Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/16073
DOI URL: http://dx.doi.org/10.21474/IJAR01/16073

RESEARCH ARTICLE

EVALUATION OF APPLICABILITY OF YOKOHAMA SYSTEM FOR REPORTING OF BREAST FINE NEEDLE ASPIRATION CYTOLOGY: A RETROSPECTIVE STUDY IN A TERTIARY CARE CENTER

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Manuscript Info

Manuscript History
Received: 25 November 2022
Final Accepted: 27 December 2022
Published: January 2023

Key words:-
Breast Cancer, Yokohama System, Fine Needle Aspiration Cytology

Abstract

Background: Breast cancer is most common cancers in reproductive women and also the leading cause of cancer deaths worldwide. First line of invasive investigation of breast lump is Fine needle aspiration cytology (FNC) to categorized the lesion as benign or malignant. Recently, an expert panel published [International Academy of Cytology](IAC) Yokohama System for reporting and classification of breast lump cytopathology. The aim of the present study was to evaluate the applicability of Yokohama system of classification and reporting.

Materials and Methods: In this retrospective studya total of 612 breast FNC cytology specimens from 1st January 2021 to 31st October 2021 were obtained. These were reclassified according to Yokohama system of reporting. The Risk of malignancy (ROM), sensitivity, specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV) and diagnostic accuracy of breast FNC were calculated.

Result: Out of 612 cases histo-pathological correlation were available in 355 cases. ROM is calculated for each category of Yokohama system. ROM for each category was 10% for category 1, 2.5% for category 2, 44.4% for category 3, 100% for category 4 and 5. Sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of FNAC were respectively 94.3%, 96.2%, 89.1%, 98.4% and 99.1% , respectively.

Conclusion: In conclusion, the IAC Yokohama System for reporting Breast cytopathology is simple but it simultaneously enables greater diagnostic accuracy, consequently leading to better patient care.

Introduction:-

As per GLOBOCONBreast cancer is most common malignancy followed by carcinoma of cervix. It is most common cause of female death in developed countries whereas it is second most cause of death in developing countries.[1] Fine needle aspiration cytology (FNC) plays a significant role in the detecting malignancy in breast lump. This minimally invasive procedure has various advantages in term of least painful, out patient procedure,

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early diagnoses, cost effective and psychological less traumatic.[2]Therefore, highly acceptable by doctors and patients.

During FNAC additional sample can be used for making cell blocks for immunocytochemistry to identify prognostic and therapeutic markers. Cells collected can also be used for microbiological testing, polymerase chain reaction (PCR) and other molecular testing[3] Hence, FNC done by experienced cytopathologist and coupled with imaging finding , clinical details becomes highly specific and sensitive test. Most of the time FNC enables cytopathologist to accurately diagnose malignant and benign breast lumps.[4]

The International Academy of Cytology (IAC) executive council in 2016 put together a breast group with the aim of creating a standardized and comprehensive method for breast FNAC reporting.[5]This breast group has decided to use a five category system to report any breast lumpHowever, due to limited data available in literature, Yokohama System for Reportingis still not uniformally used by most of the institutions. [6-8]

Aim:-

The aim of the present study was to evaluate the applicability of the Yokohama system of reporting breast FNC and to assess the diagnostic accuracy and the risk of malignancy (ROM) for each diagnostic category.

Materials And Methods:-

This retrospective study was conducted in pathology department in North India tertiary health care center. A search of the database was carried out focusing on patients who underwent breast lump FNC between 1st January 2021 to 31st October 2021. Their cyto histopathology radiological records were retrieved. Data were recorded like age, sex, clinical history, radiological location, ancillary studies and final diagnosis.

Every patients's original diagnosis was reviewed and then it was reclassified according to the Yokohama system classification like Category 1 – insufficient material, category 2 – benign, category 3 – atypical, probably benign, category 4 – suspicious for malignancy, category 5 – malignant.All lesions (including fibroadenoma, acute/chronic inflammatory disease, fibrocystic change, galactocoele, fat necrosis , benign Phyllodes tumors, atypical ductal hyperplasia and papilloma) were considered as benign and all invasive carcinomas like duct carcinoma,sarcomas, borderline and malignant Phyllodes tumors, and lymphomas were considered as malignant.

To assess the risk of malignancy (ROM) and diagnostic accuracy first cyto histopathological correlation was done when patient managed conservatively, clinical follow-up was done.

Statistical analysis

The rates of malignancy (malignant cases/overall cases) with exact 95% Confidence intervals were calculated for each category. The sensitivity, specificity, positive predictive value, negative predictive value with the 95% confidence interval was calculated. Overall diagnostic accuracy of breast FNC was also assessed.

Risk of malignancy (ROM) was calculated by dividing the number of cases with a confirmed malignant lesion by the total number of cases with a histological or clinical follow-up within each diagnostic category.

Results:-

Overall, 612 breast lump FNCs were performed from patients of all ages, ranging from 12 to 67 years (mean age 24.6 years) and both sex (n = 594 females (97%)and n= 18 men (2.9%). Breast lump size ranged from 5 to 90 mm.A total of 612 cases were re-categorized according to IAC Yokohama reporting system.(Table -1)

Table 1:- Summary of Yokohama system of reporting categories.

	N=612	**PERCENTAGE**
Category1,Inadequate/Non-diagnostic	24	3.9%
Category2, Benign	481	78.6%
Category3, atypical probably benign	9	1.5%
Category4, Suspicious	7	1.1%

Category5,Malignant	91	14.8%

Out of 612 cases histopathological correlation were available in 355 cases (Table 2) .

Table 2:- Correlation between Yokahoma system of reporting categories and matched histopathological finding.

Yokohama system reporting categories	**Histo-pathological correlation**	**Lost to follow up**	**Total**
Category1,Inadequate/Non-diagnostic	10	12	24
Category2, Benign	240	241	481
Category3, atypical probably benign	9	0	9
Category4,Suspicious	7	0	7
Category5,Malignant	89	2	91

ROM is calculated for each category of Yokohama system. ROM for each category was 10% for category 1, 2.5% for category 2, 44.4% for category 3, 100% for category 4 and 5 (Table 3).

Table 3:- Risk of malignancy (ROM) in the Yokohama system of reporting categories.

Yokohama system reporting categories	**Histological Confirmed Malignant Lesion**	**Risk of Malignancy (ROM)**
Category1,Inadequate/Non- diagnostic	1	10%
Category2, Benign	6	2.5%
Category3, atypical probably benign	4	44.4%
Category4,Suspicious	7	100%
Category5,Malignant	89	100%

Sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of FNAC were respectively 94.3%, 96.2%, 89.1%, 98.4% and 99.1%(Table 4).

Table 4:- Statistical analysis of Breast lump FNC.

STATISTIC	**VALUE**	**95%CI**
Sensitivity	94.3%	92.51% to 98.81%
Specificity	96.2%	92.43% to 98.47%
Positive predictive value	89.1%	84.64% to 96.38%
Negative predictive value	98.4%	92.80% to 99.51%
Accuracy	99.1%	94.03% to 99.81%

Discussion:-

In making the diagnosis of Breast lump paramount role of FNC cannot be denied. Having said that FNC has added advantages in term of least painful, out patient procedure, rapid diagnoses, cost effective and psychological less traumatic.[2,5] In clinical set up a triple assessment approach which comprised of clinical, radiologic and pathologic information is warranted in achieving a accurate diagnoses of breast lesion.[9,10]

Till 2016 worldwide there was no uniform system of reporting. Then the IAC Yokohama reporting system was introduced to standardized the breast reporting. This enables the reproducibility of reports and the communication between pathologists and attending clinician that ultimately leads to better patient management.[2,5]

In current study, we re-categorized 612 breast FNC cases in agreement with the IAC Yokohama reporting system and the distribution of our samples according to IAC Yokohama system are comparable to studies by Murari Apuroopa et al.,[11]Kamatar PV et al.,[12]Montezuma D et al.,[13] and Wong S et al.[14] (Table 5)

Table 5:- Summury of other studies according to IAC Yokohama system.

Yokohama system reporting categories	Our study	Murari Apuroopa et al. [11]	Kamatar PV et al. [12]	Montezuma D et al. [13]	Wong S et al. [14]
Category1,Inadequate/Non-diagnostic	24(3.9%)	39 (4.3%)	22 (5%)	209 (5.77%)	301 (11%)
Category2, Benign	481(78.6%)	522(58%)	332 (71%)	2660 (73.38%)	1937 (72%)
Category3, atypical probably benign	9 (1.5%)	160 (17.7)	7 (1%)	498 (13.74%)	117 (4.3%)
Category4, Suspicious	7 (1.14%)	63 (7.2%)	8 (2%)	57 (1.57%)	59 (2.2%)
Category5, Malignant	91(14.86%)	116 (12.8%)	101 (21%)	201 (5.54%)	278 (10%)
Total	612	900	470	3625	2696

When we calculated the associated ROM for each category, we observed ROM for category 4 and 5 is 100% where as ROM for category 3 has ROM of 44.4% which is higher then the other studies which may be due sampling error and 3 cases turned out to be DCIS.ROM of the category 1 is 10.0%, which also slightly higher then other studies but it can be explained by fact that inadequate material aspirated in small lesions. Category 2 benign showed a ROM of 2.5%.In this COViD pandemic time we had lesser then expected histopathological correlation of the benign caseswere available. Malignant cases were given importance then the benign ones. The less serious cases were advised to stay at home and to avoid crowding. ROM observed in our study was found to comparable with those obtained byMurariApuroopa et al.,[11]Poornima V Kamatar et al.,[12]Montezuma D et al. [13] (Table 6)

Table 6:- Summaries of calculated ROM of studies.

Yokohama system reporting categories	Our study	Murari Apuroopa et al. [11]	Kamatar PV et al. [12]	Montezuma D et al. [13]
Category1,Inadequate /Non-diagnostic	10%	0.3(0.07,0.65 CI)	0%	4.8%
Category2, Benign	2.5%	0.05(0.01,0.13 CI)	4%	1.4%
Category3, atypical probably benign	44.4%	0.25(0.14,0.40 CI)	66%	13%
Category4, Suspicious	100%	0.71(0.48,0.89 CI)	83%	97.1%
Category5, Malignant	100%	0.997(0.98,1CI)	99%	100%

In the present study, we found 95.9%, 97.89%, 96.79%, 97.64% and 98.57% were sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of FNAC, respectively The results are comparable withMurariApuroopa et al.,[11]Kamatar PV et al., [12] Montezuma D et al. [13] and Moschetta M et al. [15] (Table-7)

Table 7:- Summary of sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of breast FNAC.

Statistical parameter	Our study	Murari Apuroopa et al. [11]	Kamatar PV et al. [12]	Montezuma D et al. [13]	Moschetta M et al [15]
Sensitivity	94.3%	0.915(0.881,0941CI)	94.59%	97.56%	97%
Specificity	96.2%	0.991(0.952,1CI)	98.9%	100%	94%
Positive predictive value	89.1%	0.997(0.983,1CI)	98.59%	100%	91%
Negative predictive	98.4%	0.783(0.707,0.848CI)	95.74%	98.62%	98%

value					
Accuracy	99.1%	0.933(0.907,0.954CI)	96.97%	99.11%	95%

Conclusion:-

In conclusion, the IAC Yokohama System for reporting Breast cytopathology is simplebut it simultaneously enables greater diagnostic accuracy consequently, leading to better patient care .

Limitation of the study:
Our study was retrospective in nature.

Financial support and sponsorship:
Nil.

Conflicts of interest:
There are no conflicts of interest.

Informed consent statement:
Not applicable.

Acknowledgement:-

Mrs. Priya, Mrs. Lata and Mrs. Saroj for giving technical support.

Reference:-

1. Ferlay J, Soerjomataram I, Ervik M, Dikshit R, Eser S, Mathers C, et al. GLOBOCAN 2012: Estimated Cancer Incidence, Mortality and Prevalence Worldwide in 2012 v1.0: IARC CancerBase No. 11. Lyon: International Agency for Research on Cancer; 2013.
2. Field AS, Schmitt F, Vielh P. IAC standardized reporting of breast fine-needle aspiration biopsy cytology. Acta Cytol. 2017; 61(1): 3–6.
3. Schmitt F, Vielh P. Fine needle aspiration cytology samples: a good source of material for evaluating biomarkers in breast cancer. Histopathology. 2015;66:314-3150.
4. McManus, DT. & Anderson, N.H. Fine needle aspiration cytology of the breast. Current Diagnostic Pathology 2001;7:262-271Anderson BO. Fine needle aspiration for breast cancer diagnosis: one size does not fit all. J Natl Compr Canc Netw. 2016;14;599-600.
5. Field AS, Schmitt F, Vielh P et al. IAC standardized reporting of breast fine-needle aspiration biopsy cytology. Acta Cytologica 2019;63:257–273
6. Wells CA, Perera R, White FE, Domizio P. Fine needle aspiration cytology in the UK breast screening programme: a national audit of results. Breast. 1999 Oct; 8(5): 261–6.
7. Pisano ED, Fajardo LL, Tsimikas J, Sneige N, Frable WJ, Gatsonis CA, et al. Rate of insufficient samples for fine-needle aspiration for nonpalpable breast lesions in a multicenter clinical trial: The Radiologic Diagnostic Oncology Group 5 Study. The RDOG5 investigators. Cancer. 1998 Feb; 82(4): 679–88.
8. Pisano ED, Fajardo LL, Caudry DJ, Sneige N, Frable WJ, Berg WA, et al. Fine-needle aspiration biopsy of nonpalpable breast lesions in a multicenter clinical trial: results from the radiologic diagnostic oncology group V. Radiology. 2001 Jun; 219(3): 785–92.
9. Kreuzer G, Boquoi E. Aspiration biopsy cytology, mammography and clinical exploration: a modern set up in diagnosis of tumors of the breast. Acta Cytol. 1976 Jul–Aug; 20(4): 319– 23.
10. 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 Mar; 20(3): 850–5.
11. Murari. Apuroopa, V. Kalyan Chakravarthy and D. Ranga rao Application of Yokohama System for Reporting Breast Fine Needle Aspiration Cytology in Correlation with Histopathological and Radiological Findings. Annals of Pathology and Laboratory Medicine, Vol. 7, Issue 4, April, 2020
12. Kamatar PV et al., Breast Fine needle Aspiration Biopsy Cytology Reporting using International Academy of Cytology Yokohama SystemTwo Year Retrospective Study in Tertiary Care Centre in Southern India. National Journal of Laboratory Medicine. 2019 Oct, Vol-8(3): PO01-PO03.
13. 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(Suppl.4):274-79.

14.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(Suppl.4):280-91.

15.Moschetta M. Comparison between fine needle aspiration cytology (FNAC) and core needle biopsy (CNB) in the diagnosis of breast lesions. G Chir- J Surg [Internet]. 2014.