ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 17, Issue 1, 2024

Online - 2455-3891
Print - 0974-2441

Research Article

A RETROSPECTIVE COHORT STUDY IN AN INDIAN TERTIARY CARE HOSPITAL ON BREAST LESION CLASSIFICATION BY THE IAC YOKOHAMA SYSTEM USING FNAC

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Received: 14 June 2023, Revised and Accepted: 29 July 2023

ABSTRACT

Objective: The International Academy of Cytology (IAC) Yokohama system was used to categorize breast lesions as the major goal of this investigation.

Methods: Between January 2022 and March 2023, this study on breast fine needle aspiration cytology (FNAC) was carried out at a tertiary care facility in north India. This System of reporting breast cytopathology was used to classify a total of 100 patients. Histopathology correlation was available in 40 cases; Malignancy risk, sensitivity, specificity, and diagnostic precision were assessed.

Results: Breast FNAC cytology was divided into five groups using the new IAC Yokohama system and discovered C_1: Insufficient material (6%), C_2: Benign type (72%), C_3: Atypical type (05%), C_4: Suspicious type of malignancy (06%), C_5: Malignancy (11%). When histopathological reports were available, FNACs were connected with them. The likelihood of cancer, the precision, sensitivity, and specificity of the diagnosis were all calculated.

Conclusion: The IAC Yokohama System for reporting breast cytopathology governs how breast FNAC are categorized, which offers an excellent method for reporting breast cytopathology with a uniform method of reporting and clear definition of each category as well as clear communication between pathologists and clinicians regarding the risk of malignancy and subsequent management.

Keywords: Yokohama system, Fine needle aspiration cytology, Cytopathology, Histopathology.

 DOI: http://dx.doi.org/10.22159/ajpcr.2024v17i1.48601. Journal homepage: https://innovareacademics.in/journals/index.php/ajpcr

INTRODUCTION

In recent years, breast cancer has surpassed cervical cancer as the most frequent malignancy in Indian women. The two most important preoperative tests for determining the kind of breast lesion are fine needle aspiration cytology (FNAC) and core needle biopsy (CNB). The past 60 years have seen a significant increase in the use of FNAC to identify benign and malignant breast lesions. It is highly specific, sensitive, and cost-effective for this purpose. It is easy to perform and takes less time for reporting. Differentiating benign from malignant breast lesions is one of the main goals of FNACs. A triple test, which comprises clinical, radiographic, and pathological (FNAC and/or core biopsy) evaluation, is used to assess breast masses at first [1]. Generally speaking, it is best to clinically assess breast lesions initially, then with mammography and ultrasonography, and finally with fine-needle aspiration biopsy (FNAB) or CNB, which can be accompanied by USG. Rapid on-site evaluation cytology reduces the rates of insufficient samples and the burden of revisits. The sensitivity and specificity of breast FNAC is nearly 90% and 98%. Nearly 98.5% of malignant FNAC reports had a positive predictive value [2]. The accuracy of FNAB depends on various factors like the pathologist's training and experse, use of radiological aid and locaon of the lesion being evaluated. Report of breast FNAC should be in a standard format using specific diagnostic categories. This will improve the reproducibility and quality of reporting. There should be a relationship between diagnostic categories, risk of malignancy, and further management. Structured reports should be used and in a format that uses standard definitions, headings, and explanations that is easy to reproduce [3]. The International Academy of Cytology (IAC) created the IAC Yokohama reporting of breast FNAC in collaboration with a group of breast cytopathologists and doctors. This IAC Yokohama method established five categories (Inadequate/Insufficient, Benign, Atypical, Suspicious for malignancy, and Malignant) for reporting breast cytopathology. There is a distinct definition, risk of malignancy, and management strategy for each of these categories [4]. Recent studies have found that there is a 96.4% positive predictive value and a 97.6% negative predictive value for cancer risk. Insufficient categories made up 2.6%, benign categories made up 1.7%, atypical categories made up 15.7%, suspicious categories made up 84.6%, and malignant categories made up 99.5% [5].

METHODS

This study was carried out on 100 cases by the Department of Pathology of Autonomous State Medical College, Ghazipur, on FNAC conducted on the breast between January 2022 and March 2023. The Yokohama category was awarded to 100 breast FNAs. Correlation to histopathology of 40 cases was available which included 22 of 72 benign, 03 of 05 atypical, 04 of 06 suspicious of malignancy of 11 of 11 malignant cases. FNAC was conducted with 10 mL syringe and 22 gauge needles; all relevant clinical information was noted along with informed consent. Unstained slides were observed immediately after fine needle aspiration (FNAs) for adequacy of specimens. In case of inadequate specimens, the FNAs were repeated. Smears were created routinely and fixed with ethanol. Papanicolaou and May Grunwald-Giemsa stains were used for staining. Yokohama system of reporting breast cytology was used to classify all breasts FNAC. Reporting was done by two pathologists.

Breast cytology is divided into five groups by the Yokohama system according to their cancer risk of malignancy (ROM), as shown in Table 1.

The C_1 category is known as insufficient or inadequate; previously, it was termed as unsatisfactory. In this investigation, 6–7 adequately smeared and preserved epithelial tissue fragments, each containing

Table 1: Reporting of breast cytology according to Yokohama system

S. No.	Cytological categories	Explanation
1.	C1	Inadequate/Insufficient
2.	C2	Benign
3.	C3	Atypical
4.	C4	Suspicious of malignancy
5.	C5	Malignant

at least 10–20 epithelial cells, were deemed sufficient. However, this adequacy criterion was relaxed in some clinical situations that were supported by radiological findings, such as in cases of abscess, lipoma, and fat necrosis. Benign instances fall under the C_2 category and exhibit cytological characteristics that are clearly benign and may or may not be indicative of particular benign lesions. Cases falling under the C_3 category have cytological characteristics that are mostly seen in benign lesions but with a few extra characteristics that are either not found in benign lesions or are found in malignant lesions. Cytological characteristics that are typically present in malignant cases but insufficient to provide a conclusive diagnosis of malignancy are referred to as cases in the C_4 category. Cases that are categorically malignant and exhibit practically all of their cytological characteristics fall into the C_5 category.

RESULTS

Two independent cytopathologists performed FNAs in the pathology department at Maharshi Vishwamitra Autonomous State Medical College, Ghazipur, for 100 cases, and 40 of those instances were associated with histology. The benign lesions predominantly affect younger age groups, with a mean age of 25 and a range of 16–46 years. Lesions that were unusual, suspect of malignancy, and malignant were more prevalent in older age groups, with a mean age of 55.

Out of 100 cases, we found 72 cases as benign, 11 cases as malignant and 06 cases as suspicious for malignancy, 05 as atypical. 06 cases were inadequate/insufficient for diagnosis. (Table 2) displays the cytological classification using the IAC Yokohama methodology.

According to the Yokohama approach, the 40 cases out of 100 instances with histopathological correlations were separated into the following five categories: There are no cases in the C_1 category, 22 cases in the C_2 category, 3 cases each in C_3 and C_4, and a total of 11 cases in the C_5 category as shown in (Table 3). (Fig. 1) showing the epithelial clusters in C_1 that are benign have many distributed bare bipolar nuclei, and myoepithelial cells.

(Table 4) shows the overall specificity, sensitivity, and diagnostic accuracy of cases of malignant cytopathology and *in situ* malignancies discovered in histopathology and (Fig. 2) C_3 Atypical, Benign-looking clusters showing few cytological features of malignancy (Fig. 3) C_5: Malignant case showing cytological features of malignancy.

DISCUSSION

Almost all women of all ages have breast lumps, and one of the leading causes of death for women is breast cancer mortality, exceeding cervical cancer. Indian women have age-adjusted death rates for breast cancer of 25.8/100,000 and 12.7/100,000 respectively [6,7]. Initial evaluation of breast lump examination and triple assessment are based on FNAC with or without CNB, clinical examination, and mammography [5]. When it comes to identifying benign and malignant breast lesions, FNAC has good specificity and sensitivity [5].

FNAC of the breast requires a high level of expertise for both carrying out the procedure to minimize inadequate/insufficient samples as well as training in cytopathology required for interpreting breast cytology.

Table 2: Displays case classification using the IAC Yokohama methodology

S. No.	Cytological classifications	Explanation	Number of cases
1.	C_1	Inadequate/Insufficient	06
2.	C_2	Benign	72
3.	C_3	Atypical	05
4.	C_4	Suspicious of malignancy	06
5.	C_5	Malignant	11
	Total		100

IAC: International academy of cytology

Table 3: illustrates the risk of cancer for each of the five IAC Yokohama categories

Category	Inadequate	Benign	Atypical	Suspicious for malignancy	Malignancy
Malignant	00	00	01	03	11
Non-malignant	00	22	02	01	00
ROM	–	00%	33.3%	75%	100%

ROM: Risk of malignancy, IAC: International Academy of Cytology

Table 4: Sensitivity, specificity, and diagnostic accuracy

Results	Percentage of suspicious and malignant cases
Sensitivity	100
Specificity	97.5
Diagnostic accuracy	99.83

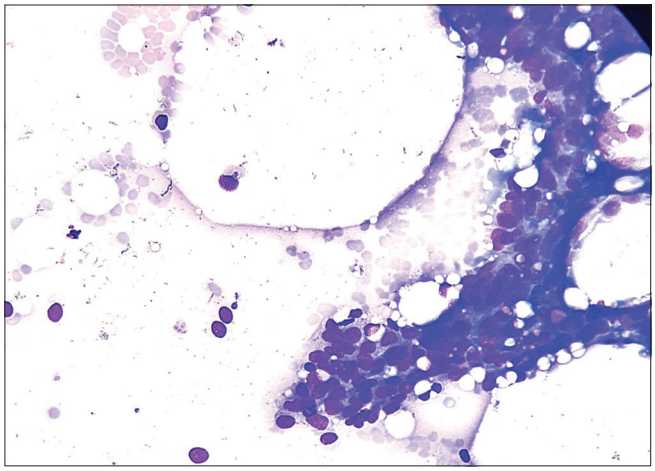

Fig. 1: Epithelial clusters in C_1 that are benign have many distributed bare bipolar nuclei and myoepithelial cells

A checklist of cytological traits both at low and high magnification that encompasses both architectural and cytological aspects for uniform and accurate reporting was needed, as was an organized and standardized reporting mechanism. To further the use of FNAC in breast lesions, a group of cytopathologists, surgeons, radiologists, pathologists, and oncologists convened in 2016 at the IAC Executive Council meeting by enhancing the reporting process and increasing the communication between cytopathologist and clinician [4].

Breast lesions are divided into five groups by the IAC, each with a precise classification, description, and ROM. Clinical management guidelines and the risk of cancer are related. 100 cases from the IAC Yokohama

Table 5: Breast cytopathology performances of several investigations compared using the reporting system of Yokohama

Types	Madubogwu *et al.* [11]	Arul and Masilamani [9]	Wong *et al.* [5]	Kamatar *et al.* [10]	Panwar *et al.* [8]	Present study
Inpatients (N)	180	523	3625	470	225	100
Inadequate %	15.5	2.7	11	5.0	1.4	6
Benign %	41.8	67.3	72.0	71.0	82.6	72
Atypical %	4.5	5.2	4.3	1.0	5.8	05
Suspicious %	3.6	7.8	2.2	2.0	1.8	06
Malignant %	34.6	17.0	10.0	21.0	8.4	11.0
Sensitivity %	90.0	93.1	98.8	94.5	100	100
Specificity %	95.5	99.0	99.4	98.9	97	97.5
Accuracy	92.9	97.2	96.2	96.7	93	99.8
ROM						
Benign	8.6	2.1	1.7	0.4	0.0	0.0
Atypical	40	18	15.7	66.0	0.0	33.3
Suspicious	50	95	84.6	83.0	75	75
Malignant	95	98.3	99.5	99.0	100	100

ROM: Risk of malignancy

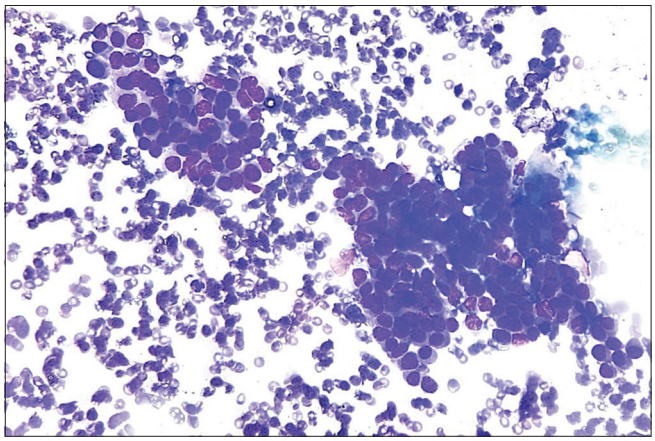

Fig. 2: C_3 Atypical, Benign looking clusters showing few cytological features of malignancy

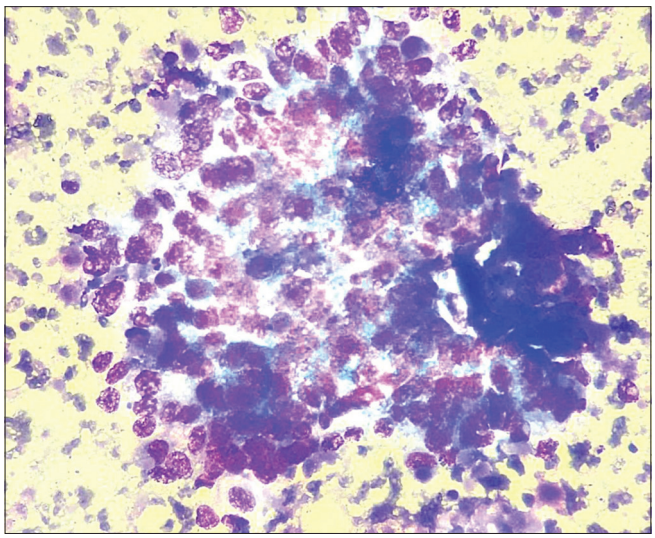

Fig. 3: C_5: Malignant case showing cytological features of malignancy

system of reporting breast cytology were used for this investigation of FNAC for breast masses, 40 cases were correlated with histopathology reports and were divided into the five categories.

Slides that were badly fixed, poorly smeared or do not fulfill criteria for adequacy are labeled as inadequate or insufficient for diagnosis.

The aim of inadequate or insufficient samples should be kept below 5% according to the breast cytology reporting IAC Yokohama approach. Various studies report inadequate samples between 1.4% and 15.5% [4,8-11]. Our study reported similar results with inadequate samples as 6%. In our analysis, the percentage of benign cases (72%), which has been reported in other studies, is comparable. Among the benign lesions fibroadenomas were the most common lesions. Other reported benign lesions are epithelial hyperplasia, lactational changes in the breast, fibrocystic disease of the breast, and inflammatory conditions, including one tubercular case. The proportion of atypical, suspicious, and malignant cases are 5%, 6%, and 11% which is similar to that reported by most of the studies presented in Table. The ROM increased from inadequate to malignant IAC categories and hence enabled pathologists to provide better guidance to clinician for more robust course of action. Depending on the people that the hospital was serving, different studies found varying percentages of malignant cases. (Table 5) shows the breast cytopathology performances of several investigations compared using the reporting system of Yokohama.

CONCLUSION

For the purpose of early detection and diagnosis of breast masses, FNAC is a quick and trustworthy test. FNA can be extremely sensitive and specific when used in conjunction with clinical evaluation and radiographic findings to diagnose breast lesions. Thanks to the development of the Yokohama system of reporting breast cytology, breast lesions have been categorized into five standard groups with clear definitions and descriptions that are simple to replicate. The IAC Yokohama way of reporting breast cytology has enhanced the flow of information between cytopathologists and doctors. Each diagnostic category gives a clear indication of the risk of malignancy and a suggestion of further course of action to be taken. Breast cytology reporting can be greatly improved and made more uniform with thorough training of cytopathologists in smear preparation, interpretation, and implementation of the IAC Yokohama system.

AUTHOR' CONTRIBUTIONS

The conceptual framework, the draft, and the data analysis were all created by Drs. Abhishek and Seema. Dr. Seema also contributed to the data collection and analysis, while Drs. Sanchit and Shivendra drafted the text and handled the last round of editing.

CONFLICTS OF INTEREST

None.

AUTHOR'S FUNDING

None.

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