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Breast fine needle aspiration biopsy cytology reporting using international academy of cytology Yokohama system: A single institution experience

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Abstract

Background/Objectives: 1) To categorize the Breast Fine Needle Aspiration Biopsy (FNAB) samples according to this new system of reporting. 2) To assess the diagnostic accuracy, sensitivity and specificity of breast FNA and calculate the risk of malignancy (ROM) for each category.

Methods: This retrospective study included all patients who underwent Breast fine needle aspiration biopsy cytology (FNAB) obtained between January 2019 to December 2019 and were reclassified according to the newly proposed IAC Yokohama reporting system. Only cases for which histopathological reports were available were included in the study. The risk of malignancy (ROM) for each category was determined. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy were evaluated based on a three-category approach.

Results: A total of 63 women were included in the study. The samples were distributed as follows: insufficient material 0, benign 34.9%, atypical 3.18%, suspicious for malignancy 7.9%, and malignant 53.9%. The respective ROM for each category was 0% for category 1 (insufficient material), 4.5% for category 2 (benign), 50% for category 3 (atypical), 100% for category 4 (suspicious for malignancy), and 100% for category 5 (malignant). When calculating diagnostic accuracy and predictive values where only malignant cases were considered positive tests, the sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy were 94.40%, 100%, 100%, 91.66% and 96.55%, respectively.

Conclusion: Categorization of the Breast FNAB cytology according to the newly proposed IAC Yokohama system of reporting helps pathologists in achieving diagnostic clarity and guides clinicians in appropriate patient management. IAC Yokohama system of reporting breast cytopathology can serve as a bridge between pathologists and clinicians in effective stratification of breast lesions.

Keywords: Breast, fine needle aspiration, Yokohama system, Mangalore, India

Introduction

Introduction and need for the study

Breast cancer is considered the most common malignancy among women in the world. It also happens to be the most frequent cause of death in women especially in developing countries^[3]. Breast cancer has overtaken cervical cancer in India with the incidence rate being 26 per 100,000 women population and mortality rate of 13 per 100,000 women population, thus making both screening and early detection crucial factors in lowering the mortality rate^[1, 2].

As we know with the advent of triple testing for breast malignancies, fine needle aspiration cytology (FNAC) plays a vital role in the evaluation of any suspicious breast lesion^[4]. It is a cost effective, minimally invasive and rapid technique, which helps play a role in early detection. It also aids in the categorization of a breast lump into benign or malignant^[5].

Although histopathology remains the gold standard, Cyto-histopathological correlation increases precision and can be of great value to the overall diagnosis^[5]. Due to overlap of cytomorphological features of both benign and malignant breast lesions to a significant extent, differentiation in all cases is not possible^[4]. To tackle these grey zone areas of uncertainty and to bring about a degree of uniformity to the reporting system, the National Cancer Institute (NCI) in 1996 proposed five diagnostic categories^[4]. These five diagnostic categories could help serve as a common language that bridges the gap between the clinician and pathologist and which could ultimately lead to better patient care^[7].

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The Yokohama System for Reporting Breast Cytopathology has proposed a five-category classification, Category 1- insufficient material; Category 2- benign; Category 3- atypical, probably benign; Category 4- suspicious for malignancy, probably in situ or invasive carcinoma; and Category 5- malignant [7].

The aim of this present study was to categorize the Breast Fine Needle Aspiration Biopsy (FNAB) samples according to this new system of reporting and to assess the diagnostic accuracy, sensitivity and specificity of breast FNA and calculate the risk of malignancy (ROM) for each category.

Materials and Methods

A retrospective study on patients who underwent fine needle aspiration cytology (FNAC) for any breast lesion was done for a period of 1 year from January 2019 to December 2019. All patients with palpable breast lumps who had undergone FNA procedure (comprising of blind and image guided) were included in the study while patients in which histopathological correlation was not done were excluded from the study. The FNAC’s obtained were retrospectively categorized using newly proposed IAC Yokohama Reporting system for Breast cytology by a single pathologist. The histopathological report was considered as the gold standard. The risk of malignancy (ROM) was calculated for each category using the formula, number of confirmed malignant cases to the total number of cases in the diagnostic category.

Statistical Analysis

The ROM was defined for each category as the number of confirmed malignant cases/total number of cases in the diagnostic category. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV), and accuracy ratios were calculated using the histologic diagnosis as the gold standard. The ratios will be determined based on three categories.

1. Category A: Only malignant cases
2. Category B: Both suspicious and malignant cases.
3. Category C: Atypical, suspicious, and malignant cases.

For these calculations, the insufficient material cases were excluded from the analysis

Results

Sixty-three women were included in the study. All the FNAB breast cytology smears were retrospectively reviewed and categorized according to newly proposed IAC Yokohama system of reporting as insufficient material 0(n=0), benign 34.9% (n=22), atypical 3.18% (n=2), suspicious for malignancy 7.9% (n=5), and malignant 53.9% (n=34) [Fig-1]. The FNAB findings were correlated with histopathology and the respective risk of malignancy (ROM) for each category was 0% for category 1 (insufficient material), 4.5% for category 2 (benign), 50% for category 3 (atypical), 100% for category 4 (suspicious for malignancy), and 100% for category 5 (malignant) [Table-1]. One breast lesion was diagnosed as inflammatory etiology and was categorized as Category 2 (benign). However, on correlating with the histopathology report, the diagnosis was infiltrating ductal carcinoma.

When calculating sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy for category A (only malignant cases considered positive test

results), the results were 94.40%, 100%, 100%, 91.66% and 96.55%, respectively. For category B (both suspicious and malignant categories considered positive test results), the results were 95.12%, 100%, 100%, 91.66% and 96.82%, respectively. For category C (atypical, suspicious, and malignant cases grouped as positive test results), the results were 95.23%, 91.6%, 97.56%, 91.66% and 95.38%, respectively [Table 2]

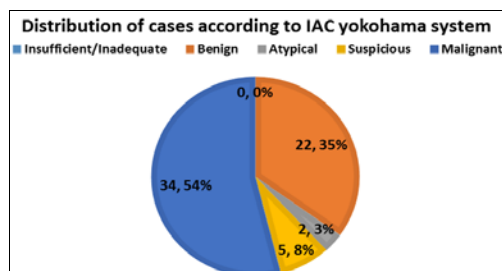


Fig 1: Distribution of cases according to IAC Yokohama system for reporting Breast cytology.

Table 1: Risk of malignancy of the different diagnostic categories

Yokohama Category	Risk of Malignancy
Insufficient/Inadequate	0
Benign	4.50%
Atypical	50.00%
Suspicious	100.00%
Malignant	100.00%

Table 2: Sensitivity, specificity, PPV, NPV, and accuracy rate of breast cytology

	Sensitivity	Specificity	Ppv	Npv	Accuracy
Category A	94.40%	100%	100%	91.66%	96.55%
Category B	95.12%	100%	100%	91.66%	96.82%
Category C	95.23%	91.60%	97.56%	91.66%	95.38%

Category A: only malignant cases considered positive; category B: suspicious and malignant cases considered positive; category C: atypical, suspicious, and malignant cases considered positive. PPV, positive predictive value; NPV, negative predictive value

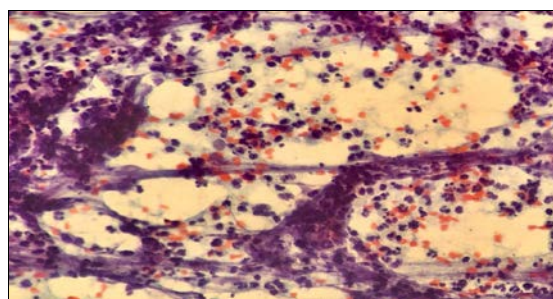


Fig 2: Category 2, Benign: Breast abscess (40X, Papanicolaou stain)

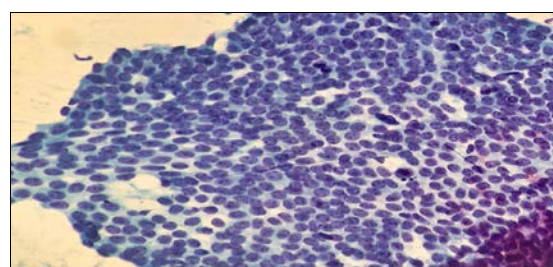


Fig 3: Category 2, Benign: Fibro adenoma (40X, Papanicolaou stain)

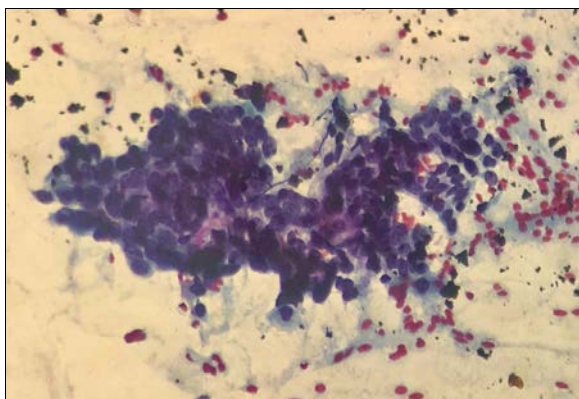


Fig 4: Category 3, Atypical: Atypical proliferating breast disease (40X, Papanicolaou stain)

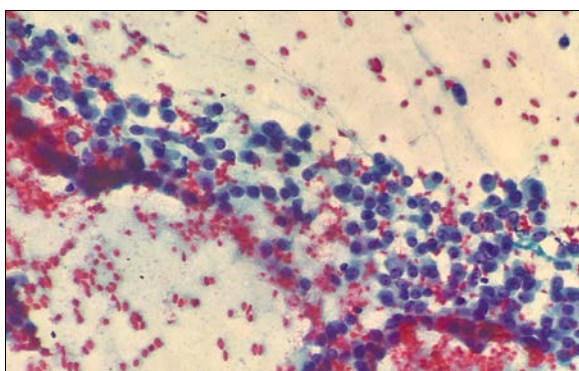


Fig 5: Category 4, Suspicious for malignancy (40X, Papanicolaou stain)

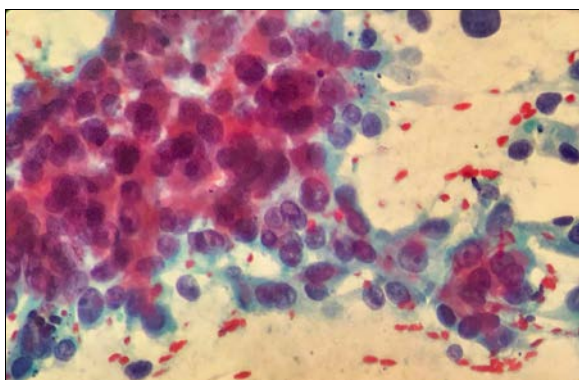


Fig 6: Category 5, Malignant: Ductal carcinoma (40X, Papanicolaou stain)

Discussion

The IAC Yokohama System of reporting defines five categories for the standardization of reporting breast fine needle aspiration biopsy cytology. Furthermore, these categories can effectively stratify breast lesions according to their risk of malignancy and can provide a management algorithm for each category. This study shows that the utilization of the categories proposed in the IAC Yokohama System for Reporting Breast FNAB Cytology can enable the reproducibility of results among institutions worldwide and provide vital information for the treating clinician.

In the present study, 63 cases of breast fine needle aspiration cytology were successfully retrospectively categorized according to the newly proposed IAC Yokohama system. There was one discordant case of category 2 (benign) reported as inflammatory etiology but on correlating with

the final histopathology report it was diagnosed as infiltrating ductal carcinoma. The reason for discordancy was attributed to sampling error. The findings of our study were correlated with the results of other studies. In a study done by Montezuma *et al.*, they were the first to categorize breast FNAB cytology samples according to the proposed IAC reporting system and they evaluated patient outcomes based on this categorization. They were able to demonstrate where only malignant cases were considered positive tests, the sensitivity, specificity, and diagnostic accuracy were 97.56, 100, and 99.11%, respectively. They were also able to estimate the risk of malignancy for each category successfully^[3]. The findings were similar to our study. Similarly, in a study by Kamatar *et al.*, they were successively able to categorize patients FNAB reports into 4 categories according to the International Academy of cytology (IAC) Yokohama system of Breast cytology and were able to demonstrate high sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy. They were also able to calculate the risk of malignancy for each category. They concluded that categorization of the Breast FNAB cytology according to IAC Yokohama system of reporting helps providing some clarity for the pathologist while making a diagnosis. It also can guide clinician in providing appropriate patient management^[4].

In a similar study done by Chauhan *et al.*, the sensitivity, specificity, positive and negative predictive value and diagnostic accuracy were found to be 98.90%, 99.16%, 97.82%, 99.58% and 99.09% respectively, which were similar to our findings. Hence, they were able to conclude that FNAC is a simple, reliable, cost effective tool and when coupled with physical examination and imaging studies (triple approach), can be a highly sensitive diagnostic tool. They stated that if a universally acceptable standardized reporting system for breast cytology is adopted, it could enhance the diagnostic accuracy of FNAC^[5].

Layfield *et al.* in their study observed that there was a good overall agreement between observers. Hence, they concluded that the IAC YSRB system could provide greater agreement among viewers (69%) than other standard guidelines for cytology specimens obtained from some other body sites^[8].

In a study done by Wong *et al.*, they were also able to obtain a high positive predictive value (96.4%) and negative predictive value (97.6%). Thus, they concluded that Breast FNAB is a highly accurate test, which can enable the effective diagnosis of breast lesions. They also added that a rapid onsite examination or ROSE can improve the overall performance and can enable immediate triage for further biopsy if necessary^[6].

The comparison of the findings of our study with the above mentioned studies have been summarized in Table 3.

There is a paucity of studies in the Indian population regarding the employment of the newly proposed IAC Yokohama System for Reporting Breast FNAB Cytology. This emphasizes the need for more studies especially in India, which can provide good insight into the need for standardization of reporting of breast cytology.

The main limitations found in our study are the small sample size and the high risk of malignancy of Category 3 (atypical). This could be attributed to sampling error and can be avoided with the aid of ultrasound guided fine needle

aspiration of suspicious breast lesions. In conclusion, studies with larger sample size and conducted in many health care centers could render more accurate and standardized results.

Table 3: Comparison of risk of malignancy with other studies

Categories	Present study	Montezuma <i>et al.</i> [3]	Kamatar <i>et al.</i> [4]	Wong <i>et al.</i> [6]
Insufficient	0%	4.8%	0%	2.6%
Benign	4.50%	1.4%	4%	1.7%
Atypical	50%	13%	66%	15.7%
Suspicious	100%	97.1%	83%	84.6%
Malignant	100%	100%	99%	99.5%

Conclusion

Categorization of the Breast FNAB cytology according to IAC Yokohama system of reporting helps pathologist in achieving diagnostic clarity and guides clinicians in appropriate patient management. IAC Yokohama system of reporting breast cytopathology can serve as a bridge between pathologists and clinicians in effective stratification of breast lesions.

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