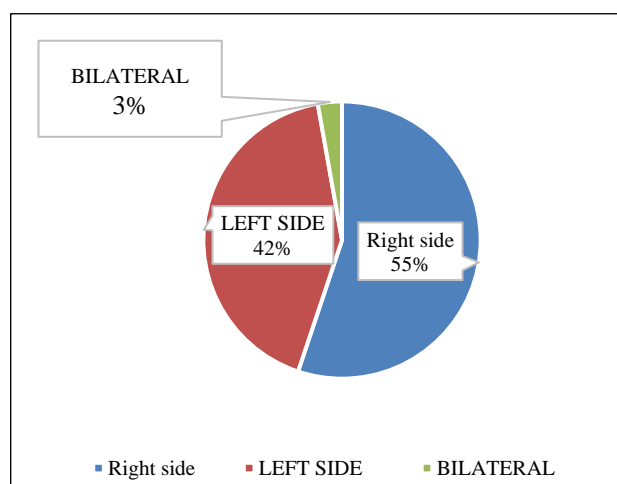

Figure 1: Side wise distribution of breast lesions.

Table 1: FNAC results (Yokohama categorization) - age wise distribution.

Age group (in years)	Inadequate	Benign	Atypical	Suspicious for malignancy	Malignancy
10-20	00	11	0	00	00
21-30	02	17	0	00	00
31-40	01	18	01	00	00
41-50	03	16	04	01	02
51-60	03	04	02	03	06
61-70	03	04	00	02	02
71-80	00	00	00	00	01
81-90	00	00	00	00	00
91-100	00	00	00	00	01

The number of cases diagnosed as benign category by FNAC were 77 of which 37 cases were biopsied with all cases showing as benign lesions on histological examination. 6 cases were reported as proliferative breast disease with atypia on cytology, of which only one case was biopsied and reported as atypical ductal hyperplasia. 12 cases were diagnosed as malignancy by FNAC of which 6 biopsies were received of which 5 cases were reported as malignant lesions of breast (Table 2).

Table 2: Categorization of breast lesions according to IAC Yokohama reporting system.

Cytological category	FNAC result	No of cases	%	No of cases biopsied	Histopathological examination
C1 (insufficient)	Inadequate	6	5.60	2	Invasive ductal carcinoma (1) Granulomatous mastitis (1)
C2 (benign)	Fibroadenoma	26	24.29	20	Fibroadenoma (20)
	Lipoma	12	11.21	3	Lipoma (1) Fibroadenoma (2)
	Mastitis	6	5.60	3	Fibroadenoma (1) Mastitis (2)
	Gynecomastia	3	2.80	-	-
	Fibrocystic breast disease	11	10.28	5	Fibrocystic breast disease (5)
	Cystic lesion	4	3.73	1	Fibrocystic breast disease (1)
	Breast abscess	2	1.86	-	-
	Proliferative breast disease without atypia	11	10.28	5	Fibroadenoma (4) Benign breast lesion (1)
	Fibroadenosis	2	1.86	-	-
C3 (atypical)	Proliferative breast disease with atypia	6	5.60	1	Atypical ductal hyperplasia (1)
C4 (suspicious for malignancy)	Suspicious for malignancy	06	5.60	06	Invasive ductal carcinoma (6)
C5 (malignancy)	Ductal carcinoma (11) Papillary carcinoma (1)	12	11.21	06	Invasive ductal carcinoma (4) Invasive papillary carcinoma (1) Fibroadenoma (1)
Total		107		52	

Table 3: Cytology-histopathology correlations of breast lesion.

	Histopathological diagnosis		Total
Cytological diagnosis	Malignant lesions	Benign lesions	
Malignant lesions	11 (TP)	1 (FP)	12
Benign lesions	0 (FN)	38(TN)	38
Total	11	39	50

Table 4: Statistical comparison with previous studies.

Authors	Year	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Srilakshmi et al	2013	95.2	100	100	95.2
Ariga et al	2002	99	99	99	99
Agarwal et al	2015	89.5	100	100	94.2
Hebbar et al	2013	93.1	100	100	90.4
Mahajan et al	2013	96.77	98.66	96.77	98.6
Our study	2023	100	97.43	91.67	100

In our study (Table 3), out of 12 cases, 11 cases were diagnosed as malignant lesions in both cytology and histopathology (true positives) and out of 38 cases, all were diagnosed as benign lesions in both (true negatives). The sensitivity of our study is 100%, specificity is 97.43%, positive predictive value is 91.67% and negative predictive value is 100% (Table 4).

The number of cases with inadequate aspirates were 6. This was due to repeatedly aspirated smears were hemorrhagic on first pass itself due to increased vascularity of the lesions or due to technical errors in smear preparation.

FNAC smears in fibroadenoma breast by routine H&E staining show uniform tight cohesive clusters of benign ductal epithelial cells, myoepithelial cells and many bare bipolar nuclei in the background (Figure 2).
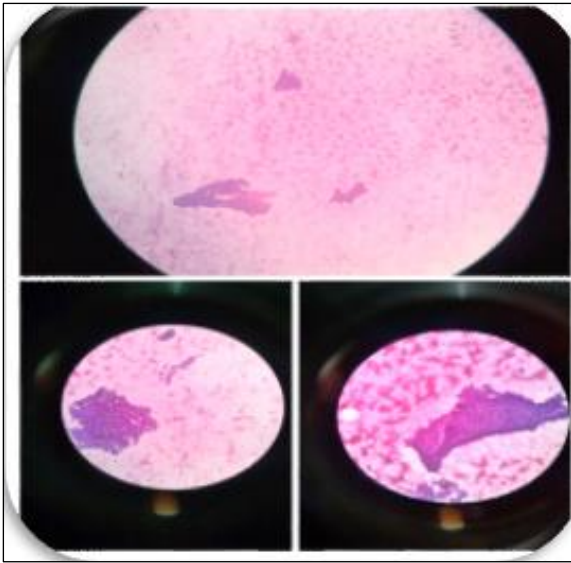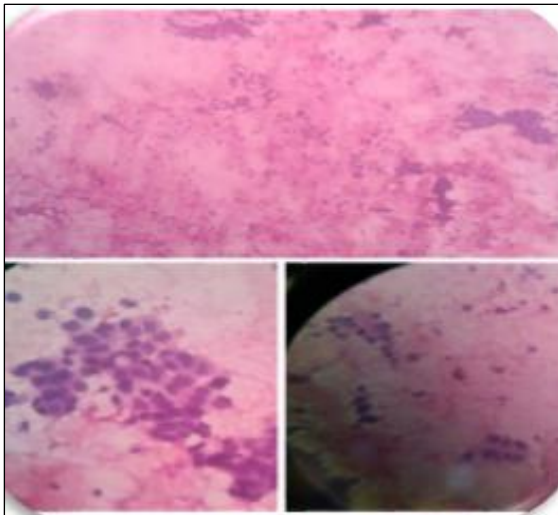
Figure 2: Cytology, H and E- Fibroadenoma.

Figure 3: Cytology, H and E- ductal carcinoma breast.
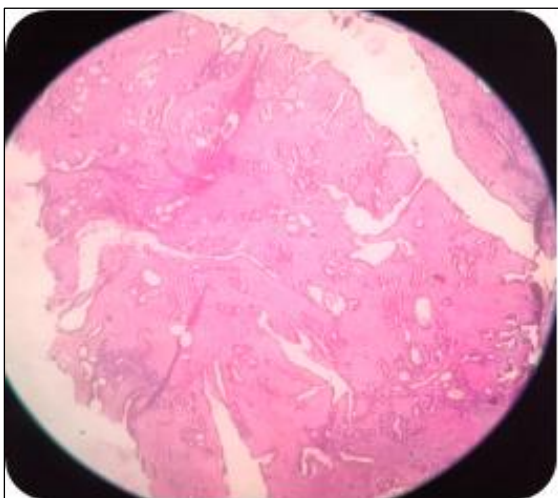

Figure 4: HPE- H and E- 10X Fibroadenoma.

The Invasive breast carcinoma cases show dyscohesive and singles of atypical cells with pleomorphic, hyperchromatic nuclei and eosinophilic cytoplasm (Figure 3). Histopathology of fibroadenoma shows benign ductal and myoepithelial cells arranged in pericanalicular and intracanalicular patterns in a cellular myxoid stroma (Figure 4). Tumor cells in Invasive papillary carcinoma are arranged in papillary pattern with fibrovascular core exhibiting cytological atypia and stratification (Figure 5). Invasive carcinoma breast biopsy shows tumor cells arranged in tubules, cords without myoepithelial cells and invading the stroma (Figure 6).
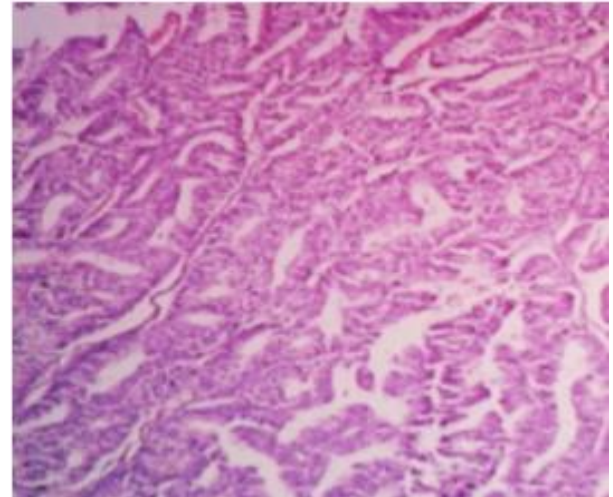

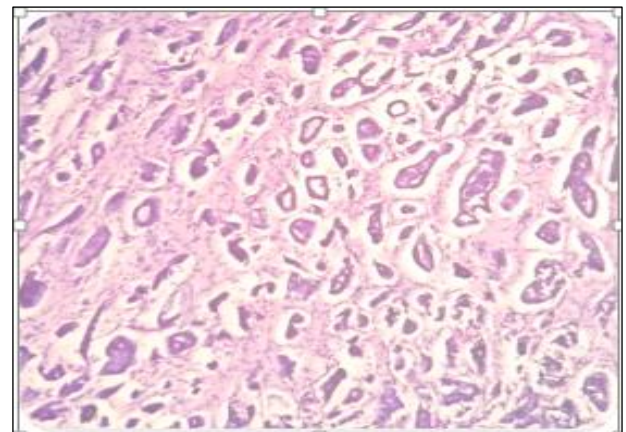**Figure 5: HPE, H and E- 40X- Invasive papillary carcinoma.**

Figure 6: HPE- H and E- 40X- Invasive carcinoma breast NST.

DISCUSSION

The incidence of breast cancer has increased worldwide due to advancement in screening, diagnosis and lifestyle changes of women.[6] Early diagnosis can decrease the mortality of breast cancer around 18-29%.[7] Fine needle aspiration cytology of palpable breast lump is an established and well accepted diagnostic tool with high

degree of accuracy in determining the benign or malignant breast lesion.[8] The goal of present study is to assess the diagnostic accuracy of FNAC in breast lesions by doing cytology- histopathology correlation.

In our study, Fibroadenoma was the most common benign lesion of breast which is in agreement with Dominguez et al, Tiwari, Qasim et al, Srikanth, Yalavarthi et al and Risaldar et al.[9-13,17] In the present study, majority of benign lesions of the breast were seen within the age bracket of 10 to 40 years (Table 1), which is in agreement with Rocha et al (14-40 years) and Khemka et al (15-44 years).[14,15] In contrast to our study result, MacIntosh et al had majority of benign breast lesions within the age group of 27-77 years in his study.[16] In our study, the most common malignant lesion of breast was Infiltrating ductal carcinoma (94%), which is in agreement with studies done by Risaldar et al and Srikanth et al.[17,12]

In our study, the distribution of breast lesions (Figure 1) were more in the right breast (55%) when compared to left breast (42%), which is in agreement with studies done by Srikanth et al and Rupom et al.[12,18] In contrast to our results, left side breast lesions were more common in studies done by Risaldar et al, Meena et al, Reddy et al and Clegg-Lamptey et al.[17,19-21]

In the present study, the malignant lesions were in the age bracket of 41-70 years, which is in agreement with other studies like Risaldar et al (30-70 years), Khemka et al (35-84 years), Srikanth et al (31-70 years) and Rocha et al (41-75 years).[17,15,12,14] The results suggests that the breast cancers can occur as early as 4th decade of life.

One case of inadequate smear in FNAC was reported as Invasive ductal carcinoma in histopathology. This was due to FNAC was not taken in representative areas.

According to statistical analysis, there is excellent correlation of almost 98.07% between cytology and histopathology which is in agreement with studies done by Rupom et al and Chiemchanya et al.[18,22] The sensitivity of FNAC in breast lesions was 100%, which is in agreement with studies done by Ibikunle DE et al and Ariga et al.[23,24]

The specificity of FNAC in breast lesions is 97.43%, which is in agreement with study done by Sankaye et al.[25] The positive predictive value in our study was 91.67%. Srilakshmi et al, Agarwal et al had PPV of 100% in their study.[26,27] Mahajan et al in his study had a PPV of 96.77%.[28]

There are some difficulties and limitations that need to be mentioned about FNAC. Both false negative and false positive results can occur. The most significant difficulty in making a diagnosis is the overlapping features of different lesions.

CONCLUSION

The results of our study proves that the FNAC is a rapid, accurate and valuable tool in diagnosis of breast lesions, as it has high rate of specificity, sensitivity and low rate of false positivity, false negativity. It is helpful in preoperative evaluation of breast lesions and deciding further management, so that we can avoid unnecessary surgical intervention.

REFERENCES

1. Bray F, Ferlay J, Soerjomataram I, et al. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2018;68(6):394-424.
2. Work ME, Andrulis IL, John EM, Hopper JL, Liao Y, Zhang FF, et al. Risk factors for uncommon histologic subtypes of breast cancer using centralized pathology review in the Breast Cancer Family Registry. Breast Cancer Res Treat. 2012;134(3):1209-20.
3. Roussel F, Dalion J, Benozio M. The risk of tumoral seeding in needle biopsies. Acta Cytol. 1989;33:936-9.
4. Kocjan G, Bourgain C, Fassina A, Hagmar B, Herbert A, Kapila K, Kardum-Skelin I, Kloboves-Prevodnik V, Krishnamurthy S, Koutselini H, Majak B. The role of breast FNAC in diagnosis and clinical management: a survey of current practice. Cytopathol. 2008;19(5):271-8.
5. Basnet S, Talwar OP. Role of cell block preparation in neoplastic lesions. J Pathol Nepal. 2012;2(4):272-6.
6. Siddegowda MS, Ara T. Correlation of fine needle aspiration cytology with histopathology of malignant breast lesions in a tertiary care hospital-Mandya. J Evid Based Med Healthc. 2019;6(41):2697-701.
7. Balasundaram, Nilavazhagan A. Comparative study with clinico-pathological correlation between ultrasonography, mammography and fine needle aspiration cytology in evaluation of breast lumps in coastal population of Karaikal. IAIM. 2019;6(9):21–7.
8. Begum F, Kumar PR. Diagnostic correlation of palpable breast masses by cytology and

histopathology: A prospective study. IAIM. 2018;5(11):44-9.

9. Domínguez F, Riera JR, Tojo S, Junco P. Fine needle aspiration of breast masses. An analysis of 1,398 patients in a community hospital. Acta Cytol. 1997;41(2):341-7.

10. Tiwari M. Role of fine needle aspiration cytology in diagnosis of breast lumps. Kathmandu Univ Med J (KUMJ). 2007;5(2):215-7.

11. Qasim M, Ali J, Akbar SA, Mustafa S. Lump breast: Role of FNAC in diagnosis. Prof Med J. 2009;16:235-8.

12. Srikanth S. Cytological and histopathological correlation of breast lesions –a study of one hundred cases. Indian J Pathol Oncol. 2017;4(2):273-7.

13. Yalavarthi S, Tanikella R, Prabhala S, Tallam US. Histopathological and cytological correlation of tumors of breast. Med J Dr DY Patil Univ. 2014;7(3):326-31.

14. Rocha PD, Nadkarni NS, Menezes S. Fine needle aspiration biopsy of breast lesions and histopathologic correlation. Acta Cytologica. 1997;41(3):705-12.

15. Khemka A, Chakrabarti N, Shah S, Patel V. Palpable breast lumps: Fine-needle aspiration cytology versus histopathology: A correlation of diagnostic accuracy. Internet J Surg. 2009;18:1.

16. MacIntosh RF, Merrimen JL, Barnes PJ. Application of the Probabilistic Approach to Reporting Breast Fine Needle Aspiration in Males. Acta Cytologica. 2008;52(5):530-4.

17. Risaldar AA, Begum Z, Alvi U. Correlation of FNAC with Histopathology of breast lesions. IP J Diagn Pathol Oncol. 2020;5(4):375-380.

18. Rupom TU, Choudhury T, Banu SG. Study of fine needle aspiration cytology of breast lump: correlation of cytologically malignant cases with their histological findings. Bangabandhu Sheikh Mujib Med Univ J. 2011;4(2):60-4.

19. Meena SP, Hemrajani DK, Joshi N. A comparative and evaluative study of cytological and histological grading system profile in malignant neoplasm of breast - An important prognostic factor. Indian J Pathol Microbiol. 2006;49:199.

20. Reddy DG, Reddy CRR. Carcinoma of the breast, its incidence and histological variants among South Indians. Indian J Med Sci. 1958;12(4):228–34.

21. Clegg-Lamptey J, Hodasi W. A study of breast cancer in korle bu teaching hospital: Assessing the impact of health education. Ghana Med J. 2007;41(2):72-7.

22. Chiemchanya S, Mostafa MG. Fine needle aspiration cytology in the diagnosis of breast lump. J Bangladesh Coll Physicians Surg. 2000;18:61-5.

23. Ibikunle DE, Omotayo JA, Ariyibi OO. Fine needle aspiration cytology of breast lumps with histopathologic correlation in Owo, Ondo State, Nigeria: a five-year review. Ghana Med J. 2017;51(1):1-5.

24. Ariga RI, Bloom K, Reddy VB, Kluskens L, Francescatti D, Dowlat K, et al. Fine needle aspiration of clinically suspicious palpable breast masses with histopathological correlation. Am J Surg. 2002;184 (5):410-3.

25. Sankaye SB, Dongre SD. Cytological study of palpable breast lumps presenting in an Indian rural setup. Indian J Med Paediatric Oncol. 2014;35(2):159-64.

26. Shrilakshmi HP, Chavda JA. Study of cytohistologic correlation of breast lesions. Nat J Integra Res Medi. 2013;4(2):54-6.

27. Agarwal R, Mohan N, Sharan J, Gupta G, Kumar P. Spectrum of breast diseases with cyto–histopathological correlation in a tertiary care hospital of Western Uttar Pradesh. Indian J Pathol Oncol. 2017;4(1):1-7.

28. Mahajan N A, Bhale CP, Mulay SS. Fine needle aspiration cytology of breast lesions and correlation with histopathology- A 2 year study. Int J Health Sci Res. 2013;3(2):55-65.