Original article

Received: 2023-12-01
Accepted: 2024-03-01
https://doi.org/10.18502/bccr.v16i1.18751

BCCR
2024, No 1, Vol 16 :1-9
www.bccrjournal.com

Diagnostic Accuracy of Fine Needle Aspiration Cytology for Breast Lump by Yokohama System for Reporting and Its Correlation with Histomorphology

Nikita Taur*, R. R. Soni, A T Deshmukh, Sonal Chaukade

1

Dr. Panabrao Deshmukh Memorial Medical College, Amravati, India

*Corresponding author
Nikita Taur

taurdrnikita@gmail.com

ABSTRACT

Background: The International Academy of Cytology Yokohama System has created a standardized method of describing breast cytology by grouping them into 5 categories: inadequate, benign, atypical, suspicious, and malignant. To validate the likelihood of cancer in the various categories, several investigations have been undertaken at various institutions as a mandate. Aim: The main objective of the research is to identify the accuracy of fine needle aspiration cytology for breast lumps by the Yokohama system for reporting and its correlation with histopathology.

Methodology: The present study was a retrospective study performed over 8 months. The Yokohama system performs FANCs for breast lumps. Whenever accessible, histopathological diagnoses were also retrieved. Statistical Analysis Used: Sensitivity, specificity, PPV, NPV, and diagnostic accuracy were estimated using a histological diagnosis as the gold standard for each of the five categories.

Results: Out of 200 cases 106 had histopathological concordance. Five categories - insufficient, benign, atypical, suspicious, and malignant of the IAC Yokohama system were 1.00%, 62.50%, 4.50%, 1.50%, and 30.50%, Category1(1%), category2 (62.5%), category3 (4.5%), category4(1.5%), category5 (30.5%). When malignant, suspicious, and unusual cases were taken into account as positive test findings, the highest level of sensitivity (90.60%) was attained. The maximum specificity (100%) was seen when only malignant patients were taken into account as positive test findings, but the highest diagnostic accuracy (96.22%) was shown when the malignant and suspect categories were taken into account as positive test results.

Conclusion: FNAC using the Yokohama system for reporting is an accurate diagnostic tool for breast lumps. The system provides a standardized framework for reporting FNAC findings, and studies have reported high sensitivity and specificity rates for diagnosing breast lumps using FNAC. Therefore, FNAC can be used with histomorphology to ensure accurate diagnosis and appropriate management of breast lumps.

Keywords: Pathology; Histomorphology; Diagnosis

INTRODUCTION:

Women are becoming more aware of the condition and the anxiety and stress that go along with it, leading them to mistakenly diagnose every breast symptom as carcinoma and requiring them to seek medical attention. Sometimes, a suspicious lump's benignity or malignancy cannot be determined only via clinical examination [1].

In India, the occurrence rate is up to 26 for every 100,000 females, whereas the death rate is just 13 per 100,000 females [2]. Breast carcinoma is the most frequent cancerous tumor and the cause of 18.4% of all women's malignancies globally, tumors are becoming more prevalent because of their rising occurrence, morbidity, and mortality. The ability to distinguish a benign from a cancerous lesion is the clinical pathologist's primary concern because it is the greatest cause of tumor-related mortality in females [3, 4].

Under the supervision of ultrasound, fine needle aspiration is a quick, inexpensive, and less-invasive diagnostic test for both palpable and non-palpable breast lesions. Nowadays, however, the use of a core needle biopsy has become more common since it enables assessment of both histological grade and hormonal state (estrogen receptor (ER), progesterone receptor (PR), and the receptor for human epidermal growth factor (Her2)). A triple test that includes a diagnostic test, mammography, and FNAC is the gold standard for determining whether a breast mass is benign or malignant [5].

FNAC has a strong predictive value of 100% and a high sensitivity of 90%–95% for the detection of breast cancer [6]. It has a meager false-positive rate concerning FNAC's of fibroadenomas and papillary tumors of the mammary and a lower detection rate for reduced ductal and lobular cancers [7-9].

The IAC Yokohama Breast FNAC reporting System was created with the help of surgeons, oncologists, radiologists, and a group of knowledgeable cytopathologists. To enhance the interpretation of breast cytology, a standard reporting method has been devised. Moreover, it attempts to enhance physician and cytopathologist interaction by connecting the review system with available management alternatives [10]. The present study aims at classifying the breast FNACs according to the IAC Yokohama system and evaluating their correlation with histomorphology.

2. Methodology

This is retrospective research performed in a tertiary care center and medical college in which all the fine needle aspirates for breasts were done over 18 months (FNAC corresponding to 200 patients) and were retrieved after approval from the institutional ethics committee. All women with breast lumps undergoing FNAC's gave their complete informed consent to participate in the study.

2.1 Inclusion Criteria: All cases of breast lumps undergoing FNAC's and patients giving consent for the study are involved in the research.

2.2 Exclusion Criteria: Cases that had a recurrence of malignancy without giving consent were excluded from the research.

FANC's were performed by pathologists using a 22 G needle in a 10-ml syringe. For the PAP stain, smears were fixed in 100% alcohol, and air-dried smears were used for the MGG stain. Haematoxylin and eosin (H & E), Papanicolaou, and Giemsa stains were used to stain smears. Also, clinical information was obtained, and all cases were grouped into five categories by the IAC Yokohama reporting system. Reporting criteria for breast lump by Yokohama system is –

Category 1 – Insufficient or Inadequate
Category 2- Benign
Category 3- Atypical
Category 4 – Suspicious of malignancy
Category 5 – Malignant

In 200 instances, histopathological diagnosis, which was regarded as the gold standard, was available. Core biopsy, excisional/incisional biopsy, or resected specimens were used for histological reporting. Routine processing with H & E stained sections was used for Histo-pathology reporting and ancillary techniques were used wherever necessary. Correlative cytological samples and histopathological slides were compared. These results were used to estimate the Fine Needle Aspiration Cytology test's sensitivity, specificity, positive predictive value, and negative predictive value.

Results:

The age distribution of cases was analyzed, and it was found that the highest number of cases (60, 30.00%) occurred in the age group of 17-25 years. The age group of 26-35 years had 45 cases (22.50%), while the age group of 36-45 years had 33 cases (16.50%). The age group of 46-55 years had 39 cases (19.50%), and the remaining 23 cases (11.50%) were observed in the age group above 55 years.

Table 1. Distribution of age group

Age group (years)	Cases	Percentage
17-25	60	30.00%
26-35	45	22.50%
36-45	33	16.50%
46-55	39	19.50%
above 55	23	11.50%

Table 2. DPercentage of benign and malignant cases in HPE

Type of tumor	Cases	Percentage
Benign	139	69.50%
Malignant	61	30.50%
Total	200	100.00%

Table 3. Categories among the cases

Category	Cases	Percentage
1	2	1.00%
2	125	62.50%
3	9	4.50%
4	3	1.50%
5	61	30.50%
Total	200	100.00%

139 cases out of 200 were diagnosed as benign, which accounts for 69.50% of the total cases. This indicates that the majority of the tumors observed in the study were benign and 61 out of 200 cases were diagnosed as malignant.

The distribution of cases into five different categories numbered 1 to 5. Category 1 has only 2 cases, representing 1.00% of the total cases. Category 2 is the most common category, with 125 cases representing 62.50% of the total cases. Category 3 has 9 cases, accounting for 4.50% of the total cases. Category 4 has only 3 cases, making up 1.50% of the total cases. Finally, category 5 has 61 cases, which represent 30.50% of the total cases and is the second most common category in the research.

According to Table 3, the majority of cases, 154 out of 200, or 77%, were diagnosed in the Upper Outer Quadrant (UOQ) of the organ or body part. The next most common quadrant was the Upper Inner Quadrant (UIQ), which accounted for 19 out of 200 cases, or 9.50%. The Lower Outer Quadrant (LOQ) had 16 cases, representing 8% of

Table 4. Types of quadrants in breast cancer.

Types of quadrant	Cases	Percentage
Upper inner quadrant (UIQ)	19	9.50%
Upper outer quadrant (UOQ)	154	77.00%
Lower outer quadrant(LOQ)	16	8.00%
Lower inner quadrant (LIQ)	11	5.50%
Total	200	100.00%

Table 5. Distribution of FNAC

S. No	FNAC	Cases	Percentage
1	Fibroadenoma	32	16.00%
2	Fibrocystic disease of the breast	6	3.00%
3	Breast abscess	19	9.50%
4	Benign lesions disease	125	62.50%
5	Malignant	11	5.50%
6	Fibrofatty tissue	7	3.50%
7	Total	200	100.00%

the total cases, while the Lower Inner Quadrant (LIQ) had 11 cases or 5.50% of the total cases.

According to Table 4, the most common condition observed in the FNAC test was benign lesions disease, with 125 cases, or 62.50% of the total cases. The next most common condition was Fibroadenoma, with 32 cases, or 16.00% of the total cases. Breast abscesses accounted for 19 cases or 9.50% of the total cases. Malignant cases were observed in 11 instances or 5.50% of the total cases. Fibrofatty tissue was seen in 7 cases, or 3.50% of the total cases. Finally, fibrocystic disease of the breast was found in only 6 cases or 3.00% of the total cases.

The data shows that Fibroadenoma was the most prevalent condition detected in the histopathology examination, accounting for 66.04% (70 cases) of the total cases. Fibrocystic disease of the breast was the second most common condition observed, with 8.49% (9 cases) of the total cases, followed by Breast abscess with 11.32% (12 cases) of the total cases. Gynecomastia was present in 4.72% (5 cases) of the total cases, while Phylloid tumor was found in only 0.94% (1 case) of the total cases. Tubular adenoma accounted for 3.77% (4 cases) of the total cases, and Ductal cell carcinoma was detected in 4.72% (5 cases) of the total cases.

The data indicates that there was only one case in Category 1 where the cytological and histopathological diagnoses did not agree. For category 2, out of the total of 73 cases, 72 cases showed agreement between cytology and histopathology, while only one case showed disagreement. In Category 3, out of the three cases, two cases showed agreement while one case showed disagreement. Both cases in Category 4 showed agreement between the two diagnostic techniques. In Category 5, all 27 cases showed agreement between cytology and histopathology. The discrepancies between the two techniques may be due to various factors such

Table 6. Distribution of cases in HPE

S. No	Histopathology	Cases	Percentage
1	Fibroadenoma	70	66.04%
2	Fibrocystic disease of the breast	9	8.49%
3	Breast abscess	12	11.32%
4	Gynecomastia	5	4.72%
5	Phylloid tumor	1	0.94%
6	Tubular adenoma	4	3.77%
7	Ductal cell carcinoma	5	4.72%
8	Total	106	100.00%

Table 7. Concordance and discordance of cases

Cytological category	Histopathological concordance	Histopathological discordance	Total cases
1	0	1	1
2	72	1	73
3	2	1	3
4	2	0	2
5	27	0	27

as technical errors or differences in their sensitivity or specificity.

FNAC and histopathology have a diagnostic accuracy of 96.22%, with a sensitivity of 90.60%, specificity of 100%, PPV of 100%, and NPV of 96.05%. These findings suggest that the test is highly reliable in detecting both positive and negative cases.

Discussion:

Breast lumps are common among women, and their diagnosis is critical in determining appropriate management. Fine needle aspiration cytology (FNAC) is a widely used technique for diagnosing breast lumps. The Yokohama system for reporting FNAC is a standardized reporting system used in many countries for diagnosing breast lumps. The system provides a standardized framework for reporting FNAC findings and helps to minimize diagnostic errors. [11]

In a current study majority of 60 (30.00%) patients were in the age group 17 to 25 years followed by the 26 to 35 years age group where 45 (22.5%) cases were observed. Bisht et al. [12] According to research, fibroadenoma is the most prevalent breast lump in women between the ages of 20 and 40 (68.7%). Four instances (7.8%) of breast cancer were discovered in people between the ages of 50 and 70, with invasive ductal cell carcinoma being the most prevalent kind.

In a current study out of 200 cases, 139 cases were diagnosed as benign, which accounts for 69.50% of the total cases, and the remaining 61 (30.50%)cases were diagnosed as malignant. Similar observations were seen in the Bisht et al [12]study in which out of 51 cases 47

Table 8. Diagnostic Accuracy of FNAC and histopathology are as follows.

Parameters	Percentage
Sensitivity	90.60%
Specificity	100%
PPV	100%
NPV	96.05%
Diagnostic Accuracy	96.22%

Table 9. Distribution of breast lump by Yokohama system IAC Yokohama System in various published studies

Studies	Insufficient	Benign	Atypical	Suspicious of Malignancy	Malignant	Total
Present	1%	62.50%	4.50%	1.50%	30.50%	200
De Rosa et al. [15]	19.2%	36.9%	10.8%	4.7%	28.4%	4624
Apuroopa et al. [16]	4.3%	58%	17.7%	7.2%	12.8%	900
Mc Hugh et al. [17]	9%	47%	7%	11%	26%	695
Kamatar et al. [14]	5%	71%	1%	2%	21%	470
Wong et al. [18]	11.2%	72%	4.3%	2.2%	10.3%	2696
Agarwal et al. [19]	19%	50.2%	6.6%	3.8%	20.4%	1205
Ahuja and Malviya [13]	3.6%	69.5%	6.3%	2.3%	18.2%	537
Montezuma et al. [20]	5.77%	73.38%	13.74%	1.57%	5.54%	3625

(92%) cases were diagnosed as benign and 4 (8%) were diagnosed as malignant.

By enhanced communication between doctors and pathologists, the usage of a standardized reporting system will contribute to the repeatability of findings between other institutions and better treatment of patients.

In a current study, 22 G needle aspirates from the breast were retrospectively categorized according to the IAC Yokohama Reporting System. The current study had 1.00% insufficient, 62.50% benign, 4.50% atypical, 1.50% suspicious, and 30.50% malignant lesions, respectively. This distribution of cases is similar to the outcomes obtained by Ahuja and Malviya [13] and Kamatar et al [14].

A current study result showed that in the majority of cases, 154 out of 200 were diagnosed in the upper outer quadrant (77.00%). This finding was observed in most of the published studies in a different region of women and the Chan et al study resulted in breast cancer most occurring in the UO quadrant (60.9%)

In the present study, the cytology histological correlation was 66.04% for fibroadenoma and 8.49% for fibrocystic disease of the breast. 70 cases were diagnosed histologically as fibroadenoma, 9 were a fibrocystic disease, one case of benign breast disease as a phylloid tumor, and four cases of benign breast disease as tubular adenoma.

The diagnostic accuracy of FNAC in diagnosing breast

lumps using the IAC Yokohama system has been extensively studied. In a current study, FNAC and histopathology have a diagnostic accuracy of 96.22%, with a sensitivity of 90.60%, specificity of 100%, PPV of 100%, and NPV of 96.05%. These findings suggest that the test is highly reliable in detecting both positive and negative cases. Similar findings were observed in Ahuja and Malviya [13], Bisht et al [12], and Gardas V et al [22] studies have reported high specificity and Positive predictive value cases, in which specificity cases were 100% and positive predicative cases were100%. These results indicate that FNAC is an accurate diagnostic tool for breast lumps.

In current research out of the total of 73 cases, 72 cases showed agreement between cytology and histopathology, while only one case showed disagreement. In Category 5, all 27 cases showed agreement between cytology and histopathology. However, correlation with histopathology is essential to ensure accurate diagnosis and appropriate management of breast lumps. Studies have reported high correlation rates between FNAC and histomorphology. These results indicate that the Yokohama system for reporting FNAC is an accurate diagnostic tool for breast lumps, and it can be used in conjunction with histomorphology to ensure accurate examination and appropriate management of breast lumps.

Limitation

The study only evaluated the examination accuracy of FNAC for breast lumps using the Yokohama system for reporting and did not consider other reporting systems or diagnostic techniques.

Table 10. Distribution of cases in FANC in the published study

FANS	Current study	Bisht et al.[12]
Fibroadenoma	32(16.00%)	31 (60.8%)
Fibrocystic disease of the breast	6(3%)	2(3.9%)
Breast abscess	19(9.50%)	4(7.9%)
Benign lesions disease	125(62.50%)	11(21.5%)
Malignant	11(5.50%)	2(3.95%)
Fibrofatty tissue	7(3.50%)	1(2%)

Table 11. Distribution of cases of HPE in the published study

HPE	Current study	Bisht et al.[12]
Fibroadenoma	70(66.04%)	3.5(68.6%)
Breast abscess	12(11.32%)	4(7.8%)
Fibrocystic disease of the breast	9(8.49%)	3(5.9%)
Gynecomastia	5(4.72%)	1(2%)
Phylloid tumor	1(0.94%)	1(2%)
Tubular adenoma	4(3.77%)	1(2%)
Ductal cell carcinoma	5(4.72%)	1(2%)

Conclusion:

FNAC using the Yokohama system for reporting is an accurate diagnostic tool for breast lumps. The system provides a standardized framework for reporting FNAC findings, and studies have reported high sensitivity and specificity rates for diagnosing breast lumps using FNAC. Correlation with histomorphology is essential to ensure accurate diagnosis and appropriate management of breast lumps. Therefore, FNAC can be used with histomorphology to ensure accurate diagnosis and appropriate management of breast lumps. For a better treatment of patients and management, the authors propose regularly integrating this method into cytopathology reporting.

References:

1. Yong WS, Chia KH, Poh WT and Wong CY. A comparison of trust biopsy with fine needle aspiration cytology in the diagnosis of breast cancer. Singapore Med J. 1999; 40(9): 587-589.
2. Gupta S. Breast cancer: Indian experience, data, and evidence. South Asian J Cancer. 2016;5:85-6.
3. Rahman MZ, Islam S. Fine Needle Aspiration Cytology of Palpable Breast Lump: A Study of 1778 Cases. Surgery S12:001. doi 10.4172/2161- 1076.S12-001.
4. Obaseki DE, Olu-Edo AN, Ogunbiyi JO. Diagnostic accuracy of fine needle aspiration cytology of palpable breast masses in Benin City, Nigeria. West Afr J Med. 2010; 29(4):259-262. PubMed.
5. Jindal U, Singh K, Kochhar A. Fine Needle Aspiration Cytology of Breast Lumps with Histopathological Correlation: A Four Year and eight-month study from rural India. Internet J Pathol. 2012; 13(3).
6. Wang M, He X, Chang Y, Sun G, Thabane L.Asensitivity and specificity comparison of fine needle aspiration cytology and core needle biopsy in the evaluation of suspicious breast lesions: A systematic review and meta-analysis. Breast 2017;31:157-6
7. Hoda RS, Brachtel EF. International Academy of Cytology Yokohama system for reporting breast fine-needle aspiration biopsy cytopathology: A review of predictive values and risks of malignancy. Acta Cytol 2019;63:292-301.
8. Wong S, Rickard M, Earls P, Arnold L, Bako B, Field AS. The international academy of Cytology Yokohama system for reporting breast fine needle aspiration biopsy cytopathology: A single institutional retrospective study of the application of the system categories and the impact of rapid onsite evaluation. Acta Cytol 2019;63:280-91.
9. Montezuma D, Malheiros D, Schmitt FC. Breast fine needle aspiration biopsy cytology using the newly proposed IAC Yokohama system for reporting breast cytopathology: The experience of a single institution. Acta Cytol 2019;63:274-9
10. Field AS, Raymond WA, Rickard M, Arnold L, Brachtel EF, Chaiwun B, et al. The international academy of Cytology Yokohama system for reporting breast fine-needle aspiration biopsy cytopathology. Acta Cytol 2019;63:257-73
11. Wai CJ, Al-Mubarak G, Homer MJ, Goldkamp A, Samenfeld-Specht M, Lee Y, et al. A modified triple test for palpable breast masses: The value of ultrasound and core needle biopsy. Ann Surg Oncol 2013;20:850-5.
12. Bisht DS, Sharma H, Sharma DJ, Upadhyay V. To compare the diagnostic accuracy of FNAC with histopathology in benign and malignant breast lumps. Indian J Pathol Oncol 2022;9(2):107-111
13. Ahuja S, Malviya A. Categorization of breast fine needle aspirates using the international academy of Cytology Yokohama system along with the assessment of the risk of malignancy and diagnostic accuracy in a tertiary care center. J Cytol 2021;38:158-63
14. Kamatar P, Athanikar V, Dinesh US. Breast fine needle aspiration biopsy cytology reporting using international academy of Cytology Yokohama system-two year retrospective study in the tertiary care center in Southern India. National Journal of Laboratory Medicine 2019;8:PO01-3.
15. De Rosa F, Migliatico I, Vigliar E, Salatiello M, Pisapia P, Iaccarino A, et al. The continuing role of breast fine-needle aspiration biopsy after the introduction of the IAC Yokohama system for reporting breast fine-needle aspiration biopsy cytopathology. Diagn Cytopathol 2020;48:1244-53.

16. Apuroopa M, Chakravarthy VK, Rao DR. Application of Yokohama system for reporting breast fine needle aspiration cytology in correlation with histopathological and radiological findings. Annals Pathol Lab Med 2020;7:A210-5.
17. McHugh KE, Bird P, Sturgis CD. Concordance of breast fine needle aspiration cytology interpretation with subsequent surgical pathology: An 18-year review from a single sub-Saharan African institution. Cytopathology 2019;30:519-25
18. Wong S, Rickard M, Earls P, Arnold L, Bako B, Field AS. The international academy of Cytology Yokohama system for reporting breast fine needle aspiration biopsy cytopathology: A single institutional retrospective study of the application of the system categories and the impact of rapid onsite evaluation. Acta Cytol 2019;63:280-91.
19. Agarwal A, Singh D, Mehan A, Paul P, Puri N, Gupta P, et al. Accuracy of the International Academy of Cytology Yokohama system of breast cytology reporting for fine needle aspiration biopsy of the breast in a dedicated breast care setting. Diagn Cytopathol 2021;49:195-202.
20. Montezuma D, Malheiros D, Schmitt FC. Breast fine needle aspiration biopsy cytology using the newly proposed IAC Yokohama system for reporting breast cytopathology: The experience of a single institution. Acta Cytol 2019;63:274-9.
21. Chan et al. Evaluation of the association between quantitative mammographic density and breast cancer occurred in different quadrants. BMC Cancer (2017) 17:274
22. Gardas V. Cytological study of breast lumps with histopathological correlation. Indian J Basic Appl Med Res. 2018;7:185–92.