



Categorisation Of Fine Needle Aspiration Cytology Of Breast Using International Academy Of Cytology Yokohama System With Histopathological And Radiological Correlation In A Tertiary Care Hospital - A Retrospective Study.

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Abstract

Background: Breast carcinoma is one of the leading causes of mortality and morbidity worldwide. Fine needle aspiration cytology (FNAC) is cheap, quick, reliable, safe and can be done on outpatient basis and is useful in the diagnosis of most breast lesions. Cytologic reporting of Breast FNACs have undergone many changes with the introduction of the Yokohama system. The objective of this study was to categorise the FNACs as per Yokohama system with histopathological and radiological correlation and to assess the sensitivity, specificity, positive predictive value, and negative predictive value along with diagnostic accuracy.

Methods: A total of 118 cases of palpable breast lumps received in the Department of pathology for fine needle aspiration cytology between January 2021 - December 2022 were included in the study. All details of the patient along with radiological diagnosis and histopathological diagnosis wherever available were recorded. The FNACs were reclassified according to IAC Yokohama categorisation. Using histopathological diagnosis as the gold standard; sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy were calculated.

Results: Out of 118 breast fine needle aspirates, 59 had histopathological correlation. The risk of malignancy for insufficient, benign, atypical, suspicious and malignant categories were 0%, 15%, 83%, 83%, and 100% respectively. Sensitivity - 88.5%, specificity - 91.6%, positive predictive value - 93.4%, negative predictive value - 84.6% and diagnostic accuracy - 89.3% was noted.

Conclusion: Yokohama system for breast cytopathology reporting has better reproducibility and serves as a source for better communication for the pathologist and clinicians.

Keywords: Breast, Fine needle aspiration cytology, Risk of malignancy, Yokohama system

Introduction

Breast carcinoma is one of the most common malignancies and ranks second to lung cancer in the world. Most often, females diagnosed with breast cancer are in the reproductive age group with incidence rising after the age of 30 years. [1] In recent years minimally invasive breast biopsy

techniques and fine needle aspiration cytology (FNAC), have become well established for the diagnostic evaluation of palpable breast lesions. A triple test comprising of clinical, radiographic, and Fine needle aspiration is considered mandate for definitive assessment of breast lumps. [2] Although

Surgical biopsy is the ‘gold standard for diagnosis of palpable breast lesions, FNAC has its obvious advantages. It is cheap, fast, and can be done on an outpatient basis and can reliably differentiate benign from malignant lesions, thereby reducing the frequency of open biopsies. [3] The IAC Yokohoma system for reporting breast cytology has established a clear categorization of breast lesions into five tiers, each with a clear definition and description, and a specified risk of malignancy. [4,5] This study aims at categorising breast lesions according to Yokohoma system and correlating with the diagnosis rendered on radiology and histopathology.

Materials And Methods

Aims And Objectives: The objective of this study was to categorise the FNACs as per Yokohoma system with histopathological and radiological correlation and to assess the sensitivity, specificity, positive predictive value, and negative predictive value along with diagnostic accuracy.

Methods: This is a retrospective, analytical study, done on 118 cases of palpable breast lumps that presented to central laboratory for fine needle aspiration cytology from January 2022 - December 2022. All demographic details, radiology, cytology, and histopathology reports were collected from

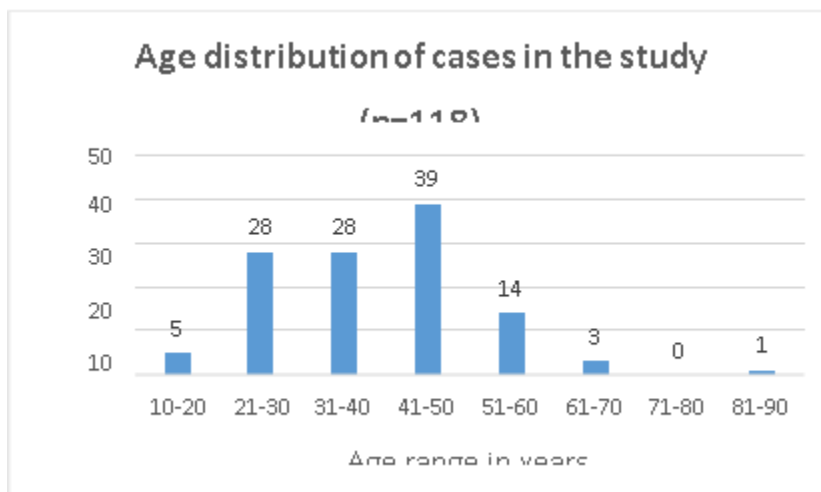
archives. Of 118 cases, 42 cases had histopathological correlation. Histopathological diagnosis was considered gold standard for analytical purpose. All cytology smears were examined under the microscope and were categorised according to Yokohoma reporting method of breast cytology which divides the patients into five categories: C1- insufficient/ inadequate, C2- Benign, C3-Atypical, C4- Suspicious of malignancy, C5- Malignant.

Statistical Methods: Descriptive and inferential statistical analysis was carried out in the present study. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and diagnostic accuracy were calculated using histopathologic diagnosis as the gold standard. Sstatistical software SPSS 22.0, and R environment ver.3.2.2 were used for the analysis of the data and Microsoft word and Excel to generate graphs, tables etc.

ResultS:

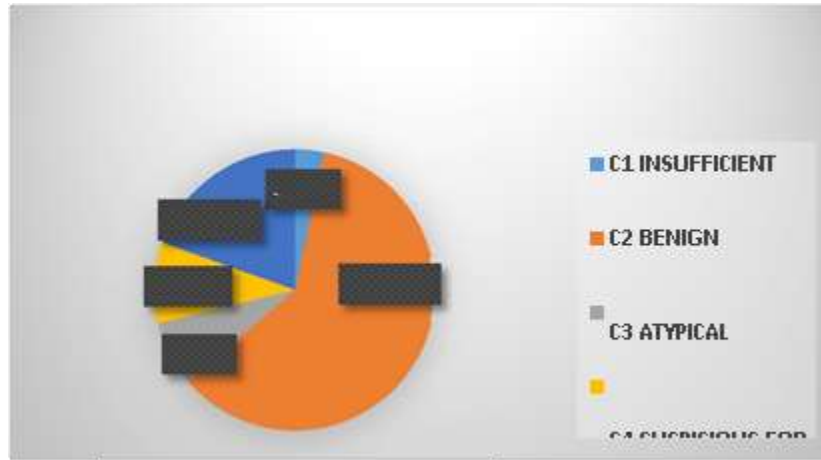
The study comprised a total of 118 cases with their age ranging from 10 – 90 years and the most common age group was 42-50 years with 39 cases. (Table/ Figure 1) All patients were females, and the most common site of lesion was the left upper outer quadrant of breast.

Table/Figure 1: Age distribution of cases in the study (n=118)



These lesions were categorized using IAC Yokohoma system of reporting breast. (Table/ Figure 2) Among the benign cases, fibroadenoma accounted for majority, followed by fibrocystic change and benign cystic diseases.

Table/Figure 2: Categorisation of cases according to IAC Yokohoma system



These categories were correlated with radiological imaging reports (Table/ Figure 3). On radiological assessment, 72 cases were diagnosed as benign (BIRADS I,II,III) and 46 cases were diagnosed as suspicious of malignancy (BIRADS IV,V).

Table/ Figure 3: Correlation of Yokohoma category with radiological Diagnosis

YOKOHOMA CATEGORY	NO OF CASES	RADIOLOGICAL DIAGNOSIS	
		BIRADS I,II,III	BIRADS IV,V
Insufficient	04	03	01
Benign	71	63	08
Atypical	09	03	06
Suspicious of Malignancy	11	02	09
Malignant	23	01	22
Total	118	72	46

Out of 118 cases, 59 cases had histopathological correlation (Table/Figure 4). Of the 26 cases that were reported as benign, 22 cases were reported as benign on histopathology and 4 turned out to be malignant. Of the 6 cases that were reported as atypical, 5 cases turned out to be malignant on histopathology. Of the 6 cases that were reported as suspicious for malignancy on Yokohoma, 5 turned out to be malignant. All the 21 cases that were reported as malignant on Yokohoma, were reported as malignant on histopathology.

Table/ Figure 4: Correlation of Yokohoma category with matched Histopathology Diagnosis

IAC YOKOHOMA	TOTAL NO OF CASES(FNAC)	MATCHED HISTOPATHOLOGY CASES		
		NUMBER OF CASES	BENIGN	MALIGNANT

Insufficient	04	0	0	0
Benign	71	26	22	04
Atypical	09	06	01	05
Suspicious of Malignancy	11	06	01	05
Malignancy	23	21	0	21
TOTAL	118	59	15	44

Risk of malignancy (ROM) was calculated for different diagnostic categories according to IAC Yokohoma categorisation. (Table/ Figure 5)

Table/ Figure-5: Risk of Malignancy of Different Diagnostic Categories

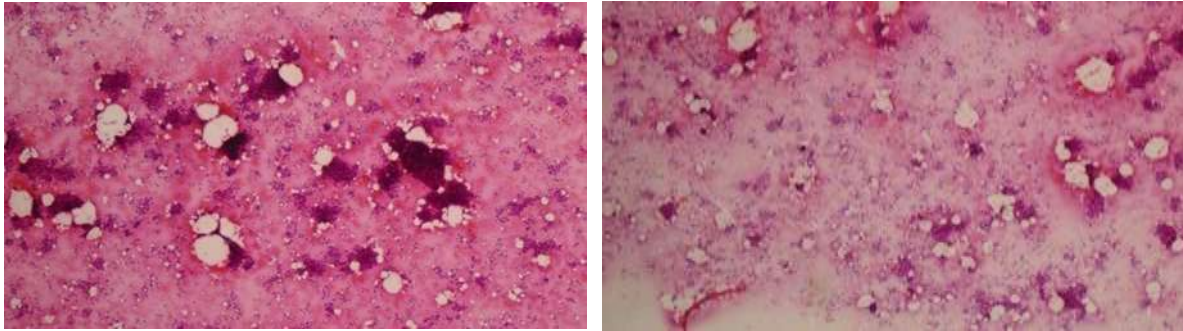
Sl no	Yokohoma category	Risk of malignancy
1	Insufficient	0%
2	Benign	15%
3	Atypical	83%
4	Suspicious of Malignancy	83%
5	Malignant	100%

Using histopathological diagnosis as the gold standard and while considering malignant, suspicious, and atypical in one group as positive for malignancy; sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy were calculated for Yokohoma categorisation of breast cytology (Table/ Figure-6).

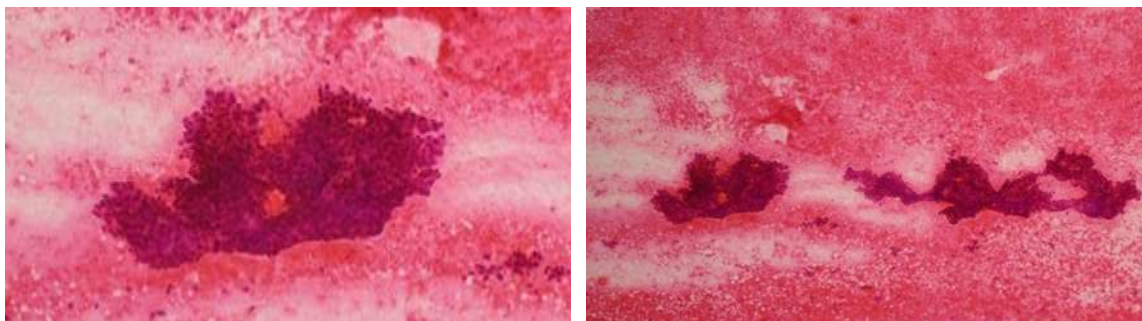
Table/ Figure-6: Sensitivity, Specificity, PPV, NPV And Diagnostic Accuracy of IAC Yokohoma categorization

Statistical Parameters	Percentage
Sensitivity	88.5%
Specificity	91.6%
Positive Predictive Value	93.4%
Negative Predictive Value	84.6%
Diagnostic Accuracy	89.3%

Picture 1 & 2(10X view of ductal epithelial cells showing features of atypia)



Picture 3 & 4 (40X view of ductal epithelial cells showing features of atypia)



Table/ Figure-7: Comparison studies of sample size

IAC yokohoma	Montezuma et al	Kamatar PV et al	Apuroopa et al	Our study
Insufficient	209 (5.77%)	22 (5%)	39 (4.3%)	4 (3.38%)
Benign	2660 (73.38%)	332 (71%)	522 (58%)	71 (60.16%)
Atypical	498 (13.74%)	7(1%)	160 (17.7%)	9 (7.62%)
Suspicious of Malignancy	57 (1.57%)	8 (2%)	63 (7.2%)	11 (9.32%)
Malignancy	201 (5.54%)	101 (21%)	116 (12.8%)	13 (19.4%)
Total	3625	470	900	118

ROM for each category was calculated in our study. calculated ROM was 0% for insufficient category. ROMF for category 2 was 15%, 83% for category 3, 83% for category 4 and 100% for category five. These results were comparable to studies done by Apuroopa et al and kamtakar et al [8,9].

The sensitivity, specificity, PPV, NPV and diagnostic accuracy of FNAC was calculated using histopathology as gold standard. They were 88.5%, 91.6%, 93.4%, 84.6% and 89.3% respectively and is comparable to studies done by Ahuja et al (Table/ Figure 8).

Table/ Figure 8: Comparison Studies Of Sensitivity, Specificity, Ppv, Npv And Diagnostic Accuracy Of Fnac With Other Studies

Statistical parameters	Montezuma et al	Kamatar PV et al	Ahuja et al	Our study
Sensitivity	97.56%	94.59 %	97.2 %	88.5%
Specificity	100 %	98.9 %	86 %	91.6%
PPV	100 %	98.59 %	77 %	93.4%
NPV	98.62 %	95.74 %	98.5 %	84.6%
Diagnostic accuracy	99.11 %	96.97 %	89.6 %	89.3%

Discussion: Breast lesions are presently evaluated by triple test approach which comprises of clinical, radiological, and pathological parameters to arrive at final diagnosis and to guide patient management. Classically, triple test involves clinical examination, mammography and FNAC. Presently core needle biopsy is also included to arrive at final diagnosis and is the alternate for FNAC (6).

FNAC is a simple, cheap, and quick procedure which can be done on an OPD basis, and a turnaround time of shorter duration, and thereby speeding up the treatment process. Presently fine needle biopsy is popular as it allows the assessment of histologic grades this when accords with clinical and radiological findings, the sensitivity and specificity of FNAC is like that of core needle biopsy (7).

FNAC plays a pivotal role, especially in tertiary care hospital where it is not always feasible to take core needle biopsy in every patient who presents with breast lump ascribed to time and cost limitations of needle biopsy. FNAC is much easier to perform and is cost effective when compared to core needle biopsies [8].

The new (IAC) Yokohoma system provides an improved structured format for reporting breast lesions by giving comprehensive definitions and risk of malignancy (ROM) for five categories. It helps to break the communication barriers between the cytopathologist and clinicians. This also helps in research on the application of FNAC for breast lesions to maximally benefit the patient with this low-cost procedure (9)

In our study, majority of the lesions are benign. All the patients were evaluated by triple test which

comprises of clinical, radiological and FNAC (Pathological) tests to reach to an accurate diagnosis, as shown in picture 1-4. We categorised 118 samples according to IAC Yokohoma reporting system, and the distribution of samples in the various Yokohoma categories were similar to studies (Table/ Figure-7) done by Apuroopa et al, Kamatar PV et al and Montezuma et al [8, 9,10,].

IAC system of categorisation of breast FNAC is simple, and an excellent diagnostic modality to help pathologist in diagnosis and helps the clinicians in appropriate diagnosis.

Limitation: The main limitation of this study is its small sample size. Sensitivity, specificity, and diagnostic accuracy can be improved if higher sample size were included in the study.

Conclusion: The newly proposed Yokohoma system for reporting breast cytology constitutes a simple system which allows for pronounced diagnostic clarity and better communication between the pathologist and the treating oncosurgeon. In conjunction with radiology support, it can help medical oncologist provide appropriate management to the patients.

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