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Fine Needle aspiration cytology (FNAC) in combination with radiological imaging enhances the diagnostic accuracy of breast lesions in developing countries

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ABSTRACT:

Breast cancer is the commonest cancer in women with high mortality rates in developing countries as mainly due to lack of screening and early diagnostic facilities.

The study was designed to evaluate the role of FNAC in enhancing the diagnostic accuracy of breast lesions if combined with radiological imaging including Mammography and High Resolution Ultrasound (HR USG). This prospective Study was conducted at MINAR cancer hospital, Multan, Pakistan from January 2018 to December 2019. 140 patients with different presenting complaints and having breast lump were included in study. Patients were assessed by history, clinical examination, Mammography and HR USG and results were compared with histopathological examination of Trucut tissue biopsy. Data was collected and analyzed. Diagnostic accuracy in all concordant benign and malignant lesions was very high with NPV and PPV of 100% each while the NPV and PPV in non concordant benign or suspicious cases was 96% and 97% each. The sensitivity and specificity of FNAC was 100% in patients with age more than 35 years while sensitivity was 98% and specificity was 92% in patients with age less than 35 years indicating comparatively high sensitivity of FNAC for breast lesions in advancing age.

FNAC enhances the diagnostic accuracy of breast lesion in combination with radiological imaging, as errors of any one modality is compensated by second one thus It can be used as an alternate to biopsy in breast care centers of developing countries those are lacking biopsy or histopathological facilities.

Key Words: FNAC, Mammography, breast lump, Imaging

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Short/Running title:

FNAC in combination with Mammography for diagnosis of breast lump

INTRODUCTION:

Breast cancer is the commonest cancer in women, accounting approximately 25 % of total cancer cases in women^{1,2}. It has high mortality rates in developing countries as compare to developed countries. Presentation in late stage due to lack of early diagnostic facilities are the most likely factors behind this high mortality^{3,4}. Breast cancer related death rate has fallen down in developed country and significant contribution is that of early detection in addition to advanced treatment facilities.

Patients presenting with breast complaints are managed with multidisciplinary diagnostic approach including history, clinical examination, mammography, high resolution breast ultrasound (HR USG) and cytological examination⁵.

Choice of mammography, HR USG or both for clinically palpable lumps depends upon age and consent of the patient. In young patients most breast lumps are benign and breast is dense. So UR USG is the modality of choice to avoid radiation exposure on one hand and reduced sensitivity of mammography in dense breast to detect the lesion on other hand as well.

Breast lesions are classified by BIRADS (breast imaging reporting and data system) that was initially designed for mammography by ACR 9 American college of Radiology.⁶

All palpable or non palpable breast lumps diagnosed on radiological examination are not malignant. However the best possible management and outcome of breast lumps is dependent on early diagnosis. Core biopsy is being highly emphasized but it is expensive, invasive and time consuming requiring experienced hands and established histopathological laboratory^{7,8}. Developing countries like ours Pakistan has limited health care resources. Infrastructures for breast care services is deficient in diagnostic facilities, histopathological laboratories and experienced personals for surgical or Trucut biopsies at small hospitals. Although most of surgeon have question about the accuracy of FNAC but diagnostic accuracy for breast lesion can be enhanced by combination of FNAC with mammography or HR USG⁹. FNAC is defined as the study of the cells obtained from breast lesion by fine needle aspiration after creating vacuum¹⁰. FNAC is simple, safe, minimally invasive, cost effective and reliable test that can be used in these hospitals for early diagnosis of breast cancers. Mammography and HR USG have their limitation of sensitivity for detection of lesions with incidence of false negative and false positive reporting up to 10-15% that increases with dense breast in young age but decreases with increasing age because of more lucent breast¹¹. However this incidence of over diagnosing or under

diagnosing can be reduced by combining FNAC with radiological images as deficiency of one modality might be compensated by the other one.

MATERIALS AND METHODS:

This prospective Study was conducted at MINAR cancer hospital, Multan, Pakistan from January 2018 to December 2019 after getting approval from Institutional ethical committee of MINAR cancer Hospital Multan, Pakistan (Rubina Mukhtar, Head of radiology department, MINAR cancer Hospital). 140 patients with different presenting complaints and having palpable or non palpable but visualized on mammography or HR USG breast lump, with mean age of 35.11 years $SD \pm 13$ (ranging between 16 – 65 years), were included in study. Patients were assessed by history, clinical examination, Mammography and HR USG. Patients under the age of 35 years were evaluated on HR USG only while patients over the age of 35 years were evaluated by both modalities of mammography and HR USG and results were classified as benign, suspicious or malignant.

FNAC is done after explaining procedure to patient, using sterile measures by cleaning skin with spirit swab and then 10 ml syringe with 22 gauge needle under USG vision is introduced. Once needle is seen in lesion, vacuum is created in syringe and plunger is given to and fro strokes and then is taken out. Needle is detached and air is sucked in syringe, needle is reattached and any material in syringe is spread on glass slide and fixed with 95% alcohol.

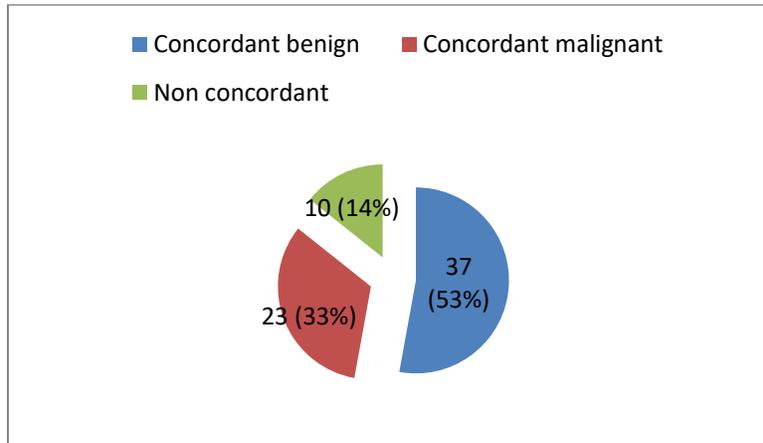
Results of FNAC were compared with histopathological examination of Trucut tissue biopsy. Lesions having all clinical and radiological features of either benign or malignant or BIRADS 2&5 were labeled as concordant while other lesions not having all features of either benign or malignant or BIRADS 3&4 were labeled as non concordant. Data was collected and analyzed.

RESULTS:

All lesions having all benign or malignant features on clinical and radiological examinations were classified as concordant and those not having all features of benign or malignant were labeled as non concordant (Graph 01). Age wise distribution is shown in Table 01.

Breast cancer occurred in age range of 22-85 years with mean age of 50.5 and $SD \pm 16.1$. 65% of total malignancies occurred in patients over 45 years. Breast malignancy was rare before age of 35 years of age with only 4 cases forming 6.5% of total. Benign lesions were found in age range of 16 -60. The Mean age for benign lesions was 32.4 years with $SD \pm 12.1$. Most of benign lesion 82% of total found up

to the age of 45 years. Age wise distribution of malignant and benign lesions with percentages is shown in table 02. Only 2 patients had false positive FNAC and 6 had false negative.



Graph 01: Incidence of concordant and non concordant lesions:

Table 01: Prevalence of Age wise BIRADS grading

N=97				
Age group in years	BIRADS 2 (concordant)	BIRADS 3 & 4 (Non concordant)	BIRADS 5 (concordant)	Total No of pts
16-25	22	2	4	28
26-35	18	2	0	20
36-45	20	6	8	34
46-55	8	4	12	24
>55	6	6	22	34
Total	74	20	46	140

All these patients were below 35 years of age (table 03). Correlation of radiological and FNAC findings with histopathology is shown in table 04. Distribution of breast lesions according to histopathology is shown in table 05. Different presenting complaints and their association with malignancy is shown in table 06. Data analysis was done and chi square and student T test were applied. PPV & NPV were 100% in all concordant lesions and was 96 & 97 % respectively in non concordant lesions.

Table 02: Age wise distribution of malignant and benign lesions

Age group in years	Malignant lesions			Benign lesions		
	No	%of same age gp	%of total No	No	% same age Gp	%of total
16-25	4	14.3	2.8	24	85.7	17
26-35	2	10	1.4	18	90	13
36-45	12	35.3	85.7	22	64.7	16
46-55	16	66.6	11.4	8	33.3	5.5
>55	28	82.3	20	6	17.7	4.3

Table 03: BIRADS grading wise false positive or negative FNAC of 140 patients

Sr.No	BIRADS	No of Patients	False positive FNAC	False Negative FNAC
1.	2	74	Nil	2
2.	3/4	20	Nil	4
3.	5	46	2	Nil

Table 04: Radiology VS histopathology Results

Histopathology	BIRADS				
	5 (malignant)	2 (Benign)	3/4 (Probably)	Total	%
Malignant	46	2	14	62	44.3
Benign	0	72	6	78	55.7
Total	46	74	20	140	

Table 05: Distribution of breast lesions according to histopathology reports

Histopathology	Patient No	%
Malignant	62	44.3
Benign	78	55.7
Total	140	100

Table 06: Association of presenting complaints with malignancy

Presenting complaints	Total patients		Benign masses		Malignant masses	
	No	%	No	%	No	%
Pain	10	7.5	8	80	2	20
Discharge	12	8.5	8	66.6	4	33.3
Nipple Retraction	12	8.5	8	66.6	4	33.3
Peaue'd orange skin	6	4.2	2	33.3	4	66.6
Palpable mass	100	72	68	68	32	32

DISCUSSION:

Triple test is widely used for diagnosis of breast lumps that consists of clinical examination, mammography and FNAC but the FNAC itself is most reliable modality of all three. Literature reports negative predictive value and sensitivity between 95-99% and 96-98% respectively.

Use of FNAC in breast lumps was first introduced in 1930 by Martin and Ellis and since that FNAC has gained wide use in making the differentiation between benign and malignant breast lesions with high degree of accuracy. FNAC is a simple, cost effective and less invasive procedure as compare to biopsy. FNAC is also useful in reducing anxiety and reducing number of unnecessary invasive procedures. It's safe and minimizes the delay in diagnosis. Literature review shows the incidence of needle track associated tumor transplantaion by FNAC is very low that is 0.0045% and is even lower in superficial tumors¹².

The frequency of inadequate or inconclusive FNAC reports is variable and affected by many factors including technical experience, preparation and fixation of smear, ill defined masses or deeply situated lumps. Rate of false negative result is variable from 1-8%^{13,14}. Rate of false negative reports might be reduced by doing FNAC under USG guidance. Accuracy of diagnosis for breast lesion is enhanced if FNAC is combined with mammography and HR USG breast.

Our study showed enhanced diagnostic accuracy of breast lump when FNAC combined with mammography.

CONCLUSION:

FNAC is cheap, reliable and minimally invasive procedure that enhances the diagnostic accuracy of breast lesion in combination with radiological imaging thus reducing the incidence of missing the malignant lesion or over diagnosing the lesion, as errors of any one modality is compensated by second

one. It can be used as an alternate to biopsy especially in breast care centers of developing countries like Pakistan those are lacking biopsy or histopathological facilities. It may help to decide further management of breast lesion as concordant benign lesion may be kept on follow up for observation on the other hand might proceed for definite treatment without wasting time in case of concordant malignant lesion.

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