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Original Research Article

Analysis of Breast FNAC Based on IAC Yokohama System at a Tertiary Care Centre in South India

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Abstract:

In 2020, 2.3 million women were diagnosed with breast cancer and 685 000 deaths occurred globally. There were 7.8 million women alive who were diagnosed with breast cancer in the last 5 years, making it the world's most prevalent cancer. Breast cancer occurs in every country of the world in women at any age after puberty but with increasing rates in later life. Recently, the International Academy of Cytology (IAC) has proposed a new reporting system for breast fine needle aspiration (FNA) cytology.

Objectives: We aimed to categorize our breast FNA samples according to IAC system and assess the risk of malignancy (ROM) as well as the diagnostic yield of breast FNAC.

Materials and Methods: This is a Retrospective study carried out in the Department of Pathology, Vinayaka Missions Kirupananda Variyar Medical College & Hospitals, Salem, Tamil Nadu. All Patients with palpable breast lesions who underwent FNAC and excision during the 2 years (June 2019 to June 2021) were included in the study.

Results: A total of 936 FNAC of breast samples were received. Patient's age group varied from 14 to 82 yrs. But only 676 cases had histopathology correlation. Out of which, 6 were males and 670 were females. These 676 samples were categorized by the new IAC system. The Risk of malignancy for each category was 0% for category 1 (insufficient), 0% for category 2 (benign), 5% for category 3 (atypical), 85% for category 4 (suspicious for malignancy) and 99% for category 5 (Malignant).

Conclusion: Structured reporting helps in improving the quality, clarity and reproducibility of reports across departments, cities, countries and internationally. Linking cytology reporting to management algorithms will enhance the clinician's use of FNAB cytology and where appropriate core biopsy is needed.

Keywords: Breast cancer, IAC system, Risk of Malignancy.

Introduction

Breast cancer has overtaken cervical cancer in India with age adjusted rate being 25.8 per 100,000 women population and mortality rate of 12.7 per 100,000 women population. [1,2] With the advent of triple testing for breast malignancies, FNAC has become an integral part of the evaluation of breast lesions especially in low income countries. Triple testing includes breast clinical examination, mammography/ultrasonography, and cytology FNAC/ Core needle biopsy (CNB). [3]

FNAC is a simple, painless, inexpensive OPD procedure with speedy results varying from 1 to 2 hrs. One of the major goals of Breast FNAC is to differentiate benign from malignant lesions thereby helping the clinicians to decide the modality of treatment. Differentiation is not possible in all cases due to significant overlap of the cytomorphologic features of both benign and malignant breast lesions. Untill 2015, there is no unique coding system for categorization of breast fnab and also terminologies used by pathologists were definitely confusing among clinicians and their approaches also significantly varies. To solve this, In 2016, the International Academy of Cytology (IAC) established a "Breast Group" which included pathologists, radiologists, surgeons, and oncologists mainly to produce comprehensive and standardised guidelines for breast FNAC reporting. The IAC Yokohama System for Reporting Breast Cytopathology includes the indications, FNAC technique, smear making and material handling, a reproducible standardised reporting system, the use of ancillary diagnostic and prognostic tests and correlation with clinical work-up algorithms. Hence, this will facilitate

clinician's understanding and use of FNAC in breast pathology. [4]

This IAC Yokohama System defines five categories for reporting breast cytology, each with a clear descriptive term, definition, risk of malignancy (ROM) and a suggested management algorithm. These categories will serve as a common language between the clinician and the pathologist and thereby improves better patient care.[5] Hence this study is aimed to classify the breast fine needle aspiration cytology samples according to IAC YOKOHAMA system, to assess the diagnostic accuracy, sensitivity and specificity of breast FNAC and to calculate Risk of malignancy (ROM)for each category.

Materials and Methods

This Retrospective study was carried out in the department of Pathology, Vinayaka Missions Kirupananda Variyar Medical College & hospitals, Salem, Tamil Nadu. All Patients with palpable breast lesions who underwent FNAB and excision during the 2 years (June 2019 to June 2021) were included in the study.

Inclusion Criteria: All breast FNAC specimens (both blind and image guided) received in the cytopathology section.

Exclusion Criteria: Patients who did not undergo surgical excision were excluded from the study.

The clinical notes of all cases will be reviewed for the following data: age, mode of presentation and family history.

FNAC was done by using 5 cc syringes with 22-23G needle under aseptic precautions. Air dried smears were stained with Giemsa stain and wet smears were stained with H& E and PAP stain. H and E stain was done for histopathology slides.

IAC have categorized the breast lesion into C1 to C5 (C for Code).

- C1-Insufficient material
- C2-Benign
- C3-Atypical probably benign
- C4-Suspicious, probably in situ or invasive carcinoma
- C5-Malignant

ROM (Risk of malignancy) will be calculated for each category using the formula: number of confirmed cases/the total number of cases in the defined category.

Statistical Methods

Data will be entered in MS Excel Sheet and will be analysed using SPSS Version 16.0. Standard descriptive analysis will be performed. Sensitivity, specificity, PPV, NPV and diagnostic accuracy will be calculated using histopathology diagnosis as gold standard.

Results

All the fine needle aspirations in our department are done by experienced pathologists and USG guided Fnac were done by radiologists. Smears are processed and analysed by two pathologists blindly. Results are put into categories defined by IAC system. A total of 936 fnac of breast samples were received. Patient's age group varied from 14 to 82 yrs. But only 676 cases have histopathology correlation. Out of which is 6 males and 670 females. These 676 samples were categorized by the new IAC system as in table (1).

Histopathology specimens of these cases were analysed and correlated with FNAC findings [table 3]. The Risk of malignancy for each category was 0% for category 1 (insufficient), 0% for category 2 (benign), 5% for category 3 (atypical), 85% for category 4 (suspicious for malignancy) and 99% for category 5 (Malignant) [Table-4]. Sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy were respectively as 97.67%, 99.6%, 94.56%, 93.33% and 96.60%.

All the C5 (94 cases) lesions had follow-up. Histological grading was done using Elston and Ellis modified Bloom–Richardson grading system and we found that most of the cases were in moderately differentiated grade 78% followed by poorly differentiated in 12% cases and well-differentiated in 10 % cases.

Table 1: Case Distribution as Per IAC Category

S. No	Category	No of Cases	Percentage
1	Insufficient	21	3.1%
2	Benign	461	68.1%
3	Atypical	60	8.8%
4	Suspicious	40	5.9%
5	Malignant	94	13.9%
6	Total	676	100%

Table 2: FNAC & Histopathology Correlation

Category	Benign							Malignant	
Insuffi-cient	Inflam-matory Lesions	Fibroade-noma	Fibro-cystic Breast Disease	Phyl-loides	Lacta-tional Chang-es	Gynae-comastia	Epithe-lial Hyper-plasia	Insi-tu	Ca
Benign (461)	22	258	165	7	3	6			
Atypical (60)		5	35	3			15	1	2
Suspicious (40)							2	13	25
Malignant (94)							4	15	75
Total								29	102

Table 3: Distribution of Atypical & Suspicious Cases Confirmed By HPE

Category	Benign	Epithelial Hyperplasia	Insitu Carcinoma	Malignant
C1	1	3	-	-
C2-461	461	-	-	
C3-60	42	15	1	2
C4-40	-	6	13	21
C5-94		2	4	88

Table 4: Risk of Malignancy

Category	ROM
Insufficient	0
Benign	0
Atypical	5%
Suspicious	85%
Malignant	99%
Total	

Table 5: Distribution of Lesions between Various Studies Using IAC System

Studies	C1	C2	C3	C4	C5
Hemalatha et. al.	18%	31.2	12	13.4	25.4
Tikku et. al.	2.8	28.3	32.7	5.6	30.8
Arul et. al.	2.7	67.3	5.2	7.8	17
Singh et. al.	5	51	2	3	39
Chauhan et. al.	4.9	73.07	1.5	2.35	18.16
Montezuma et. al.	5.7	73.38	13.7	1.57	5.54
Panwar et. al.	1.3	82.6	5.7	1.7	8.4
Present Study	3.1	68	8.8	5.9	13.9

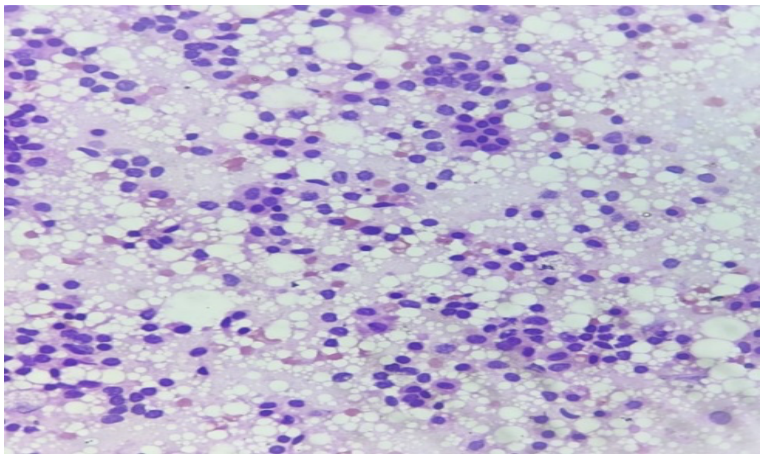

Figure 1: Category 3[atypical] Scattered polygonal to round cells with moderate eosinophilic granular cytoplasm and round nucleus. Mild nuclear atypia was noted. HPE showed lactating adenoma

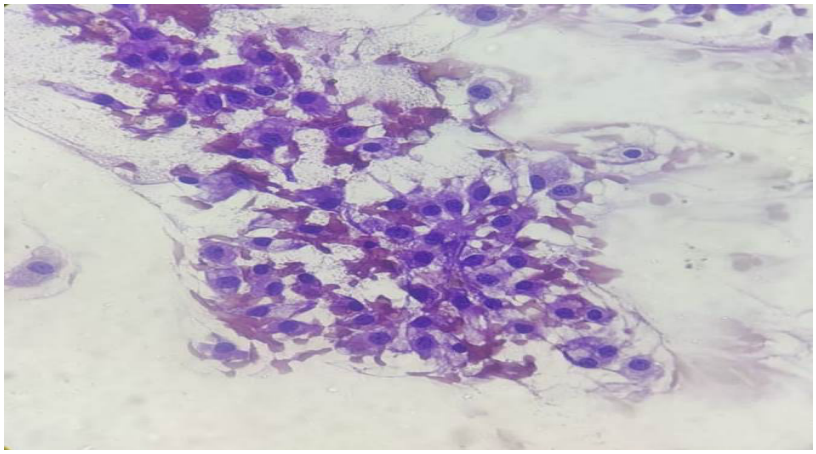

Figure 2: Category 3[atpical]: Sheets of apocrine cells showing mild atypia later HPE showed fibrocystic disease with apocrine metaplasia

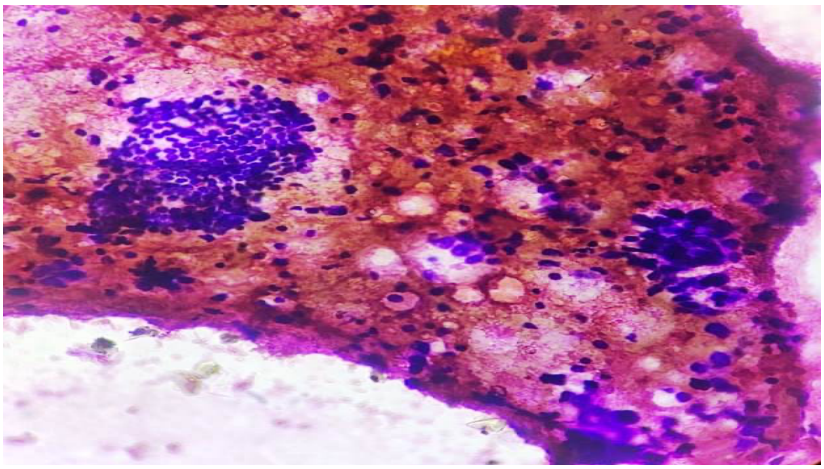

Figure 3: Category 4[suspicious]: mixed population of benign and atypical cell clusters.Core biopsy confirmed malignancy

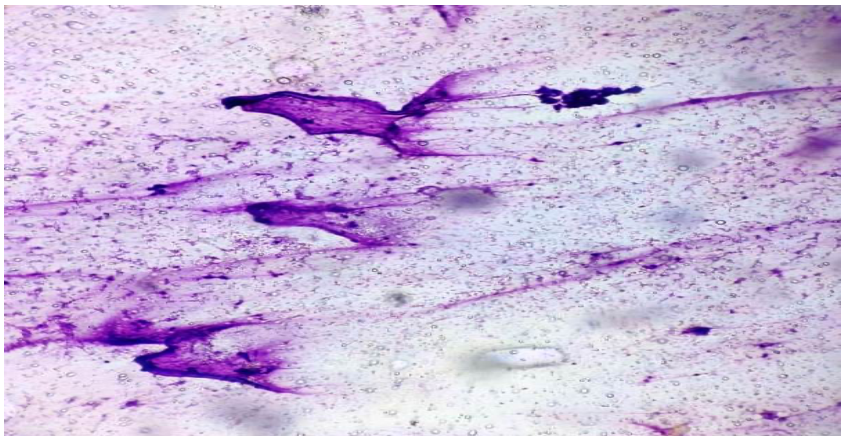

Figure 4: Category 4 [suspicious]-Scanty atypical cells in a mucinous background. HPE showed mucinous carcinoma

Discussion

The technique and diagnostic interpretation Of fine needle aspiration cytology has developed over the years into an extremely useful, accurate, highly specific, sensitive, and cost-effective method for the diagnosis of benign and malignant breast lesions [5,6]. FNAC has been readily accepted by patients and clinicians as a minimally invasive, cost-effective and valuable tool for diagnosis and management.

Breast FNAC can attain a sensitivity of 90–99% and a positive predictive value (PPV) of malignancy approaching 100%. In medically under-resourced developing countries, which

represent more than 80% of the world's population, breast is one of the most common FNAC sites and FNAC is the most appropriate test for all palpable breast lesions where preoperative imaging, core needle biopsy (CNB) and histopathology are not readily available .The IAC Yokohama Breast FNAC Reporting System has been developed by a group of experts in the field of cytopathology assisted by oncologists, radiologists and surgeons. The reporting system is based on a review of the literature and the expertise of the IAC breast group. The rationale for the development of this international reporting system is to have a standardized reporting system, which will improve the performance, interpretation and reporting of breast FNAC cytology and clarify communication between cytopathologists and clinicians by linking the reporting system with suggested management options. Ultimately, the system will benefit patient care and facilitate research and the ongoing utilization of FNAC breast cytology. The system and the suggested management algorithms have been designed to be applicable in all medical infrastructure settings.[6,7]

FNAC offers significant benefits as a diagnostic test with its rapidity of diagnosis, low cost, high rate of acceptance by patients, low complication rates, virtually no contra-indications and high accuracy.[8] Even in practice where CNB is available an generally preferred, FNAC still offers advantages and is preferred for specific clinical situations like Confirmation and drainage of cystic lesions, Diagnosis of infections/abscesses and to procure material for microbiological studies, Difficult to biopsy lesions such as those that are retroareolar or close to the chest wall or prosthetic implants, Possible recurrences in reconstructed breasts, Diagnosis of palpable lesions that lack an imaging abnormality, Lesions where ROSE is required prior to possible CNB, Patients who are pregnant or lactating, Patients taking anti-coagulants or with a history of bleeding diatheses, Patients considered at low risk on clinical and imaging findings, where the FNAC provides the final diagnosis with the triple test , to provide a malignant diagnosis and material for ER, PR and HER2 testing in patients with advanced carcinoma or metastatic disease.

FNAC can also be readily performed on axillary lymph nodes found on palpation or ultrasound examination, with or without CNB where required. The FNAC can thus stage a patient with breast carcinoma providing a significant cost benefit over a sentinel lymph node biopsy, which can still be performed if the FNAC is negative.[3] IAC standardized reporting includes five categories from C1 to C5. Inadequate degree of cellularity of the epithelial cells comes under C1. In our study, 3.1% cases had inadequate aspirate and were placed in C1 category which was in concordance with studies done by Montezuma et al[4] (5.77%), Panwar et al[7](1.6%) ,Chauhan et al.[9] (4.9%), Singh et al.[10] (5%) and Tikku et al[11] (2.8%), whereas Hemalatha et al[12] had a slightly higher rate (18%) of C1 cases [Table 5]. Though ideal rate of < 10% is recommended, the adequacy of sample depends on nature of lesion, available technology, skill, experience of aspirator, Lack of ductal epithelial cells, Difficulty in aspiration because of sclerosis, sampling from wrong areas, aspiration of inflammatory cells, erroneous aspiration, inadequate smearing and improper staining were responsible for the same. Use of guided fine aspiration, adequate training of aspirator, proper smearing and staining techniques will all help in reducing inadequacy and also better sample yield.

C2 category is for lesions showing the characteristic pattern of different benign lesions. Usually cellular, with ductal configuration, myoepithelial, and bipolar nuclei. Inflammatory background may also be there. Lesions included under benign category are fibroadenoma, fibrocystic disease, lactational changes, gynaecomastia, galactoceole and benign phylloides. In our study, 68% (461 cases) falls under category 2. They were categorized as follows-Inflammatory-4.7%, fibroadenoma-55.9%, fibrocystic disease-35.7%, phylloides-1.5%, lactational-0.65%, gynaecomastia-1.3%.

This was in concordance with other studies done by Chauhan et al [9](73.07%),Montezuma et al[4] (77.3%) and Panwar et al[7] (82.6%). All these studies show Fibro adenoma being the most common benign breast lesions. They occur usually due to unopposed estrogen levels around the time of puberty and also Mediator complex subunit 12-MED 12 genes play a role in pathophysiology of fibroadenomas. .They is classified as complex and simple fibroadenomas. In our study we found 15 cases of complex fibroadenoma by doing HPE correlation. These individuals have to be frequently followed as there is risk of malignancy.

There have been two areas of major debate, i.e. the definitions of "atypia" and "suspicious for malignancy. The term atypical is defined as the presence predominantly of cytological features seen in benign processes, but with the addition of some features that are uncommon in benign lesions and which may be seen in malignant lesions**.**

These features include single intact cell dispersal, nuclear enlargement and pleomorphism, high cellularity, necrosis and complex architectural features suggesting micropapillary or cribriform proliferations. Smears with features of cellular crowding, pleomorphism, and discohesion which are not seen in benign lesions are categorized under C3 or atypical. Aspirate with features such as poor preserva-

tion hypocellularity, or components of a benign smear, precluding the diagnosis of malignancy, are reserved for C4 or suspicious malignant category. Aspirates with strong malignant findings are categorized under C5.[4-6]

The gray zone lesion included C3-60 (8.8%) cases and C4-40 (5.9%) cases. Similar results were also obtained in studies done by panwar et al., [5.7%] Arul et al.,[5.2%] and Hemalatha et al.[12%] However, the study conducted by Tikku et al reported 32.7% C3 and 5.6% C4 cases, while Montezuma et al.[4] had reported 13.7% C3 and 1.57% C4 cases. [Table 5]. Smear findings showing fibroadenoma features with atypia, FCD changes with atypical cells, lack of bipolar cells in the background, apocrine cells with atypia, increased cellularity are all placed under this category[fig 1,2].ROM for this group by IAC was 13-15%.

Hence smears with these doubtful findings are put under this category. On doing HPE correlation ROM for this category in our study was 5%. Hence, Most of the lesions which we place in this category are benign but we need to conclude by doing Repeat fnac/core biopsy which is the next step for clinician. In C4 lesions i.e. suspicious for malignancy there were 40 cases (5.9%). The term 'suspicious' in breast FNAB is defined as the presence of some cytomorphological features which are usually found in malignant lesions, but with insufficient malignant features, either in number or quality, to make a definitive diagnosis of malignancy. [14-16]

Before using this categorization, usually many pathologists use terms such as proliferative breast disease with atypia or without atypia which is confusing terminology whether to follow up or go for cure/excision. But after this categorization, it is better clearer that most cases in C4 have high ROM and hence proceeded with core biopsy.

Smears showing single dispersed cells with hyperchromatic nuclei juxtraposed to a bimodal ductal epithelial tissue fragments, monolayered sheets of ductal epithelial cells with mild to moderate atypia, Singly scattered large atypical cells are all placed under this category [fig 3,4]. Since ROM of this category is 85%, all cases should go for core biopsy or excision biopsy. In our study following hpe correlation 21 cases proven to be malignant, 13 as insitu and 6 epithelial hyperplasia.

Our study had 13.9% cases of C5 category which was concordance with to the studies done by Arul et al.[13] 17.1% and all other studies have 20 to 39%.Most are Invasive ductal carcinoma NOS grade followed by lobular carcinoma, carcinoma with medullary features, colloid/mucinous carcinoma, plasmacytoma and lymphoma. This structured reporting has enhanced the reproducibility of reports and creates uniformity in its assessment, especially by clinicians.

Conclusion:

Structured reporting helps in improving the quality, clarity and reproducibility of reports across departments, cities, countries and internationally and will assist patient management and improve breast health care and facilitate research. Linking cytology reporting to management algorithms will enhance the clinicians' use of FNAC and where appropriate core biopsy is needed. Standardized use of cell blocks, immunohistochemistry, in situ hybridization and other molecular tests of prognostic and diagnostic markers will improve patient care. We conclude that this IAC reporting system for classification and diagnosis of breast lesions is mandatory for all pathologists to implement in their reporting thereby reducing subjective variability and better understanding of the report by clinicians.

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