ORIGINAL RESEARCH

Cytopathological evaluation of breast lesions based on the international academy of cytology (IAC) yokohama system for reporting breast fine needle aspiration cytology (FNAC) in a regional cancer centre

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ABSTRACT

Introduction: FNAC, which is a minimally invasive procedure, has developed as the most accurate and cost-effective initial method for guiding the clinical management of the patients with breast lesions. The International Academy of Cytology (IAC), Yokohama system for breast fine needle aspiration cytology(FNAC) established a uniform, tired reporting system for breast FNAC specimens. Using this system, the cytopathologist can communicate breast FNAC interpretations to the referring clinician. Based on this objectives of our study is to standardize the reporting system of breast lesion by FNAC. To assign all reported breast lesions in one of the five diagnostic categories as defined by Yokohama system to maintain the uniformity. To correlate with histopathology whenever possible. To assess the risk of malignancy(ROM). **Materials and Methods:** Following institutional scientific and ethical committee approval, this study was undertaken in the Cytology division of Department of Pathology, Kidwai Memorial Institute of Oncology, over a period from1-dec-2019 to 30-may-2021. This was a descriptive study. All smears from FNAC of breast lesions were interpreted according to IACY okohama system. **Results:** A total of 260 cases of breast lesions were taken during the study period. The demographics constituted 98.1%females and1.90% males with an age range of 13-81years and a mean age of 48.9. The most common lesions were malignant (52.3%), while benign constituted 28.8%. Histopathological analysis were available for 148/260cases. **Conclusion:** FNAC is a reliable, well tolerated diagnostic modality which can be used in diagnosis of breast lesions. Following the IAC Yokohama system, FNA is a useful tool and requires specific training & ongoing experience. Therefore this newly proposed IACY okohama system for reporting breast cytopathology is a simple system that allows greater diagnostic clarity and, consequently, better communication between pathologist and treating clinician, also helps in predicting the ROM.

Keywords: IACYokohama,insufficient,benign,malignant,atypical,suspicious.

INTRODUCTION

Breast cancer is the most common malignancy in woman worldwide with global incidence of about 2.1million cases per year and in India, it is1, 62,468per year[1]. Breast lesions include a spectrum of lesions, from benign to malignant.

Fine needle aspiration is one of the primary investigation widely followed, as it is cost effective and minimally invasive when compared to the core needle biopsy(CNB) which is gold standard[2]. Fine needle aspirate is a simple, rapid, cost-effective, and minimally invasive test for both palpable and impalpable (under ultrasonographic guidance) breast lumps. However, now a days usage of core needle biopsy has gained popularity as it allows evaluation of histological grade as well as hormonal

status[estrogenreceptor(ER)/progesterone receptor (PR)/human epidermal growth factor receptor (Her2)]. Forthediagnosisofbreastcancer,FNAChasahighsensitivityof90%–95%andahigh positive predictive value ~100%[3]. It has a low false-negative rate related to low-grade ductal andlobularcarcinomaandaverylowfalse-positiverateratelatedtoFNAsoffibroadenomasand papillary lesions of the breast.[4-6]

Usingultrasonography(USG)guidanceandrapidon-siteevaluation(ROSE)optimizes the usage of FNAC. The cytological findings should be interpreted along with clinical and radiological findings in the "triple test." With the triple test parameters, the sensitivity and specificity of FNAC is comparable to core needle biopsy.[5]

TheIACYokohamaBreastFNACReportingsystemhasbeendevelopedbyagroupof expert cytopathologists with assistance from surgeons, oncologists, and radiologists. It has beendevelopedtohaveastandardizedreportingsystemtoimprovetheinterpretationofbreast cytology. It also aims at improving communication betweenthe cytopathologist and clinician by linking reporting system with management options.[7]

ActuallytheInternationalAcademyofCytology(IAC)establishedaYokohamasystem for breast fine needle aspiration cytology (FNAC) in 2016intending to develop an internationally recognized and standardized reporting system that would define best practice guidelines for theuseof FNACindiagnosingbreastlesions moreconsistentlyandaccurately.

This guides the clinicians to proceed with management[7]. Our institute being a tertiary cancer center would be ideal to conduct such study. Based in thus aim of our study is to standardize the reportingsystem ofbreast lesions by FNAC. Also to report allreportedbreast lesionsinoneofthe fivediagnosticcategoriesas definedbyYokohamasystemtomaintainthe uniformity and to assess the risk of malignancy.

MATERIALS AND METHODS

This is descriptive study undertaken at cytology division, Department of pathology at KidwaiMemorialInstituteofOncology(KMIO)foraperiodof18monthsfrom2019to2021, to evaluate the cytomorphology of different breast lesions. Institutional approval has been obtained to conduct the study from the hospitalethics committee.

All patients clinically and radiologically diagnosed as breast lesions referred to the cytologydivision of KMIO for routine and image guided FNAC were included in the study. Clinical and radiological data relevant to the case were collected from the patient and case records. Sample size was 260.

Allcases with breast lesion that are referred to Cytologydivision who were clinically andradiologicallyevaluatedforbreastlesionsandarewillingtogiveinformed/writtenconsent were included inthe study. Whereas cases notwilling to giveinformed /written consent and review cases from elsewhere for whichFNAC was done outside were excluded

Clinicaldetailslikeage,gender,radiologicalfindings,and provisional clinical diagnosis were recorded from case files. The anatomical site and size of mass lesions documented by Ultrasonography(USG), mammography were considered. Informed consent before FNA was obtained from the parents/caretakers of patients.

RoutineFNAwasdoneinpalpablelesionswhileUSGguidancewasusedforsmalland difficult lesions.FNAs were performed bytrained cytopathologists with the assistance of an interventional radiologist in the presence of a clinician for clinical monitoring. Two to four smearsweremade foreachcasedependingonthe materialaspirated.SmearsforPapanicolaou's (PAP) stain were immediately fixed. Air-dried smears were stained with May-Grunwald Giemsa (MGG) stain.

Breast FNAC's done was reclassified based on the newly proposed IAC Yokohama System, into five categories and was compared with histopathology, ROM was assessed whenever possible.

Socio demographic variables like the age and gender and the cytological analysis consistingofcytomorphologydiagnosis,histopathology diagnosiswereconsideredasrelevant variablesfortheanalysis.Descriptiveanalysiswascarried outbymeanandstandarddeviation for quantitative variables, frequency and proportion for categorical variable and the final analysis was done with the use of Statistical Package for Social Sciences (SPSS) software version23.0.

RESULTS

Atotalof260casesofbreastFNA(includingbothroutineandUSGguidedFNA)were performedduring this period. The mean ageof the study population was 48.9 years (age range: 13-81 years).The most common being 40 to 49 years age group with 83 patients followed by 50 to 59 years age group. 54 cases were above 60 years in age. Of 260 subjects, there were 255 females constituting to 98.1% and 5 males constituting to1.90%.

The study group showed equal involvement of right and left breast lesions in 124 subjects(47.7%) each respectively. Bilateralbreast involvement seen in 12 subjects (4.60%). Ofthe 260 subjects involved in this study, 121 subjects (46.5%) underwent routine FNA and 139 subjects went through USG guided FNA (53.5%)

All cases were interpreted cytologically and subjected into Yokohama category. The most common interpretationwas categoryV in136 casesconstituting to 52.3% and second is categoryII in 75 cases constituting to 28.8%. 27 case showed sparse cellularityortoo poorly smeared or fixed to allow a cytomorphological diagnosis and were interpreted as category I constituting to 10.4%. There were

15(5.80%) cases interpreted as categoryIV and 7 (2.70%) cases interpreted as category III.

Table1:-DistributionofYokohamadiagnosticcategoryofstudy subjects.

S.No.	Yokohama Category	No. of subjects(%)
1	Category–I	27(10.4)
2	Category–II	75(28.8)
3	Category–III	07(2.70)
4	Category–IV	15(5.80)
5	Category–V	136(52.3)
Total		260(100.0)

Histopathologicalcorrelationwasavailable for 148 casesof260 subjects involved. Of the correlated 148 cases, 118 cases (80%) were categoryV, 26 cases (17.9%) were benign, 1 case(0.7%) of category I, III, IV respectively.

Table 2:-DistributionofHPEresultsofstudysubjects.

Yokohama category	HPEcategories					Totalno.ofstudy subjects
	I	II	III	IV	V	
I	0	6	0	0	9	27
II	1	17	0	0	8	75
III	0	0	1	0	1	7
IV	0	3	0	1	5	15
V	0	0	0	0	95	136
Total	1	26	1	1	118	260

Respective ROMfor each category was calculated ROM is higher for the categoryV with 69.8%.

Table3:-Distribution of ROM of study subjects.

Yokohama category	No of cases(%)	Benign	Malignant	ROM(%)
I	27(10.4)	06	09	33.3
II	75(28.8)	17	08	11.1
III	07(2.70)	00	01	14.3
IV	15(5.80)	03	05	33.3
V	136(52.3)	00	95	69.8

In our study 118 of the 136 subjects interpreted as malignant under category V of Yokohama were fallingin the age group of 40->60 years and 57 cases of the 75 subjects interpreted as benign, categoryIIof Yokohamawere fallingin the age groupof 20- 49 years. Malignant category, category Vof Yokohama has 136casesofwhich134 cases(52.3%)were female and 2 cases (40.0%) were male.

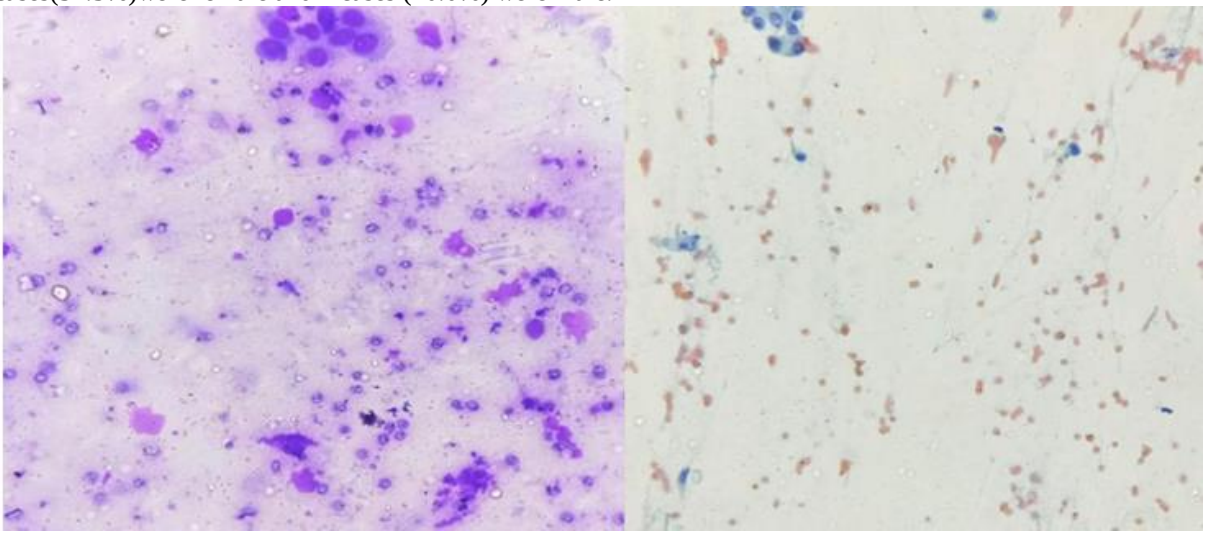

Figure1:MCG andPAPstainsmearofYokohamacategory1-Insufficient/inadequate

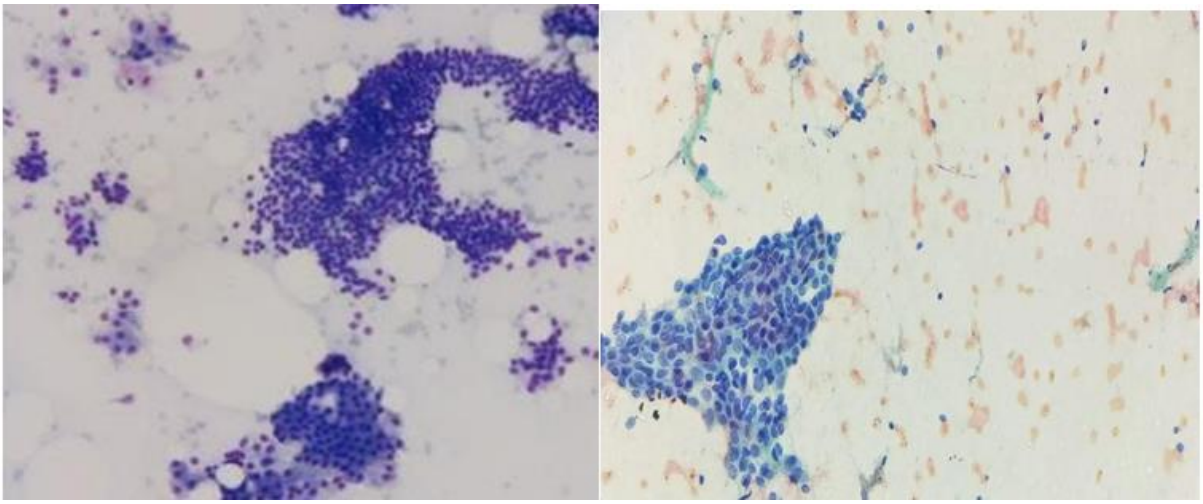

Figure2:MCGandPAPstainsmearofYokohamacategory2-Fibroadenoma

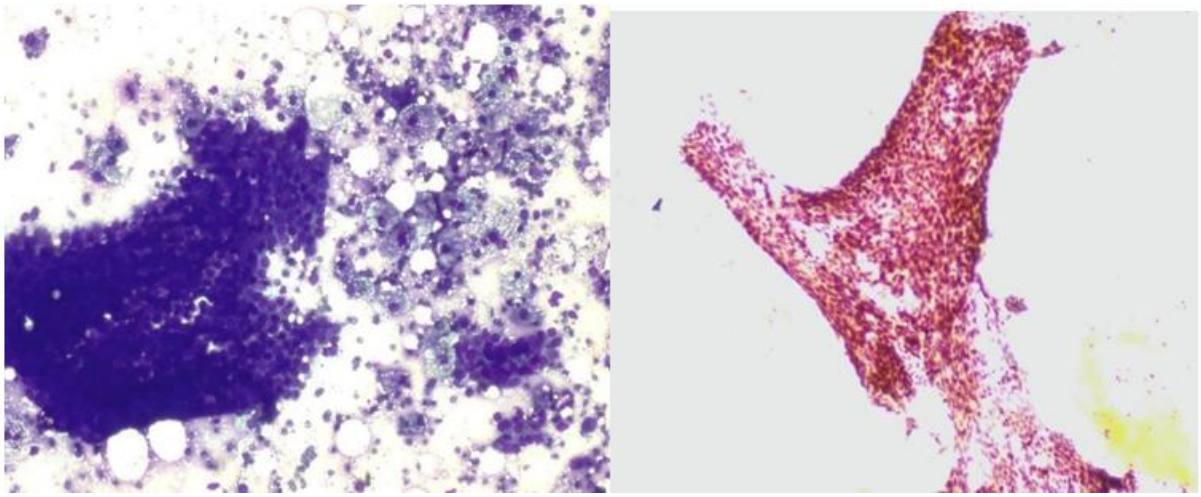

Figure3:MCGand PAPstainsmearofYokohamacategory3-Atypicalcells

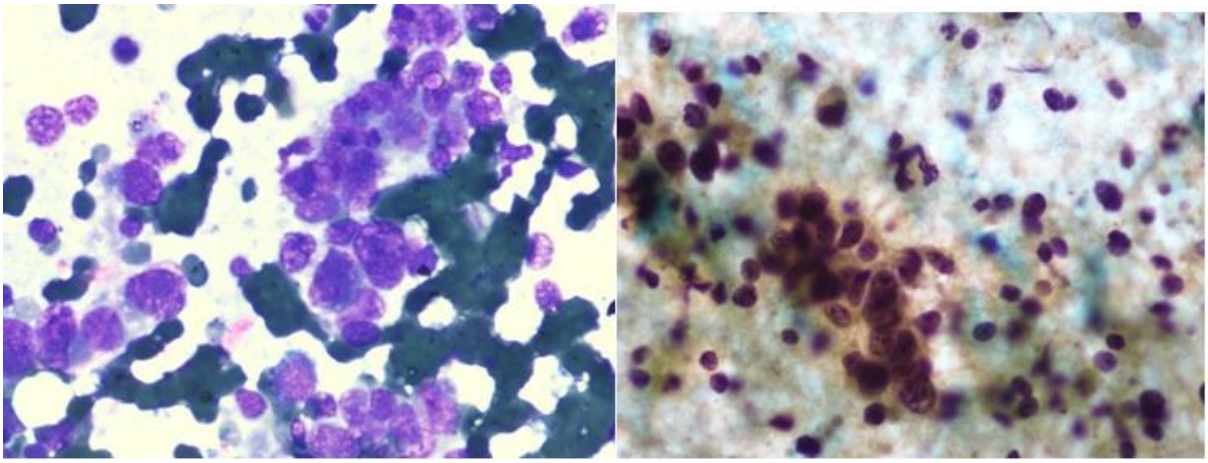

Figure4: MCGandPAPstainsmearofYokohamacategory4-Suspiciousofmalignancy

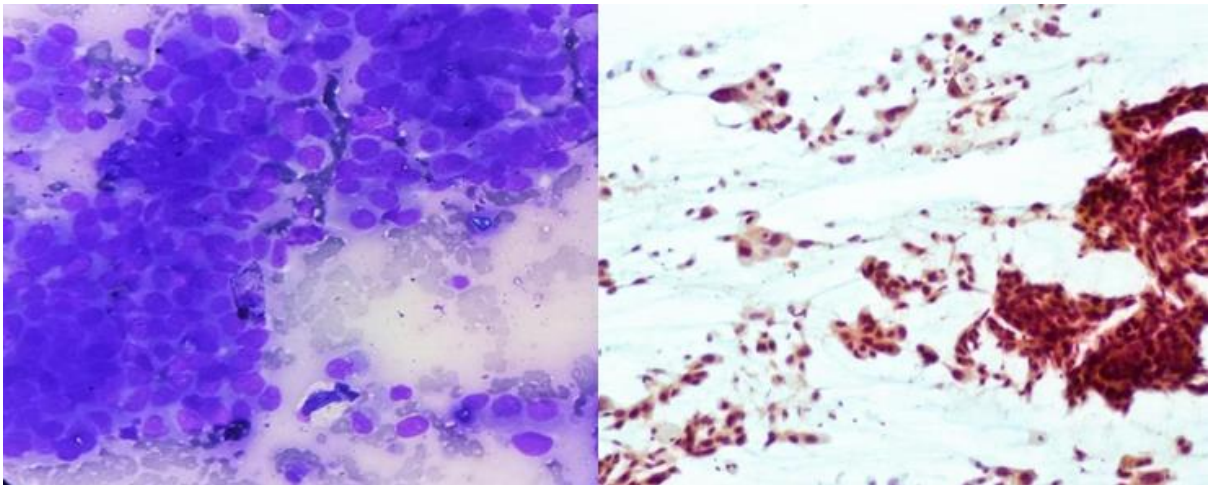

Figure5:MCGandPAPstain smearofYokohama category5- Ductcarcinoma DISCUSSION

Breast cancer is the commonest malignant tumor of all female cancers, and there is increasing incidences, morbidity, and mortality globally. There are various diagnostic modalities by which material/tissue samples can be obtainedfrom the breast. They are Percutaneous FNAC, USG guided FNAC and CNB

Martin and Ellis first introduced the application of FNAC for the diagnosis of breast massesin 1930. Since then it has been established as an essential tool for evaluating breast lesions although CNB is gold standard[8]. Even FNAC material can be used for ancillary techniques like Immunohistochemistry andmolecular testingwith satisfactory results[9].

Cytology material obtained by the FNAC has been shownto providegood quality of DNAand molecular in situ techniques performed on cytology material show an optimal concordance with histology[10]. The least invasive with least amount of turnaround time is the FNAC procedure. Percutaneous FNAC using USG is used for lesions. It offers real time monitoringofsamplecollection.USGguidedFNAisusedf orsmalllesions.Largeandpalpable lesions Routine FNAC is used. FNAC has minimal complication. There were no reported complications of FNAC procedurein this studyother than mild pain and discomfort.

The Yokohama system, which utilizes the triple assessment approach, followed the same criteria in present study. This approach helps assess breast lesions, which combines clinical,radiological, and pathology information to ensure accurate diagnosis and patient management[2,3,11,12]. The IAC Yokohama system for reporting breast FNA cytology defines five categories f orreporting breast cytology and help to stratify breast lesions by their ROM and give a management algorithm for eachcategory.

The ROM was assessed was compared with the recent studies[4-6,13,14]. In the present study it was observedthat ROMamountedto33.3%in category 1 and 10.6% in category 2, as compared with the other studies, we had an increased number of cases reported as insufficient category, probably due to lack of training and experience of radiologist and cytology technician, as the procedure and smearing was done by new traineestudents due to which the materialobtained was sparse and smearing was suboptimal, however iscorrelating with 30.3% ofHoda et almeta-analysis.[4]

InstudydonebyMontezumaetaltherespectiveROMfor eachcategorywas4.8% for category1(insufficient material),1.4%forcategory2(benign),13%forcategory3 (atypical), 97.1%forcategory4(suspiciousformalignancy), and100%for category5(malignant).[6]

A retrospective study by Wong S et al., over a period of 36 months on 2,696 breast FNAC's, where 579 cases with matched histopathology and 456 cases had Rapid Onset evaluation(ROSE),showedlowerROMforcategories1a nd2whencomparedwiththepresent study[5]. Incorporating ROSE helped them in decreasing the percentage of insufficient from 17.1% without ROSE to 4% with ROSE.

A meta-analysis done by Hoda RS and Brachtel EF, included publications between January 1,1997, and December 31, 2017, by reviewing literature obtained a case-cohort of 33,341 breast FNAC's, which was drawn from 27 studies through a PubMed database[4]. They collected data for the number of total cases and each category when available and calculated ROM for each category. Their ROM for the insufficient category was 30.3%, on the higher sidethanother mentionedstudies, however wassimilar to present study[2,6,13]. Theyconcluded that thediagnosticcategoriesofthe newIACYokohamaSystemeachcarryan implied ROM, which increasesfromthebenigntomalignantcategoriesasobser vedinotherstudies,including the present study.

Another studydone by Wai CJ et aldepicted physical examination was 92% accurate (95%confidence interval[CI]0.89-0.96,p<0.0001)atpredictingwhetheramasswasbenign or malignant. Imaging was 88% accurate (95% CI 0.84-0.92, p < 0.0001) and needle biopsy was95% accurate(95% CI 0.92-0.98, p <0.0001).The modifiedtripletest was99% accurate (95% CI 0.98-

1.00, p < 0.0001). Each1-point increment inthe mTTS was associated withan increased risk of cancer, with an odds ratio of 9.73 (CI 5.16-18.4, p < 0.0001)[13]

In an Indian study by Kamatar PV et al., they analyseda totalof 470 cases, obtained betweenJanuary2017andDecember2018,whichinclude d453(96%) femalepatientswith17 (4%)malepatients[14].Theyretrospectivelyreviewedbreas tFNACcases,andtheyalso observedthatROMwasincreasesfrombenigntomalignan tcategoriesasobservedinourstudy and other studies as well.

ChauhanVet al., astudyon468patients, whereintheyhada moresignificant number ofcategory2(Benign)cases,342(73.07%)andcategory4, category5amountingto11(2.35%) and 85(18.16%),when compared with present studywhere we had 52.3% (136) of category five cases, 5.80%(15), 28.8%(75) category four and two respectively[15].

CONCLUSION

FNAC is a reliable, welltolerated diagnostic modalitywhichcan be used indiagnosis ofbreastlesions. FNAC can be used to arrive at a diagnosis. In situations where the patient is too sick and other more invasive methods cannot be used, FNAC becomes the diagnostic modality of choice for the initial management of such patients. The turnaround time with FNACislessthushelpingintheoverallmanagementofpati ents.FollowingtheIACYokohama system, FNA is a useful tool and requires specific training &ongoingexperience.

Thereforethisnewlyproposed IAC Yokohama systemfor reporting breast cytopathologyisa simple systemthat allows greater diagnostic clarity and, consequently, better communication between pathologist and treating clinician, also helps in predictingthe ROM.

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