Original Research Article

Application of IAC Yokohama system for breast cytology – The experience at a tertiary care hospital

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ABSTRACT

Introduction: Breast malignancies are one of the commonest malignancies in Indian women. Increasing urbanization is attributed to raise of breast cancers and have surpassed cervix cancer in recent times and are now ranked top in some metros. FNA is used as an important diagnostic tool as a part of triple assessment. The application of the IAC Yokohama system in breast cytology improves the reporting and also allows the calculation of risk of malignancy (ROM).

Aim: The main aim of the study is to; 1. Apply the IAC Yokohama system for the diagnostic; 2. assessment and subsequent categorization of FNA samples and correlate them with histopathology examination (HPE); 3. calculate ROM; 4. Calculate p-value.

Materials and Methods: A total of 305 samples received were diagnosed and classified according to the IAC Yokohama system. The study was conducted over a period of 2 yrs retrospectively from June 2019 to May 2021. For the 305 FNA samples received, HPE correlation was made and statistical parameters, ROM , p-value were calculated.

Results: 305 FNA samples were obtained and categorized according to the IAC Yokohama system. They were categorized and the percentage of incidence noted as 1. Insufficient - 6.89%, 2.Benign - 72.46%, 3.Atypical probably benign - 3.28%, 4. Suspicious - 3.28%, 5. Malignant - 14.09%. ROM was also calculated. The distribution of cases in percentage as per categories are: category 1 – 0%, category 2 - 2%, category 3 – 0%, category 4- , 42.86% category 5- 100%. For 305 FNA samples reported 95 cases received for HPE and subsequently cyto – histopathological correlation was made and statistical parameters were calculated. Compiled statistics showed sensitivity of 100%, specificity of 93.54%, NPV of 100%, PPV of 89.19% and diagnostic accuracy at 95.78%. The p-value for the present study is 0.0001 which is very significant.

Conclusion: Application of the IAC Yokohama system of reporting breast cytopathology helps in better categorization of FNA samples and it improves the efficacy of cytopathologist. It gives better clarity to the clinicians in the management of the patient and can reduce unnecessary surgeries.

1. Introduction

Breast malignancies are one of the commonest malignancies in Indian women. Increasing urbanization is attributed to raise of breast cancers and have surpassed cervix cancer in recent times and are now ranked top in some metros.[1] FNA is used as an important diagnostic tool as a part of triple assessment. The international academy of cytology system for reporting breast fine needle aspiration cytology was formed in the year 2016 by a set of cytopathologists, radiologists, surgeons, and oncologists.[2] According to IAC Yokohama system of reporting breast cytology, 5 different categories have been classified as follows:

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1. Insufficient / Inadequate
2. Benign
3. Atypical, probably benign
4. Suspicious of malignancy
5. Malignant

This type of reporting is helpful in organizing the way of reporting breast FNA samples. It provides more appropriate information to the clinician in decision making for patient care management and improves mutual communication.[3] Also the FNA procedure has the advantage of being easier, quicker to perform and less cumbersome. By using the IAC Yokohama system the samples received in our pathology department were classified into different categories and ROM was also calculated for the same.

2. Materials and Methods

The present study was carried out in the department of pathology, ESIC medical college and hospital, Sanathnagar, Hyderabad, India. The study was carried out over a period of 2 years, retrospectively from June 2019 to May 2021. 305 breast FNA samples were collected and categorized according to the IAC Yokohama system for reporting breast cytopathology. All were female patients. 95 cases of these had histopathological correlation and statistical parameters, ROM were calculated on the obtained data.

P-value was also calculated by using the chi-square test.

3. Results

A total of 305 FNA samples were obtained and all these are categorized according to the IAC Yokohama system after thorough review by an experienced pathologist. The age group for all the cases was 11 – 80 yrs (Table 1) and those cases with palpable breast lump were taken. The most common age group with lump in the breast observed in our study was 31 – 40 yrs. The earliest age presented with breast malignancy was 33 and we have observed 10 malignancies in the age group of 31 – 40 yrs.

All the FNA samples obtained are put in one of the 5 categories according to the IAC Yokohama system of reporting. The percentage distribution of cases according to IAC Yokohama are shown in (Table 2).

For 305 FNA samples received, 95 cases were obtained for HPE correlation (Table 3). The ROM is calculated for each category. Sensitivity, Specificity, PPV, NPV, Diagnostic accuracy are calculated for the present study using MS EXCEL sheet.

Chi-square test for categorical data was used for calculation of p-value to assess statistical significance (Table 4). p-value < 0.05 is considered as significant. In the present study p- value obtained was 0.0001 which is very significant.

Table 1: Age distribution of FNA samples

Age range	No. of cases
11 – 20	24
21 – 30	72
31 – 40	96
41 – 50	81
51 – 60	27
61 – 70	4
71 – 80	1

Table 2: Distribution of cases according to IAC Yokohama system

IAC yokohama category	Total no. of cases	% of distribution
Insufficient	21	6.89%
Benign	221	72.46%
Atypical	10	3.28%
Suspicious of malignancy	10	3.28%
Malignant	43	14.09%
Total	305	100%

Table 3: Cyto – histopathology correlation

IAC yokohama category	Cytology	Histopathology
Insufficient	21	4
Benign	221	50
Atypical	10	5
Suspicious of malignancy	10	7
Malignant	43	29
Total	305	95
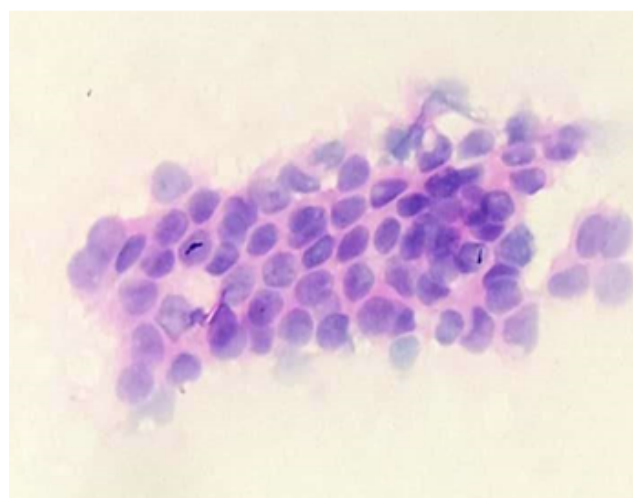
Fig. 1: H&E-Showing ductal epithelial cell cluster under 100x

Table 4: Distribution of histopathological cases according to IAC Yokohama and chi-square and p-value calculation

IAC yokohama categories	Benign	Malignant	Total	Chi- square value	P-value
Insufficient	4	0	4		
Benign	49	1	50		
Atypical	5	0	5	83. 115	<0.0001
Suspicious of malignancy	2	5	7		
Malignant	0	29	29		
Total	58	35	95		

Table 5: Risk of malignancy for each category

IAC yokohama categories	ROM
Insufficient	0%
Benign	2%
Atypical probably benign	0%
Suspicious of malignancy	71.43%
Malignant	100%

Table 6: Statistical analysis

Statistical parameters	Percentage
Sensitivity	100%
Specificity	96.66%
Positive predictive value	94.59%
Negative predictive value	100%
Diagnostic accuracy	97.89%
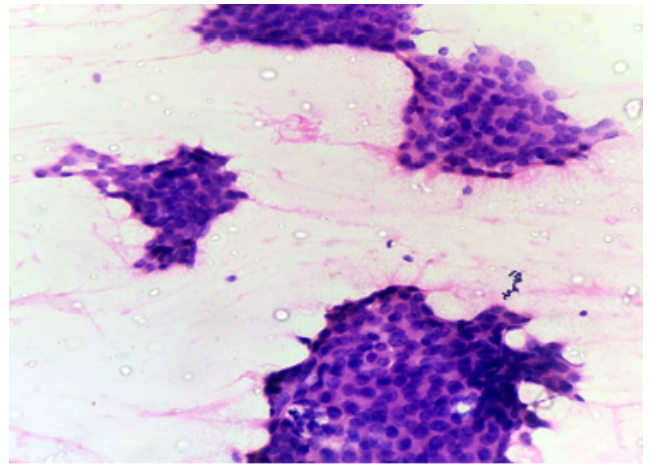
Fig. 2: H&E-Showing benign ductal epithelial cell cluster under 40x
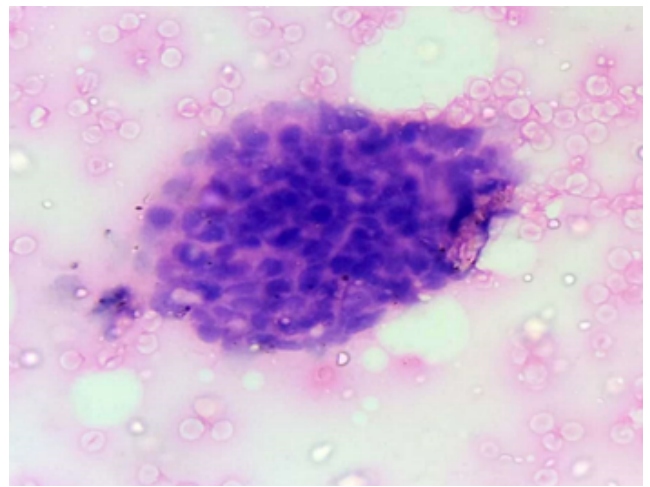
Fig. 3: H&E- cluster of ductal epithelial cell lacking myoepithelial layer under 100X
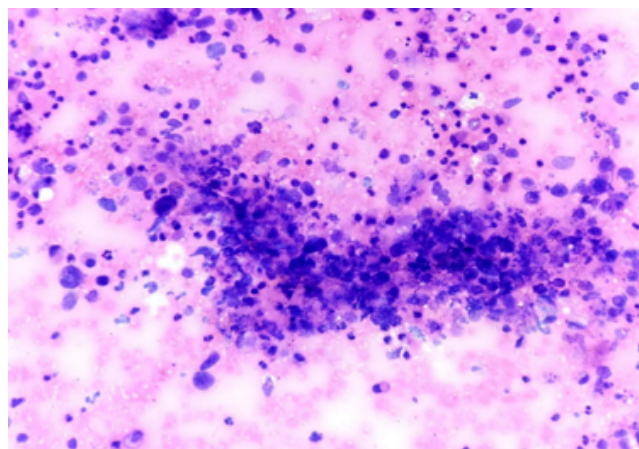
Fig. 4: H&E- Loose cohesive cells with anisonucleosis under 100x
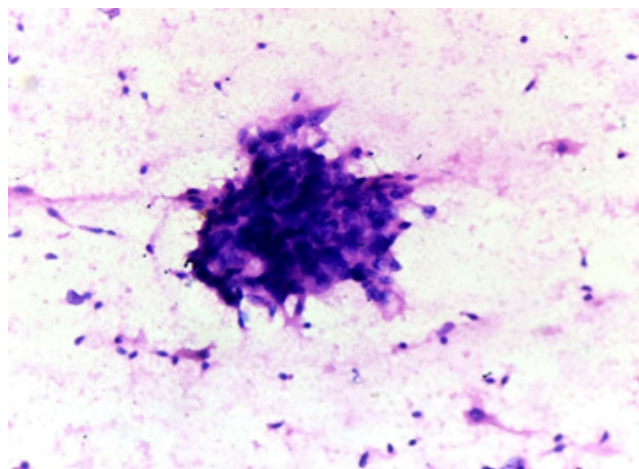
Fig. 5: H&E-Cluster of highly pleomorphic cells with increased N:C ratio
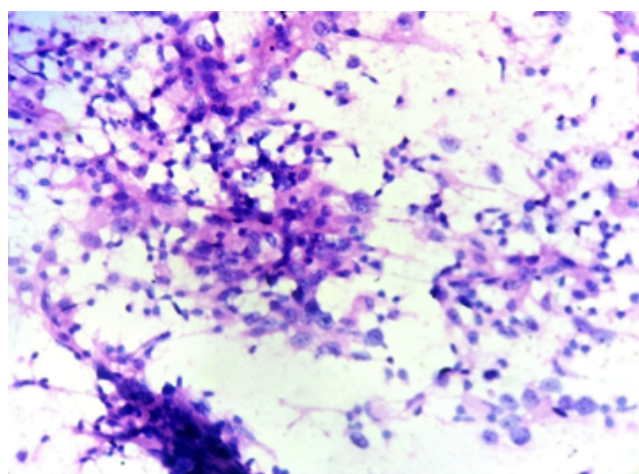
Fig. 6: H&E- Dispersed arrangement of pleomorphic cells under 40x

4. Discussion

Breast FNA is a quick, precise and highly convenient diagnostic procedure which can be done in OPD. It has less complications and can diagnose a wide spectrum of diseases with high accuracy and has less turnaround time than HPE. So in this era of core biopsies, FNA is still continuing as an important diagnostic tool along with clinical imaging and self assessment as a part of triple assessment. It has high sensitivity, specificity and high reproducibility.[4–11]

In our study, we observed the most common age group affected with breast malignancies are between 31 – 40 yrs and the earliest age group presenting with breast lump was 13 years. The present study is comparable to Badge SA et al[12] and Sreedevi CH et al[13] where there are no malignant cases in the age group of 11-20yrs. In our study we have observed 1 malignant case in the age group 21-30 and no malignant cases between 71-80. This could be because of increased incidence of breast cancers in younger age group when compared to elderly probably because of urbanization. The % of benign and malignant cases obtained in the present study is comparable to the studies of Sreedevi CH et al[13] and Badge SA et al.[12](Table 7)

In the present study we obtained 305 breast FNA samples of female patients and these were categorized into one of the 5 given categories according to the IAC Yokohama system and the number of cases obtained in each category was subsequently compared with other studies done in India and

elsewhere showing that the relative proportion of malignant cases are growing in the Indian context.(Table 8)

ROM calculated for each category was comparable to the study of Poornima V Kamatar et al.,[16] In the present study we observed 0% ROM in insufficient and atypical categories. Atypia associated with malignant lesions has been appropriately recognized and was put up in higher categories which is responsible for low ROM with atypical category. The ROM is comparatively less in the present study when compared to other studies. So, more diligence has to be paid in categorizing suspicious lesions.(Table 9)

The sensitivity, specificity, positive predictive value, negative predictive value, diagnostic accuracy are calculated and these statistical parameters are comparable to studies of Moschetta M et al[18] We observed 100% sensitivity and negative predictive value in our studies.

p-value is also calculated for present study and it is <0.0001 which is very significant and it implies that the recognition of various Yokohama categories in ESIC setup has largely been successful and is comparable to the established standards of IAC Yokohama and this has helped the department in giving appropriate guidance to the surgeons in dealing with breast lesions.(table 10)

Table 7: Comparison of age wise distribution of FNA cases

Age	Sreedevi CH et al [13]		Badge SA et al [14]		Present study	
	Benign	Malignant	Benign	Malignant	Benign	Malignant
11-20	22	0	10	0	24	0
21-30	36	0	36	0	71	1
31-40	17	4	82	17	84	12
41-50	8	4	27	29	61	20
51-60	2	5	7	4	11	16
61-70	0	1	0	6	2	2
71-80	1	0	0	2	1	0
Total	86(86%)	14(14%)	162(73.63%)	58(26.37%)	254(83.27%)	51(16.73%)

Table 8: Comparison of IAC Yokohama distribution of cases with other studies

IAC Yokohama Category	Montezuma D et al., [14]	Wong S et al., [15]	Poornima V Kamatar et al., [16]	Apuroopa M et al., [17]	Present study
Insufficient	209 (5.77%)	301 (11%)	22 (5%)	39 (4.3%)	21 (6.89%)
Benign	2660 (73.38%)	1937 (72%)	332 (71%)	522(58%)	221 (72.46%)
Atypical probably benign	498 (13.74%)	117 (4.3%)	7 (1%)	160 (17.7)	10 (3.28%)
Suspicious	57 (1.57%)	59 (2.2%)	8 (2%)	63 (7.2%)	10 (3.28%)
Malignant	201 (5.54%)	278 (10%)	101 (21%)	116 (12.8%)	43 (14.09%)
Total	**3625**	**2696**	**470**	**900**	**305**

Table 9: Comparison of ROM with other studies

IAC Yokohama Category	Montezuma D et al, [14]	Poornima V Kamatar et al., [16]	Apuroopa M et al., [17]	Present study
Insufficient	4.8%	0%	5.0%	0%
Benign	1.4%	4%	1.2%	2%
Atypical probably benign	13%	66%	12.5%	0%
Suspicious	97.1%	83%	93.65%	74.43
Malignant	100%	99%	100%	100%

Table 10: Comparison of statistical parameters with other studies'

Statistical parameters	Montezuma D et al., [14]	Moschetta M et al., [18]	Poornima V Kamatar et al., [16]	Apuroopa M et al., [17]	Present study
Sensitivity	97.56%	97%	94.59%	95.9%,	100%
Specificity	100%	94%	98.9%	97.89%,	96.66%
Positive predictive value	100%	91%	98.59%	96.79%,	94.59%
Negative predictive value	98.62%	98%	95.74%	97.64%	100%
Diagnostic accuracy	99.11%	95%	96.97%	91.5 %	97.89%

5. Conclusion

Application of IAC Yokohama system of reporting breast cytopathology helps in easy categorization of breast FNA samples and it improves the efficacy of cytopathologist. It also provides better clarity to the clinicians in the management of the patient and can reduce unnecessary surgeries.

6. Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

7. Source of Funding

None.

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