

Cytological Evaluation of Fine Needle Aspiration of Breast Lesions Using IAC Yokohama Classification System for Reporting Breast Cytopathology

Amita Dogra¹, Prabhat Pant¹, Usha Joshi¹, Hari Shankar Pandey¹

ABSTRACT

Introduction: Breast cancer is rapidly emerging as the leading cause of cancer in Indian women. Cytopathology and histopathology services are required to tackle this growing burden. The use of International Academy of Cytology (IAC) Yokohama Reporting System of breast cytology by classifying them into five categories insufficient, benign, atypical, suspicious and malignant. (IAC) Yokohama Reporting System offers structured protocols, are expected to improve breast cytopathology reporting. **Objective:** The main objectives of our study were to classify breast fine needle aspirates according to the IAC Yokohama system and assess the risk of malignancy, sensitivity, specificity, positive predictive value, negative predictive value, and accuracy. **Methodology:** All breast FNAs done in the above period were retrieved and classified into five categories according to the Yokohama system. Histopathological diagnosis was also retrieved wherever available. **Results:** The new “International Academy of Cytology (IAC) Yokohama system” was used to categorize 205 patients into five categories based on the cytologic diagnosis. That C1: insufficient material (7.8%), C2: benign (64.3%), C3: atypical (7.3%), C4: suspicious of malignancy (7.8%), and C5: malignant (12.6%). Risk of malignancy (ROM) was calculated which was 100% in Yokohama category I, IV and V. In category II ROM was 00% and in category III ROM was 55.5%. FNAC correlation with histopathology was significant (P Value= <0.01 & Chi square value 40.7). **Conclusion:** The IAC Yokohama system is an excellent system for accurately diagnosing breast fine needle aspirate.

KEY WORDS: Histopathology, International Academy of Cytology Yokohama System, Fine Needle Aspiration Biopsy Cytopathology.

Introduction

Breast cancer is one of the most common malignancies among females that has left behind the lung cancer by representing 11.7% of all cancer cases globally^[1]. A number of pre operative diagnostic modalities are used to diagnose breast cancer adequately and preferably on time. Out of which Fine Needle Aspiration Cytology (FNAC) is most commonly used rapid, sensitive, cost effective and less traumatic

diagnostic method of breast lesions^[2,3]. International Academy of Cytology (IAC) Yokohama system for reporting breast cytopathology, further aids to the diagnosing capacity of FNAC by classifying the breast lesions in different categories provided with a probable management option along with acceptable precalculated Risk Of Malignancy (ROM)^[4-6]. IAC Yokohama system provide better communication between the surgeon and the pathologist, hence improves the reproducibility of cytopathological reporting of breast lesions^[2]. Histopathological examination is considered the gold standard for diagnosing benign as well as malignant breast lesions^[7,8].

Breast FNAB is a rapid, accurate and highly cost-effective diagnostic procedure with a minimal complication rate for the broad spectrum of benign and malignant breast lesions.

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¹Department of Pathology, Government Medical College, Haldwani, Nainital, Uttarakhand

Address for correspondence:

Prabhat Pant, Department of Pathology, Government Medical College, Haldwani, Nainital, Uttarakhand. E-mail: ppantpatho@gmail.com

It has a high sensitivity in the range of 90–95% and a high positive predictive value (PPV) approaching 100% for the diagnosis of breast carcinoma^[9–11]. Breast FNAB has a low false negative rate with any errors related to diagnostic difficulties with low-grade carcinomas and sampling error, and a very low false positive rate, which is usually due to misinterpretation of fibroadenomas, intraductal papillomas and papillary lesions^[12,13]. Breast FNAB in the developed world with a high level of medical resources is a component of the “triple test” comprising clinical, imaging and FNAB cytology, and the triple test has a PPV close to 100%^[13,14]. So, in this study, by correlating the FNAC with histopathology wherever possible, we tried to evaluate the effectiveness of IAC Yokohama system for reporting breast cytopathology.

Methodology

This was an Institution based cross-sectional study done over a period of 18 months from November 2021 to September 2022, in the Department of Pathology, Government Medical College and Dr Susheela Tiwari Government Hospital Haldwani. FNA was done using 19-24 gauge disposable sterile needle attached to a 20 ml disposable plastic syringe. Sample was aspirated and smeared on the glass slides. The air dried smears were stained with Giemsa and fixed smears with Papanicolaou stain. For histopathological evaluation, we received biopsy specimen from patients who have undergone a surgery in Department of Surgery, Government Medical College and Dr Susheela Tiwari Government Hospital Haldwani, after proper grossing and sectioning, stained the slides with H&E stain and evaluated by using Nottingham modification of Bloom-Richardson system.

Results

Total 205 FNAC cases were collected, out of which histopathological study was done in 70 cases. 2 cases from total 16 cases of Non diagnostic Aspirate (Yokohama category I), were correlated with histopathology and came out to be malignant. Benign category (Yokohama category II) showed maximum number of cases (132 cases; 64.69%). Out of which 39 cases were correlated with histopathology and showed 100% concordance with Fibroadenoma as the most common benign breast lesion (74 cases; 56.06%). Among malignant lesions (Yokohama category V), out of total 26 cases 16 cases were correlated histopathologically and showed 100% concordance. Commonest breast lesion was

Ductal carcinoma (25 cases; 96.15%). Out of total 16 cases in category Suspicious for malignancy (Yokohama category IV) 4 cases were correlated with histopathology and findings came out to be concordant with histopathology. Atypical, probably benign (Yokohama category III) showed variation in diagnosis. Out of total 9 cases of the category for cytohistopathological correlation, 5 cases came out to be malignant while 4 cases turned out to be benign. The details of these lesions are in Tables 1 and 2. Risk of malignancy (ROM) was calculated which was 100% in Yokohama category I, IV and V. In Category III it was 55.5% and 00% ROM was recorded in Yokohama category II (Table 2). FNAC correlation with histopathology was significant (P Value= <0.01 & Chi square value 40.7) (Figures 1 and 2).

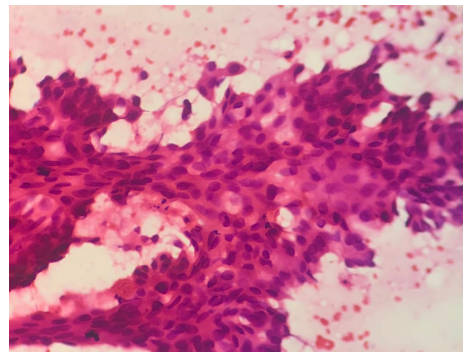


Figure 1: Cytological smear showing highly cellular smears with mild anisonucleosis. (PAP stain; 400X)

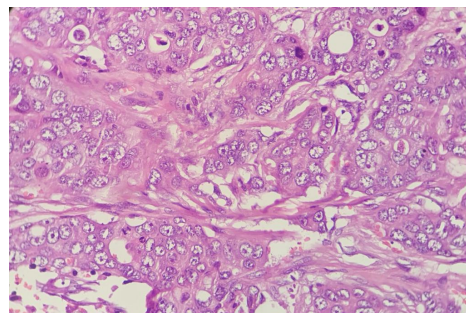


Figure 2: Section showing nests, groups and clusters of tumour cells (H&E stain, 400X)

Discussion

In the present study out of total 205 cases, maximum number of cases were diagnosed as benign (132; 64.39%) and minimum number of cases were in Atypical probably benign (14; 8.82%). Non diagnostic category had 16 cases (7.80%). These findings were correlated with several other studies (Table 3). In this study, Fibroadenoma (56.06%) is

Table 1: Cyto-histopathological correlation (n=70)

Cytopathological categorization	Number of cases where surgical specimens were received (n=70)	Histopathological diagnosis	Number of cases
Non diagnostic (n=16)	2	Infiltrating ductal carcinoma –not otherwise specified (IDC-NOS)	2
Benign (n=132)	39	<ul style="list-style-type: none"> ● Fibroadenoma ● Phyllodes tumour ● Suppurative pathology ● Granulomatous inflammation ● Duct ectasia with with focal inflammation 	31 2 3 2 1
Atypical, probably benign (n=15)	9	<ul style="list-style-type: none"> ● Ductal carcinoma in situ (DCIS) ● IDC-NOS ● Colloid carcinoma ● FA ● FA with apocrine change 	1 3 1 2 2
Suspicious for malignancy (n=16)	4	<ul style="list-style-type: none"> ● Malignant phyllodes tumour ● IDC-NOS 	1 3
Malignancy (n=26)	16	<ul style="list-style-type: none"> ● IDC-NOS 	16

Table 2: Distribution ofcytologically correlated cases for benign and malignant lesion in each category of IAC Yokohama system with calculation of ROM (n=70)

IAC Yokohama category	Histological diagnosis	ROM
1.Non diagnostic/Insufficient (n=2/total16)	Benign- 00 Malignant- 02 (IDC-NOS)	100%
2.Benign (n=39/total132)	Benign- 32 Malignant- 00	00%
3.Atypical probably benign (n=9/total15)	Benign- 4 Malignant- 5 (DCIS-1, IDC-NOS-3, Colloid Ca-1)	55.5%
4.Suspicious for malignancy (n=4/16)	Benign- 00 Malignant- 4 (Malignant phyllodes-1, IDC-NOS-3)	100%
5.Malignant (n=16/26)	Benign- 00 Malignant- 16 (IDC-NOS)	100%

the commonest benign breast lesion while Ductal carcinoma (96.15%) is the commonest malignant breast lesions. Studies conducted by Bhagat and research team (44.23% cases Fibroadenoma; 84.8% Ductal carcinoma) and Deshpande with colleagues (38.3% Fibroadenoma; 75% Ductal carcinoma) were in concordance with the present study^[15,16]. Cyto-histopathological correlation was done in total 70 cases. Out of total, 16 cases of Non diagnostic aspirate (Yokohama category I) 2 cases were correlated with histopathology where they came out to be malignant. This could have been due to low cellularity, aspiration of blood only or false technique where aspirator might have missed the malignant focus. 39 cases of Benign (Yokohama category II), 4 cases from

Suspicious for malignancy (Yokohama category IV) and 16 cases from Malignant (Yokohama category V) were correlated with histopathology and showed 100% concordance.

In Atypical probably benign (Yokohama category III) out of total 15 cases we had 9 cases for cytohistopathological correlation. Out of which 5 cases came out to be malignant while 4 cases were diagnosed as benign (Table 3). This could have been due to some cytological features that are common in benign lesions and uncommonly seen in malignant lesions. For example, one of the case from Atypical probably benign category diagnosed as colloid carcinoma breast on histopathology might have shown

Table 3: Correlation of distribution of breast lesions according to IAC Yokohama system in present study with several other studies

IAC Yokohama category	Agarwal et al [3] (n=1205)	Kamatar et al [4] (n=470)	De Rosa et al [5] (n=4624)	Montezuma et al [6] (n=3625)	Nigam JS et al [7] (n=123)	Present study (n=205)
1. Non diagnostic/ Insufficient (I)	19%	59%	19.2%	5.77%	3.25%	7.8%
2. Benign (II)	50.2%	71%	36.9%	73.38%	46.34%	64.39%
3. Atypical probably benign (III)	6.6%	1%	10.8%	13.74%	12.2%	7.31%
4. Suspicious for malignancy (IV)	3.8%	2%	4.7%	1.57%	4.88%	7.80%
5. Malignancy (V)	20.4%	21%	28.4%	5.54%	33.33%	12.68%

Table 4: Correlation of ROM of different categories of IAC Yokohama system in present study with several other studies (n=70)

IAC Yokohama category	Agarwal et al [3]	Kamatar et al [4]	De Rosa et al [5]	Montezuma et al [6]	Nigam JS et al [7]	Present Study
1. Non diagnostic/ Insufficient (I)	60.9%	0%	49.6%	4.8%	50%	100%
2. Benign (II)	8.3%	4%	4.9%	1.4%	7.27%	00%
3. Atypical probably benign (III)	17.2%	66%	20.7%	13%	40%	55.5%
4. Suspicious for malignancy (IV)	77.8%	83%	78.7%	97.1%	83.33%	100%
5. Malignancy (V)	100%	99%	98.8%	100%	97.5%	100%

this discordance due to the nature of lesion of being showing low cellularity in a hemorrhagic background containing mucinous material also the younger age group of patients might have biased the cytological diagnoses. Based upon the findings and taking Yokohama categories I, II and III as benign and categories IV and V as malignant for statistical evaluation we calculated sensitivity as 74.07%, specificity and PPV as 100%, NPV as 86% and diagnostic accuracy as 90%. The statistical parameters were correlated with several other studies (Table 5). The Risk of malignancy (ROM) was calculated as 100% for category I, 00% for category II, 55.55% for category III, and 100% for both category IV and V. These findings were correlated with several other published studies (Table 4). In study conducted by Nigam JS with colleagues we took statistical parameters of group and study population for correlation purpose^[17]. The chi square value and p value were 40.7 and <0.01% respectively which proves a significant correlation between cytopathological and histopathological findings. These findings were

correlated with studies done by Deshpande with colleagues (p value; 0.042) and Sunitha with team (p value; <0.0001 & chi square value; 83.115) and showed significant concordance^[18].

Conclusion

Based upon the findings in present study, we found that the collaboration of FNAC with IAC Yokohama system for reporting breast cytopathology proved itself to be an effective and productive tool for guiding the surgeon and clinician for better management options by providing the clear communication regarding reporting of cytopathology and a keen eyesight about the spectrum of results that can be obtained based upon the nature of lesion and other conditions. The output for patients depends upon histopathology laboratories vary between those countries with well-developed medical infrastructure and those low- and middle-income countries with more limited resources. Finally, the IAC Yokohama System will invoke a response from the cytology community and also from all those who provide a component in

Table 5: Correlation of statistical parameters of present study with different other studies

Parameter	Montezuma et al [6]	Kamatar et al [4]	Malvina D and Reshma G [10]	Oosthuizen et al [11]	Nigan et al [7]	Present Study
Sensitivity	97.56%	97%	95.12%	63%	73.58%	74.07%
Specificity	100%	94%	100%	100%	98.46%	100%
PPV	100%	91%	100%	100%	97.5%	100%
NPV	98.62%	98%	91.66%	100%	82.05%	86%
Diagnostic Accuracy	99.11%	95%	96.82%	84.6%	87.29%	90%

the “triple” diagnostic approach, which is the best practice for women with breast lesions. This will lead to continuing improvements in the care of patients with breast lesions and possible modifications to the IAC Yokohama System.

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Ethical approval: The study was approved by the Institutional Ethics Committee.

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