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Application of Yokohama system for reporting breast cytology with risk stratification in routine practice

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Abstract

Background: Fine needle aspiration cytology (FNAC) is a sensitive and cost-effective technique for diagnosis of breast lesions. Yokohama system of reporting breast FNAC was introduced in the year 2016 for overall improvement in the pattern of reporting and to have a rapport between cytopathologist and surgeons which aids for better treatment protocols. The objective of the study was to assess the accuracy and calculate risk of malignancy in five categories based on Yokohama reporting guidelines.A three year retrospective study of 314 cases of breast FNAC was undertaken. All breast lesions were classified according to Yokohama system. Risk of malignancy (ROM), Sensitivity, Specificity, Positive predictive value, Negative predictive value, and Diagnostic accuracy were calculated and correlated with histopathological follow-up. 314 FNAC cases were analysed in the study, histopathology follow-up was available in 209 cases. The distribution of cases according to Yokohama system is categorized as follows: Insufficient -3.1%, Benign-38%, Atypical probably benign -18.4%, Suspicious-9.5%, Malignant-30.5%. Overall, Risk of malignancy was 0%, 1.1%, 6.2%, 81%, and 98%, respectively. Overall, Sensitivity was found to be 96.6%, and similarly Specificity was 97.5%, Positive predictive value was 96.6%, Negative predictive value was 97.5%, and Diagnostic accuracy of 97.1%. Categorization of breast FNAC according to IAC- Yokohama system aids in accurate diagnosis and improves standardization of reporting.

Key words: Yokohama system, Cytopathology, Risk of malignancy, Cyto-histopathological correlation.

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Introduction

Breast carcinomas are the most frequent cause of cancer death among Indian women, with an estimated incidence rate of 26 per 100,000 women population and mortality rate of 13 per 100,000 women population[1]. Triple test (combination of clinical, imaging and cytological parameters) aids in further evaluation of patient, but FNAC is a safe procedure which is diagnostically superior to clinical examination and mammography.

Early detection of breast carcinomas by FNAC provides more therapeutic options, including breast conservation and better chance of cure. FNAC can identify cytological atypia and guides in clinical management. However some breast aspirates are difficult to categorize clearly into benign or malignant lesions i.e., lesions which pose diagnostic difficulty -Grey

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zone lesions. Diagnostic grey zone breast lesions include: Fibroadenomas, typical and atypical epithelial proliferations, in situ and low grade carcinomas.
Marked cellularity and cell dissociation, usually associated with malignancy can sometimes occur in aspirates of benign lesions, such as fibroadenomas. Necrosis is a worrisome finding in breast FNAC, but also occurs in some benign conditions. As cytomorphological findings of benign and malignant lesions overlap, interpretation of diagnosis becomes subjective. To overcome this errors in FNAC reporting, the International Academy of Cytology (IAC) introduced Yokohama system for reporting Breast FNAC in 2016.
Yokohama system intends to standardize and improve the reporting of breast cytology, and establishes best practice guidelines, and improves training and interpretation of breast cytology is made easy. It also facilitates optimal breast care [2]. The IAC Yokohama system incorporates five categories: Insufficient, Benign, Atypical probably benign, Suspicious of Malignancy, Malignant. Yokohama system stratifies breast lesions by their ROM and provides management options for each category.

Materials and Methods

All breast lesions that underwent FNAC procedure, were carried out at Amruth Diagnostic Laboratory-Ballari over a period of three years. This data was analysed and categorized according to Yokohama system as Category I-Insufficient, Category II- Benign, Category III-Atypical probably benign , Category IV-Suspicious, Category V- Malignant. The ROM was calculated for each category and compared with ROM proposed by IAC-Yokohama system and other similar studies based on Yokohama system of reporting breast cytology. FNAC was performed using 22/23 gauze needle, then the smears were prepared and stained with Leishman / Giemsa stain, and in few cases with Hematoxylin and Eosin stain. In case of fluid / bloody aspirate, the material was centrifuged and smears were prepared from the sediment and even repeat aspiration was performed after evacuation of cyst fluid. Further cytological diagnosis was correlated with histopathological follow-up in 209 cases. Statistical analysis was executed using SPSS software (version 21). Based on histopathological diagnosis parameters such as Sensitivity, Specificity, Positive predictive value, Negative predictive value and Diagnostic accuracy of FNAC was used to detect malignancy. ROM was computed by dividing number of malignant cases by total number of histopathological follow-up cases in the particular category.

Results

The study was conducted over a period of three years. A total number of 314 patients with breast lesions who underwent FNAC procedure were analysed, histopathological follow-up were available in 209 cases. Frequent age group encountered in breast lesion were in the range of 21 to 30 years. Out of 314 cases of breast FNAC, 4(1.2%) were male and 310 (98.7%) were female patients.
The cases were reviewed and categorized according to Yokohama reporting system (Table-1), as follows : 10 (3.1%) cases were categorized into category I, 120(38%) cases into category II, 58(18.4%) cases into category III, 30(9.5%) cases into category IV, and 96 (30.5%) cases into category V (out of 314 cases of breast FNAC). 209 cases with histopathological follow-up were correlated with FNAC findings, the Sensitivity, Specificity, Positive predictive value, Negative predictive value and Diagnostic accuracy was 96.6%, 97.5%,96.6% , 97.5% and 97.1% respectively. Risk of malignancy for each category was 0%, 1.1%, 6.2%, 81%, and 98% respectively.

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Table 1: Histopathological-Follow-Up of Yokohama Diagnostic Categories

Category	Insufficient I	Benign II	Atypical probably benign III	Suspicious of Malignancy IV	Malignant V	Total
No. of cases	10 (3.1%)	120 (38%)	58 (18.4%)	30 (9.5%)	96 (30.5%)	314
No. of cases with histopathological follow-up	3 (1.4%)	85 (40.6%)	32 (15.3%)	11 (5.2%)	78 (37.3%)	209 (66.5%)
Non-Neoplastic	2 (66%)	34 (40%)	10 (31.25%)	-	-	46 (22%)
Benign Neoplastic	1 (33.3%)	50 (58.8%)	20 (62.5%)	2 (18.1%)	1 (1.28%)	74 (35.4%)
Malignant	0	1(1.1%)	2 (6.25%)	9 (81.8%)	77 (98.7%)	89 (42.5%)
Risk of Malignancy	0	1.1%	6.2%	81%	98%	42%

Table 2: Comparison of categorical distribution according to IAC Yokohama system

Yokohama Categories	Montezuma D et al [5]	Poornima V Kamatar et al [6]	Apuroopa et al [7]	Present study
Insufficient	209 (5.77%)	22 (5%)	39 (4.3%)	**10 (3.1%)**
Benign	2660 (73.38%)	332 (71%)	522(58%)	**120 (38.2%)**
Atypical probably benign	498 (13.74%)	7 (1%)	160 (17.7%)	**58 (18.4%)**
Suspicious of Malignancy	57 (1.57%)	8 (2%)	63 (7.2%)	**30 (9.5%)**
Malignant	201 (5.54%)	101 (21%)	116 (12.8%)	**96 (30.5%)**
Total	3625	470	900	**314**

Table 3: Comparison of Risk of malignancy of the different diagnostic categories

Yokohama Categories	Montezuma D et al [5]	Poornima V Kamatar et al [6]	Apuroopa et al [7]	Tejeswini Vet al [8]	Present study
Insufficient	4.8%	0%	5.0%	22.2 %	**0 %**
Benign	1.4%	4%	1.2%	5.32%	**1.1 %**
Atypical probably benign	13%	66%	12.5%	26.31%	**6.2 %**
Suspicious of Malignancy	97.1%	83%	93.65%	100%	**81 %**
Malignant	100%	99%	100%	100%	**98 %**

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Table 4: Comparison of statistical parameters in different studies

Statistical parameters	Poornima V Kamatar et al [6]	Apuroopa et al [7]	Tejeswini Vet al [8]	Moschetta M et al [9]	Present study
Sensitivity	94.59%	95.9%	89.6	97%	**96.6 %**
Specificity	98.9%	97.89%	100%	94%	**97.5 %**
Positive predictive value	98.59%	96.79%	100%	91%	**96.6 %**
Negative predictive value	95.74%	97.64%	90.2%	98%	**97.5 %**
Diagnostic accuracy	96.97%	98.57%	94.6%	-	**97.1 %**

Discussion

FNAC of breast can diagnose non-neoplastic lesions accurately and prevents unnecessary procedure. Yokohama reporting system provides a definitive diagnostic category for breast cytology reporting and furnishes useful information to the surgeon including ROM.

In our study population, we applied Yokohama reporting system and compared the results with other studies. Most frequent age group in our study was in the range of 21-30years, similar to the studies conducted by V. Chauhan et al [3]. The categorical distribution of cases according to Yokohama system in the present study are in accordance with other studies [5,6,7] (Table-2).

In current study the rate of diagnosing category I i.e., insufficient material for reporting was 3.1% which is in accordance with the range (0-42%) reported by Mitra S[4]. Category I included ten cases, in majority of cases fluid was aspirated with low cellularity and smears showed occasional cystic macrophages. Only three cases had histopathological follow-up of which two were classified as granulomatous mastitis with fibrocystic disease and one case as complex fibroadenoma. In such scenario repeat aspiration in different planes must be performed.

The risk of malignancy for category-I,II,IV and IV are comparable with studies conducted by Montezuma D et al [5], Poornima V Kamatar et al [6], and Apuroopa et al [7] (Table-3).The ROM for category-III was low in our study the reason for this is majority of cases were benign lesions.

The ROM for category I and II in the study conducted by Tejeswini Vet al [8] was high compared to our study, the reason for this could be non-representative samples and technical issues in category I and less number of atypical cases in category III.

The statistical parameters in our study such as Sensitivity, Specificity, Positive predictive value, Negative predictive value and Diagnostic accuracy are comparable with the studies conducted by Poornima V Kamatar et al [6], Apuroopa et al [7], Tejeswini Vet al [8]and Moschetta M et al[9] (Table:4).

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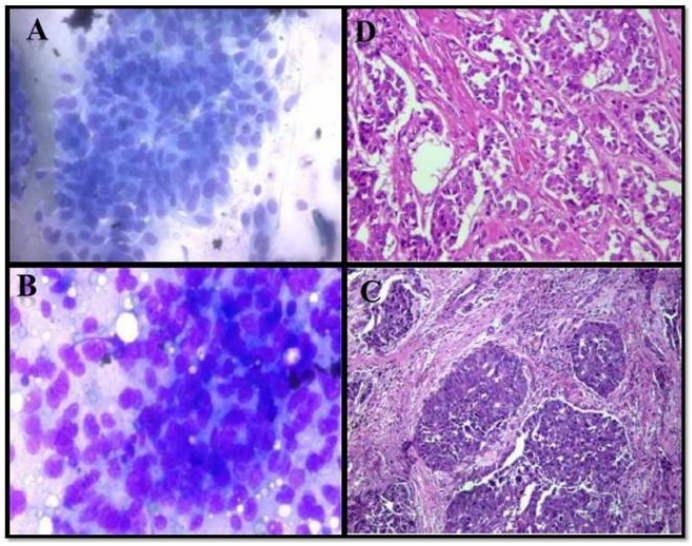

Figure 1: FNAC finding: A- Suspicious of Maligancy(Category IV), B- Positive for Maligancy(Category V), C,D- Corresponding Histopathological diagnosis-Insasive Carcinoma of No special Type

Limitations: Limitations of the present study are the sample size being small with less number of histopathological follow-up cases. Further studies with large sample size are required to evaluate the validity of Yokoham system for reporting breast cytology.

Conclusion

FNAC of Breast is safe, cost effective and reliable procedure and when reported as per Yokohama guidelines, it improves the overall effectiveness of reporting and patient management.

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