ORIGINAL RESEARCH

Cytomorphological and histopathological correlation with imaging findings in breast lumps: A retrospective study from a tertiary cancer centre

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ABSTRACT
Background: Breast cancer is the most common cancer in the Indian women accounting for 27.7% of all the female cancers in india. Breast lumps are common which require appropriate workup consisting of clinical examination, imaging and fine needle aspiration cytology. Imaging and cytopathology are crucial in categorising these lesions into benign and malignant. There is a requisite to determine the concordance of these these findings and evaluate the diagnostic efficacy. The objectives is to find the correlation of cytopathological diagnosis with imaging findings for provisional diagnosis of breast lumps and to evaluate the utilisation of fine needle aspiration as a cheap, safe method for preoperative assessment of breast lumps.
Materials and methods: All Fine needle aspiration (FNAC) of breast lumps were included in the study from Jan 2019 to Dec 2020.Their imaging findings were retrieved from the records. Only those with imaging findings were included in this study.
Results: 275 patients came for FNAC for breast lesions, out of these breast Ultrasound/ Mammography findings were available in 255 cases which were included in our study. Cytohistological correlation was obtained in 243 cases. In this sudy the sensitivity-90.3%, specificity=87.41%,positive predictive value (PPV) was 83.18%,negative predictive value (NPV) was 92.9%, with diagnostic accuracy of 88.6% for imaging findings in diagnosis of breast lesions(in comparison with histopathology considered to be gold standard for diagnosis). The Sensitivity was 99.02%, specificity was 99.29%, PPV was 99.02%, NPV was 99.29%, and the diagnostic accuracy was 95.29%for FNAC in diagnosis of breast diseases (considering histopathology as gold standard).
Conclusion: Cytological evaluation is a standardised ideal cheap ancillary method in evaluating the breast lumps which many a times masquerades breast cancers.
Key words: FNAC, cytological diagnosis, imaging, BIRADS, correlation, diagnostic accuracy

INTRODUCTION
Breast cancer is the most common cancer in the Indian women accounting for 27.7% of all the female cancers in India according to GLOBOCON 2018. Accurate diagnosis of breast lesions is made usually by the combination of clinical examination, imaging and fine needle aspiration (FNAC). FNAC was initially conceived to confirm a clinical suspicion of cancer but with time it has become a important tool for preoperative diagnosis of all kinds of neoplastic process, benign or malignant as well is also valuable in diagnosis of inflammatory

and infectious conditions. The aim of this study was to correlate the imaging and the cytological findings of breast lesions with histopathological diagnosis to evaluate the diagnostic accuracy of FNAC at our tertiary cancer centre.

MATERIALS AND METHODS

This retrospective study was carried out at the department of pathology of our tertiary cancer centre, over 2 years from January 2019 to December 2020. 275 patients came for FNAC for breast lesions, out of these breast Ultrasound/ Mammography findings were available in 255 cases which were included in our study. Ultrasound was perfomed in patients less than 35 years of age and/or mammography was perfomed in all patients above 35 years of age. Imaging evaluation of breast lumps were based on BIRADS ACR categories (Breast imaging reporting and data system; American college of radiology). BI-RADS category 6 were excluded as their diagnosis was already known. The patients in whom imaging details were not available or the cases whose details were available but their sample was directly sent for biopsy were excluded from the study.

The FNAC was performed using 21-23 G needle and 10 cc syringe under aseptic precautions. The air dried smears were stained with Giemsa stain and wet smears were stained with Papanicolaou stain(PAP) . At least six clusters of duct epithelial cells on each smear with each cluster consisting of at least 10 cells was considered adequate material. FNAC diagnosis was categorised as inflammatory (abscess, granulomatous also included), benign and malignant. Histopathological follow up was available in 243 cases. The FNAC results were mostly accurate with the histopathology(HP) diagnosis. A correlation was done between imaging, cytology and histopathology results(available),taking histopathology as standard.

RESULTS

Table1 tabulates the clinical findings, imaging results, FNAC and histopathology diagnosis of the patients. Out of 255 cases 2 were males and rest were females. There were wide age range of patients varying from 15 years to 82 years, with predominant age group being from 3rd decade to 5[th]decade. Most common clinical presentation included palpable breast lump(255 cases).Around 207 patients (81%) had no pain associated with breast lump whereas 48 patients(19%) presented with painful breast lump. Nipple retraction was found in 12 cases(4.7%), 45 patients had axillary lymphadenopathy(18%),fixity to skin was observed in 15 patients(6%) and sinus tract in 4 cases(1.5%)

Table1: Clinical, imaging, FNAC and HP findings of 255 patients

Age Group	No Of Cases	Clinical Findings	C/D	Ultrasonography/Mammography					Fnac			Histopathology		
				Score I	score2	Score3	score 4	score5	INF	B	M	INF	B	M
<10 YRS												-		
11-20	5	BL:5 BP:4 ALN:0 NR:0	MASTITIS :1 SUPP/ABS CESS:2 BBD:2	1	2		2		1	4		-	4	
21-30	32	BL:32 BP:08	GM:1 SUPP/ABS	2	16	6	6	2	6	18	8	2	18	8

Age	No of cases													
		ALN:04 NR:01, FS:0	CESS:2 BBD:25 BCA:4											
31-40	80	BL:80 BP:12 ALN:11 NR:02, FS:4	GM:2 SUPP/ABS CESS:4 BBD:56 BCA:18	6	22	26	12	8	10	46	24	4	46	24
41-50	86	BL:76 BP:11 ALN:18 NR:04, FS:6	GM:1 SUPP/ABS CESS:1 BBD:46 BCA:28	4	20	15	41	12	2	43	31	2	43	31
51-60	30	BL:30 BP:08 ALN:08 NR:02, FS:2	GM:0 SUPP/ABS CESS:1 BBD:11 BCA:18	2	5	5	4	14	2	8	20	1	8	20
61-70	16	BL:16 BP:04 ALN:02 NR:02, FS:2	GRAN:0 SUPP/ABS CESS:0 BBD:09 BCA:07	-	3	5	2	6	2	7	07	2	7	07
>70	6	BL:06 BP:01 ALN:02 NR:01, FS:1	GM:0 SUPP/ABS CESS:0 BBD:01 BCA:3		1	1	2	2	-	2	04		2	04
Total no of cases	**255**			**15**	**69**	**58**	**69**	**44**	**23**	**128**	**104**	**11**	**128**	**104**

On imaging, out of 255 cases, 142 cases were diagnosed as benign breast disease (BIRADS 1, 2, 3) and 113 cases were suspicious for malignant/ malignant (BIRADS 4, 5). On FNAC 21 cases were inflammatory, 155 cases were benign and 79 cases were malignant. Considering the imaging and FNAC results, in our study out of 42 cases of BIRADS 4 and BIRADS 5 (taken together), on FNAC came out to be benign in 34 cases, 3 were granulomatous mastitis, 4 were abscess/ suppurative lesions and a single case of inflammatory cyst. All these cases had histopathology follow up and showed similar findings except one which on FNAC was fibroadenoma with atypia but HP showed features of tubular carcinoma. 34 benign cases included fibroadenoma with fibrocystic disease(08), fibroadenoma with atypia(10), fibroadenoma(2), fibroadenoma with apocrine change(2), fibrocystic disease(8), phyllodes tumor(2) and benign breast disease(4). The histology of the granulomatous lesions showed

similar appearances of florid granulomatous inflammation with well formed granulomas. Suppurative lesions showed areas of suppuration with microabscess formation. The following cases illustrate there are certain benign breast lesions and inflammatory lesions which can present sometimes radiologically as breast carcinoma. The importance of FNAC is stressed as the treatment of carcinoma would be clearly much different from the other lesions. With high accurate diagnosis by this simple, effective, inexpensive OPD procedure, there will be avoidance of unnecessary surgical intervention as well as it will help in alleviating the fear of carcinoma from the mind of patients.

Evaluating the142 benign breast lesions on imaging and comparing the pathological results, there were discrepancy in 8 cases which were malignant .These included 5 cases of ductal carcinoma, a case of lobular carcinoma, a case of papillary carcinoma and a case of malignant phyllodes. Further cytology aided in diagnosing11 cases of suppurative/abscess, 2 cases of granulomatous mastitis and the remaining were benign .only a single case of cytologically malignant diagnosed case turned out to be case of atypical ductal hyperplasia on HP.This radiographic discordant cases can be challenging, in such cases FNAC predicts the presence of malignancy almost accurately. Amongst the benign cases , note worthy mentioning is a case of 45 years old who presented with ulcerated breast lump, BIRADS 1 but on FNAC was benign adnexal tumor confirmed on histopathology as clear cell nodular hidradenoma.

The sensitivity, specificity and accuracy of individual modality are shown in table2, table 3 and table 4. The sensitivity-90.3%, specificity=87.41%, positive predictive value (PPV) was 83.18%,negative predictive value (NPV) was 92.9%, with diagnostic accuracy of 88.6% for imaging findings in diagnosis of breast lesions (in comparison with histopathology considered to be gold standard for diagnosis). The Sensitivity was   99.02% ,specificity was 99.29%,PPV was 99.02%, NPV was 99.29%, and the diagnostic accuracy was 95.29%for FNAC in diagnosis of breast diseases (considering histopathology as gold standard) There was difference between FNAC and breast imaging results in perspective of diagnostic accuracy. FNAC proved to be a better diagnostic tool in evaluation of breast lesions.

Table 2: Final assessment of mammographic / sonographic and FNAC evaluation of breast lumps of 255 patients

	Imaging		FNAC			Histopathology		
	No	**%**		**No**	**%**		**No**	**%**
BENIGN	142	55.68	BENIGN+INFLAMM	151(128+23)	59.21	BENIGN+INFLAMM	151(130+21)	59.21
MALIGNANT	113	44.31	SOM/MALIGNANT	104	40.78	MALIGNANT	104	40.78

SOM:suspicious for malignancy

Table 3: Correlation Of Imaging And Histopathology

Imaging		Fnac/Hp	
	SOM/Malignant	**Malignant**	**Non-Malignant (Benign+Others)**
	113	94(TRUE POSITIVE)	19(FALSE POSITIVE)
	BENIGN		
	142	10(FALSE NEGATIVE)	132(TRUE NEGATIVE)
SENSITIVITY=TP/TP+FN=90.3%,SPECIFICITY=TN/TN+FP=87.41%,PPV=TP/TP+FP=8			

3.18%,NPV=TN/TN+FN=92.9%, DIAGNOSTIC ACCURACY=TP+TN/TN+FP+FN+TN=88.6% SOM-suspicious for malignant			

Table4: Correlation of FNAC with histopathology

		Histopathology	
Breast FNAC	SOM/malignant	Malignant	Benign/inflamm
	104	103(True positive)	1(false positive)
	BENIGN(+INFLAMM)		
	151	1(false negative)	150(true negative)
Sensitivity=TP/TP+FN= 99.02%, specificity=TN/TN+FP=99.29%,PPV=TP/TP+FP=99.02%,NPV=TN/TN+FN=99.29%, DIAGNOSTIC ACCURACY=TP+TN/TN+FP+FN+TN=95.29% SOM:Suspicious for malignant			

DISCUSSION

Breast cancer is the most common cancer in the world among women[1,2] and breast lumps are the most common presentation. FNAC of the breast lesions was first, introduced by Martin and Ellis in 1930[3]. The BIRADS score was first developed in 1993 for reporting mammography[1]. Since its inception several studies have found that both the modalities help clinicians in predicting the likelihood of cancer. The purpose of our study was to compare the result of breast FNAC and the imaging findings to assess its diagnostic accuracy, taking histopathology as gold standard. Though imaging is useful in differentiating benign from malignant lesions, cytological screening and diagnosis of breast lesions and stratification of theses cases into different groups of pathology can be helpful in the accurate management of the breast lesions.

In the present study imaging of breast showed a sensitivity of 90.7%. Thus a benign result on imaging does not completely rule out possibility of malignancy. In case of benign report, additional testing modalities like FNAC and HP should be used to rule out malignancy. However cautious interpretion of imaging report should be made, as variety of benign lesions can mimic malignancy and vice versa. When we compared our results with the available literature, we found that our results were comparable to Shetty et al[4]who evaluated the role of imaging in patients with palpable lumps and observed sensitivity of 100% and specificity of 80.1%[1]. Further our results also correlated with Pandey et al [5] and jan et al[6]. However Nandankumar et al[7] showed sensitivity of 85.4% and specificity of 89.13%of imaging in categorising benign and malignant lesions ,whose sensitivity value is lower than our study. The wide variation of observation seen in various studies could be partly because of variation of case selection, partly may be due to wide range of imaging findings of some cases and partly may be attributed due to the operator dependency.[8]

In our study FNAC had a sensitivity of 99.2% and specificity of around 99.29% in categorising the malignant and benign(including inflammatory) breast lesions. Our results were in agreement with studies of khemka et al[9]which showed sensitivity and specificity of 96.%and 100% respectively. Our study is also comparable with studies by Richie et al[2](sensitivity of98.4% and specificity of 95.7%)., Shanmugasamy et al[10](sensitivity of 93.5%, specificity of 100%), zhang Qin et al[11] (sensitivity of 93.5%,specificity of 100%) and bukhari et al.[12] (sensitivity was 98%,specificity 100%).The results of our FNAC and its concordance with HP were promising and diagnostically accurate.

Thus clinically and radiologically, breast lesions canbe confused with malignancy, requiring cytology for a ancillary diagnosis followed by histopathological examination for definitive

diagnosis if required. Thus FNAC is much valuable accurate easy method for preoperative evaluation of breast lumps, as it helps to triage the patients into malignant cases and benign cases. FNAC can also be used in follow up these cases [13,14]. Sometimes imaging findings were nonspecific and exhibited wide variations especially in cases of granulomatous mastitis.[15]

FNAC was useful in making a accurate preoperative diagnosis, avoiding open biopsy in case of benign breast lumps and in inflammatory lesions.

CONCLUSION

Breast lesions are diagnosed mainly based on radiologic and pathologic features. Both these techniques complement each other, however, there may be discordance between those findings. Especially in our setup of cancer centre, it is of utmost importance to categorise the lumps which frequently simulates malignancy. Hence, the pathologists and the clinicians should be mindful that the imaging scoring could be deceptive. The results of our study implied that FNAC is more reliable method to diagnose breast lesions with high diagnostic accuracy as compared to breast imaging and can suitably guide the evaluation and treatment of breast lumps.

CONFLICT OF INTEREST

None declared

CONSENT FOR RECORDS

Yes

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