ORIGINAL RESEARCH PAPER

Radio-diagnosis

COMPARATIVE ANALYSIS OF MAMMOGRAPHY, ULTRASONOGRAPHY AND COMBINATION FOR VARIOUS MAMMOGRAPHIC COMPOSITIONS

KEY WORDS: Mammography, Ultrasonography, breast pathologies.

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ABSTRACT

MATERIAL AND METHODS: This retrospective study carried out in the Department of Radio-diagnosis, MGIMS, Sewagram using electronic data of 594 patients of mammography and USG done from May 2015 to September 2018.

RESULT: For composition A or B there was no significant difference in sensitivity between MG+USG and mammography alone or mammography and USG. But for composition C or D there was a significant difference.

CONCLUSION: USG is better modality for detecting lesions in mammographically dense breast and MG+USG have significantly higher sensitivity than observed for mammography alone in detecting breast pathologies.

INDRODUCTION

The breast develops from mammary ridges. Breasts are a secondary sexual characteristic in females. They are also present in a rudimentary form in males. This tender, sensitive and delicate complex structure is constantly under the influence of hormones. After menarche, the young breast contains denser connective tissue. With progression in age the dense breast becomes mixed glandular pattern tissue, and finally begins to involute into fatty tissue. Any aberration in this process leads to the susceptibility to a spectrum of localised pathologies like, hyperplastic and neoplastic changes [1,2].

Breast cancer is most common cause of cancer death in women and overall 5th common cause of cancer deaths in the world [3]. Breast cancer is the 2nd most common cancer in Indian women [4]. Despite the gloomy prognosis, increased morbidity and reduced survival time, it can be controlled if detection and diagnosis are made in the earliest stages i.e., in the pre-invasive and clinically non-palpable stage. Detection of breast cancer in its earliest possible stage is the ultimate goal in imaging the breast, and the role of the radiologist is therefore vital. Various imaging modalities for the breast include mammography, USG, magnetic resonance imaging (MRI) and dedicated nuclear isotope scans.

In 1993 Albert Soloman suggested the diagnostic role of X rays for breast pathologies [5] Mammography was used primarily for early detection of malignancies in their curable stages, to reduce the malignancy related mortality. It is screening tool which is easily available, low cost and fairly accurate with minimal radiation to detect features of malignancies e.g. microcalcifications, speculated masses and small lymph nodes. The incidence of breast cancer deaths can be reduced by 30% by the routine screening of healthy women with mammography [6,7].

Breast tissue composition is a vital component of the radiological evaluation of the breast for two reasons. First, dense fibroglandular tissue is a risk factor for breast malignancies. Second, in dense breasts there is decreased mammographic sensitivity. For these reasons, mammography reports generally contain a description of the overall tissue composition of the breast.

In the BI-RADS edition 2013 the assignment of the breast composition is changed into four categories:
- A - breasts are almost entirely fatty,
- B - there are scattered areas of fibroglandular density,
- C - breasts are heterogeneously dense, which may obscure small masses,
- D - breasts are extremely dense.

These standardized categories help to minimize ambiguity in mammography reporting, stratify patients at the time of imaging who need additional screening and facilitate large scale studies of breast cancer [8].

In 1951, Wild and Reid [9] developed equipment specially designed for breast scanning. Once restricted for differentiating between solid and cystic lesions, with evolution of technology now it can characterize the breast nodules and differentiate them as benign and malignant. Breast ultrasound has evolved as an indispensible problem solving tool in patients less than 35 years of age, dense breasts, abscesses, masses that are not completely evaluable with mammography, post-radiation breasts, pregnant and lactating patients.

Both mammography and USG methods have been used in attempts to reduce the negative to positive biopsy ratio. The false-negative rate of mammography in the detection of breast cancer has been consistently reported to be approximately 10%, as determined by studies such as the Breast Cancer Detection Demonstration Project [10]. These mammographically occult lesions are usually discovered by physical examination and often occur in women with mammographically dense breasts. Therefore, a negative mammographic result cannot exclude malignancy in women with a palpable mass; the lesion should be biopsied if clinically indicated.

MATERIAL AND METHODS

This retrospective hospital based study was carried out at department of Radio-diagnosis in a tertiary care hospital of Maharashtra using electronic data extracted from HIS of mammography, USG and histopathology done from May 2015 to September 2018.

USG machines: Philips HD 11 XE, Voluson S6 WIPRO GE and Philips Affinity 70.

Mammography machine: GE machine with AGFA mammography cassettes; Cranio-caudal and Medio-Lateral Oblique views were taken.

The study population consisted of 594 women of different age groups (ranges from 22 to 82 years) with palpable or non-palpable breast lesions detected on clinical examination or self-breast examination and referred for mammography and women in high risk groups. Post lumpectomy mammograms and male patients were excluded from study.

Statistical analysis: Statistical analysis was carried out using SPSS software ver.21 after collecting patient data in a master chart. Quantitative data were presented as mean and standard deviation while qualitative data were presented as frequency and percentage. For this study $p < 0.05$ was considered as significant.

RESULT

After comparing data of mammography and USG of total 594 patients, following observations were made

- The peak incidence of patients was seen in the age group of 41-50 years with 238 (40.07%) patients falling in this age group (**Graph I**).
- Many breast lesions which were occult in mammography due to dense breast parenchyma were detected in USG. For composition A or B there was no significant difference in sensitivity between MG+USG and mammography alone or mammography and USG. But for composition C or D there was a significant difference **(Table I).**

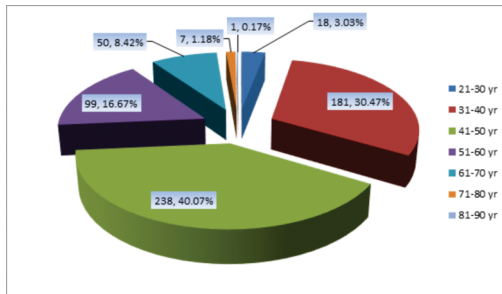**Graph I: Distribution Of Patients According To Age**

Table I: Comparative analysis of MG+USG, Mammography and USG findings and p-value

Compos ition	N	MG+USG		MG		USG		p-value	
		+	-	+	-	+	-	MG+USG v/s MG	MG v/s USG
A	35	12	23	8	27	8	27	0.28	1.00
B	121	65	56	51	70	42	79	0.07	0.23
C	264	168	96	103	161	133	131	0.0001	0.0086
D	174	114	60	47	127	107	67	0.0001	0.0001
Total	594	359	235	209	385	290	304		

Figure I: Various Breast Compositions And Some Cases On Mammography
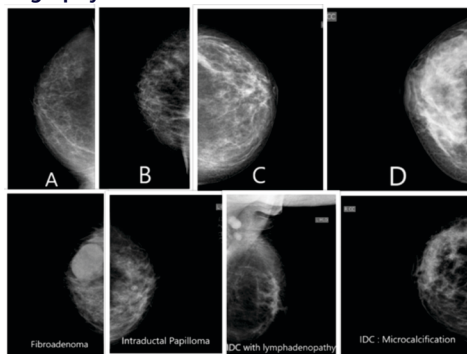
DISCUSSION

Mammography is primary method of detection and diagnosis of breast disease with sensitivity of 85% - 95% [11]. Unfortunately, false-negative mammographic findings in the setting of a palpable breast mass have been estimated at between 4% to 12% [7,12,13].

Hence many of the times, other modalities are needed to compliment the primary diagnosis given on mammography in view of its low specificity. Though a definitive diagnosis is possible with non-invasive imaging procedures, for most lesions biopsy/fine needle aspiration cytology are essential for obtaining reliable results.

Although USG is not considered a screening test but it is perfect adjunct to the mammography since both the modalities are easily available, relatively cheaper and relatively less time consuming. USG can be used to evaluate mammographically dense breasts below 35 years of age.

USG effectively differentiates solid lesions from cysts which

account for nearly 25% of breast lesions. Complex cysts or cysts which need repeated aspiration can harbor malignancy, hence they need further evaluation. In the breasts where solid lesions and cysts are obscured by mammography due to dense fibroglandular tissue, USG help in diagnosis and to decrease the number of surgical biopsies [14,15]. USG can be used to differentiate benign from malignant lesions with negative predictive value of 99.5%, specificity of 67.8% and overall accuracy of 72.9% [16].

Though mammography and USG have their own advantages and limitations. Mammography when combined with USG can yield very significant improvement in diagnosing breast lesions in dense parenchyma and our study strongly supports this evidence. The value of combined mammographic and sonographic imaging in symptomatic patients has been studied previously.

Moss et al reported sensitivity of 94.2% in 368 patients. They also reported that USG increased cancer detection by 14% in symptomatic patients who were evaluated with both mammography and USG [17]. **Barlow et al** reported a sensitivity of 87% [18]. **Taylor KJ et al** in retrospective analysis of 293 palpable malignant lesions reported that USG detected all cancers; 18(6.1%) of these 293 cancers were mammographically occult [19].

CONCLUSION

The mammography and USG are individually effective diagnostic modalities which cannot replace each other for detection of breast pathologies. But, USG is better modality for detecting lesions in mammographically dense breast.

This study confirms that the mammography and USG when combined have significantly higher sensitivity than observed for mammography alone in detecting breast pathologies.

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