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"ROLE OF ULTRASOUND IN DIAGNOSING BREAST DISEASES- A PROSPECTIVE STUDY"

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ABSTRACT:

BACKGROUND: In India, Breast carcinoma is the 2nd most common malignancy in womenprevalence of which is showing a growing trend, with the incidence increasing everyyear ranging approximately 19-33%. Advanced breast cancer stage is associated with highmorbidity and mortality. Hence identifying an accurate diagnostic tool to effectivelymanagethisdiseaseis critical.

Clinicalassessmentistheinitialinvestigation,but a sequential evaluation named "TRIPLE TEST" wasformalized, which includeClinicalexamination,Imaging,FNAC proves to be a gold standard diagnostic modality.

OBJECTIVES: The aim of the study was todeterminethediagnosticaccuracyofultrasoundindiagnosingdifferentbreastdiseases with objectives toassesstheaccuracyofultrasoundindiagnosingbenignand malignant breastlesions.

MATERIALS AND METHODS :the present study was carried out at tertiary care centre with 100 patients and followed upto 2 years. Initially, complete history was taken which included demographic data, reasonfor visit, family history of breast disease, lactation history, use of OC pills andthenclinicalexaminationwasperformed. Ultrasound imaging of bothbreastandaxillawas doneusingMindrayResona7machine. The reports were obtained frommedical records which included information regarding shape, margin, width,antero-posteriordiameter,echogenicity,vascularity,locationoflesion.Patientswhoseultrasoundreportwa sequivocalorinconclusiveweresubjectedto furtherevaluationbyFNAC/TRU CUTbiopsy. Thehistopathologicalreportofthepatientswhounderwentsurgery/biopsyweredocumentedforfina ldiagnosisandconfirmationofUSGreport.

RESULTS: Accordingtoourstudyresults,themeanageofthepatientswas36.5±23.85(agerange-15to84years). Majority of the lesions were located in the upper outer quadrantof breast. The left breast was more susceptible as compared to the right breast, whichhas been previously noted in other studies. We found no association between tumorlocation and its type (p=0.586)

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

as well as the involved side and type of breast lesion(p=0.520). The overall sensitivity of ultrasound in diagnosing breast lesions was 94.1%,specificity was 91.9% and its positive and negative predictive values were 72.7 % and98.5%respectively.

CONCLUSION: Thus diagnostic ultrasonography is useful in distinguishing between benign andmalignantlesionsofthebreast.Additionally,whenitcametopalpablemasses,ultrasoundhad ahighdegreeofdiagnosticaccuracy.

Key words : USG, breast lesion, F

INTRODUCTION:

Breast cancer has become a serious health problem around the world. The latest report by the World Health Organization and International Agency for Research on Cancer showed that the incidence and mortality of breast cancer ranked the first place among female cancer patients [1]. Breast microcalcifications (MCs) are the first indication in more than 40% of breast cancers, and they are sometimes the only indication of malignancy [2,3]. In addition, 95% of breast ductal carcinoma in situ (DCIS) is diagnosed by analyzing MCs [4]. The early detection of breast MCs can increase the possibility of breast cancer survival, making their diagnosis critical [5]. Breast MCs are small calcium deposits, with size of 0.1–1.0 mm shown on ultrasound or mammography images [6]. MCs are majorly categorized as two types which differ in chemical composition. The first type is composed of calcium oxalate, which is mainly found in benign breast lesions; the second type is hydroxyapatite, a kind of calcium phosphate, which can be found in both benign and malignant tumors [7,8]. The size, number, distribution and morphology of MCs contain important information about the malignancy and benignity of breast lesions.

According to the Breast Imaging Reporting and Data System (BI-RADS), imaging based diagnosis of breast MCs mainly include three types: low risk of malignancy, intermediate risk of malignancy, and high risk of malignancy [9,10]. Among different imaging modalities, mammography has been taken as the reference standard for evaluation of MCs and is able to detect clustered MCs which have a size of about 100 μm or greater [11,12]. However, mammography exposes patients to ionizing radiation, and its diagnostic performance is relatively poor for dense and massive glands of breast [13]. Many studies have shown that Asian women have dense breast tissue and are fit for screening by ultrasound rather than mammography [13].

MATERIALS AND METHODS:

This Prospective cross sectional study has included 100 patients with benign as well as malignant breast diseases. The cases were selected randomly general surgery department at tertiary care centre from July 2020 till December 2022 and followed for a period of two months to two years. All 100 patients were subjected to USG for diagnostic purpose. Female patients presenting with breast lump/breast pain/nipple discharge and Age more than 15 years were included, while Asymptomatic female patient and male patients excluded.

Initially, complete history was taken which included demographic data, reason for visit, family history of breast disease, lactation history, use of OC pills and then clinical examination was performed. Ultrasound Imaging of both breast and axilla was done using MindrayResona 7 machine.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

Patients whose ultrasound report were equivocal or inconclusive were subjected to further evaluation by FNAC/TRU CUT biopsy. Patients with benign or probably benign lesions were followed up twice/thrice at regular intervals and the subsequent ultrasound findings were compared in terms of size and characteristics. The histopathological report of the patients who underwent surgery/biopsy were documented for final diagnosis and confirmation of USG report.

RESULTS:

In this section, the observations and analysis of the data of the 100 cases mentioned were done under the following headings. In this study population, the 15 years patients as youngest and 75 and above years being the oldest. Most commonly affected age group being 15-24 years.

Agerange	Totalnoofpatients
15-24	31
25-34	19
35-44	21
45-54	16
55-64	6
65-74	5
75andabove	2

80 patients had benign lesion of which 40 nulliparous and multiparous each. 20 patients with malignant lesion of which 1 nulliparous and 19 multiparous.

PARITY	NUMBEROFPATIENTS(%AGE)		
	Benign	Malignant	Total
Nulliparous	40(97.5%)	1(2.4%)	41
Multiparous	40(67.8%)	19(32.2%)	59
Total	**80**	**20**	**100**

78 patients were premenopausal, of which 74(94.8%) detected benign and 4(5.1%) patients were detected malignant. 22 postmenopausal pt, of which 6 had benign and 16 had malignant breast lesions.

Menstrualstatus	Totalnumberofpatients(%age)		
	Benign	Malignant	Total
Premenopausal	74(94.8%)	4(5.1%)	78
Postmenopausal	6(27.3%)	16(72.7%)	22

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

Total	**80**	**20**	**100**

Of the 100 patients, 69 presented with breast lump, 18 with mastalgia, 11 with nipple discharge, 8 with lump and mastalgia and 3 patients were presented with nipple retraction.

Chiefcomplaint	No.ofpatientshavingthecomplaint
Lumpinbreast	69
Mastalgia	18
Nippledischarge	11
Lump+Mastalgia	8
Nippleretraction	3

28 patients were presented with upper outer quadrant breast lesions, 24 with upper inner quadrant lesion, 8 with lower outer quadrant lesion, 9 had lower inner quadrant lesions, 9 had central lesions, 14 patients had lesions involving 2 quadrants and 8 had diffuse lesion.

Locationinbreast	Benign	Malignant
Upperouterquadrant	23	5
Upperinnerquadrant	19	5
Lowerouterquadrant	6	2
Lowerinnerquadrant	7	2
Centralquadrant	5	4
Involving2quadrants	13	1
Diffuse	7	1

6 patients had lesion less than 1cm, 19 had 1-2 cm lesions, 24 had 2-3 cm lesion, 16 had 3-4 cm lesion, 4 had 4-5 cm lesions, 3 had 5-6 cm lesion and 2 patients had more than 6 cm lesion.

SIZEINCM	BENIGNMASS	MALIGNANTMASS
0-1	4	2
1-2	16	3
2-3	18	6
3-4	10	6
4-5	3	1
5-6	2	1
>6	1	1

Total 52 patients presented with left breast lesion of which 40 benign lesion and 12 malignant lesions. 45 patients had right side breast lesions, of which 37 benign and 8 malignant. 3 patients had bilateral benign lesions.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

Sideinvolved	Benign	Malignant
Left	40	12
Right	37	8
Bilateral	3	0

Outofthe100Ultrasoundexaminationperformed,69USGscanshowedbenign features, 9 USG scans showed equivocal/inconclusive findings and 22 USGscansshowed malignantfeatures.

USGOF100PATIENTS	
Benign	69
Equivocal	9
Malignant	22

ComparisonofUltrasoundexaminationresultsagainstBiopsyreport

Ultrasound	Biopsyreport		
	Malignant	Benign	Total
Malignant	16	6	22
Benign	1	68	69

ComparisonofUSGfeaturesof55benignbreastlesionsand20malignantbreastlesions-

Ultrasoundfeatures		Tissuediagnosis	
		Benign	malignant
Shape	Round/Oval	46(83.6%)	14(70%)
	Irregular	9(16.4%)	6(30%)
Margins	Circumscribed	49(89.1%)	5(25%)
	Non-circumscribed	6(10.9%)	15(75%)
Width:APRatio	>1.4	52(94.5%)	0
	<1.4	3(5.4%)	20(100%)
	Hyperechoic	3(5.4%)	0

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

Echogenicity	Isoechoic	7(12.7%)	0
	Hypoechoic	33(60%)	16(80%)
	Mixedechogenicity	12(21.8%)	4(20%)
Vascularity	Normal	51(92.7%)	2(10%)
	Increased	4(7.3%)	18(90%)
Calcification	Microcalcification	0	8(40%)
	Macrocalcification	3(5.4%)	0

DISCUSSION:

Accordingtoourstudyresults,meanageofthepatientswas36.5±23.85 (agerange-15to84years).

We found a strong correlation between age and type of breast lesions, with themajorityofbenignlesionsoccurringinyoung,reproductiveagegroupsandthemajorityofmalignant lesionsoccurringinmenopausalwomen[14].Theresultsobtainedaresimilartothestudyof FaridehKhanloo et.al.

We found that majority of the lesions were located in the upper outer quadrantof breast. The left breast was more susceptible as compared to the right breast, whichhas been previously noted in other studies. We found no association between tumorlocation and its type (p=0.586) as well as the involved side and type of breast lesion(p=0.520).

The mean mass size observed was between 2-3 cm overall. The mean mass sizeforbenignlesionswasbetween1-3cmandformalignantlesionswasbetween2-4cm.

FibroadenomawasthemostfrequentbenignlesionwhileInvasiveDuctalcarcinomawasthe mostfrequentlyencounteredmalignantlesioninourstudy.

The overall sensitivity of ultrasound in diagnosing breast lesions was 94.1%,specificity was 91.9% and its positive and negative predictive values were 72.7 % and98.5%respectively.

	n	**Cancers**	**Breastultrasound**	
			Sensitivity%	**Specificity%**
Stavrosetal.1995[15]	747	125	98.4	67.8
Mossetal.1999[16]	559	256	88.9	77.9
Rahbaretal.1999[17]	161	38	95	42

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

Zonderlandetal.1999[18]	4728	338	91	98
Bergetal.2004[19]	258	177	83	34

In comparison to mammography, ultrasound is more effective in dense breastsowing to the physics of sound propagation [20]. More than half of women under 50 have glandularbreast tissue that is heterogeneously thick (50–75%) or very dense (> 75%). Thesensitivity of mammography in women with dense breasts is as low as 30-48%, andone-third of women over 50 had dense breasts as well. The interval cancer rate issignificantly higher in this population, and dense breast tissue is also a signal for a 4-6-fold increased risk of breast cancer. Ultrasound can be used as a primaryimaging modality in women <40 years of age and can be used as an adjunct imagingmodalityforwomen>40yearsofagefordiagnosingbreastdiseases.Theinitialedition of the German S3 guidelines for early breast cancer diagnosis stated thatultrasoundwasonlyadvisedforconfirmationandultrasound-guidedtherapiesinmammographicBI-RADSIVandVabnormalities,notforcancerdetection.Meanwhile,researchsuggeststhatinordertoimprovecancerdiagnosisanddistinction, ultrasonography is also advised in BI-RADS 0 and 3 cases and in densebreasts (ACR 3-4) in the new edition of the S3 guidelines published in 2008, inadditiontomammographiclesionsofBI-RADS4-5.Bergetal.explainedtherationaleforusingultrasoundasanadjuncttomammographicscreeningtocompensateforthereduced sensitivityindensebreasts.

As compared to mammography, USG is more operator-dependent. Sonographicfeature combinations rather than a single feature should be taken into consideration.Hence USG should be used inconjunction withmammographytohelpmake a definitive diagnosis[21]. To lower inter-observer variability and increase thepotential of breast sonographic features analysis, it is crucial to standardize inspectionprocedures,aswellastheinterpretationandapplicationoftechnicalstandards.

The USG features most predictive of breast lesions as benign are- round/ovalshape, circumscribed margins, width:AP Ratio >1.4(wider than taller). Majority of thebenign masses in our study were hypoechoic 59%, 4.9% masses were hyperechoic,14.7% isoechoic, and 21.3% showed mixed echogenicity. The USG features mostpredictiveofbreastlesionsasmalignantare-irregularshape,non-circumscribedmargins,width:APRatio<1.4(tallerthanwider),increasedvascularityandmicrocalcification. Majority of the malignant masses in our study were hypoechoic80% and 20% had mixed echogenicity. These findings closely correlate with thefindingsofRahbaret.al.[17]and Sareen M et.al.[22]

The accuracy of ultrasound in detection of carcinoma of the breast was 84.2%whichisbetterascomparedtothestudiesofKopanet.al.[23](52.6%),Mansooret.al.[24](57.14%)Singh,Kailash,etal.[25](65%)ThediagnosticaccuracyforFibroadenoma was 90.2% which is consistent with the findings of previous studies.Thehighestdiagnosticaccuracy(~100%)wasobservedforcysticbreastlesionshowever lower figures were reported by Fleischner et.al.[26] (96%), Mansoor et.al.[24](90.9%) probably

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

due to the small sample size of our study as compared to thesestudies.

CONCLUSIONS:

Ultrasound imaging is one of the most frequently used diagnostic tools to detect and classify abnormalities of the breast, because of its low cost, nonionizing radiation, and real-time capability. Ultrasound has potential for detecting breast MCs, especially for detecting MCs in dense breasts. Many researchers have strived to improve the capability of ultrasound in detecting breast MCs. However, a review of current ultrasound detection methods for breast MCs is still lacking.

This paper aims to review the state-of-the-art ultrasound methods for breast MC detection. These methods were broadly divided into high-frequency B-mode ultrasound imaging techniques, B-mode ultrasound image processing techniques, ultrasound elastography techniques, time reversal techniques, high spatial frequency techniques, second-order ultrasound field (SURF) imaging techniques, and photoacoustic imaging (PAI) techniques.

ABBREVIATIONS:

USG	Ultrasonography
PPV	PositivePredictiveValue
NPV	NegativePredictiveValue
FNAC	FineNeedleAspirationCytology
BIRADS	BreastImagingReportingAndDataSystem
APRATIO	Anterior-PosteriorRatio
ACR	AmericanCollegeofRadiology
DCIS	DuctalCarcinomaInSitu
LCIS	LobularCarcinomaInSitu
CA	Carcinoma

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