Combined Mammographic and Sonomammographic Evaluation of Breast Masses

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ABSTRACT

Introduction: Breast cancer is the most common cause of cancer death in women and an overall fifth common cause of cancer deaths. Triple assessment of clinical examination, breast imaging and needle biopsy remain the mainstay of a breast cancer diagnosis. Among imaging techniques mammography helps in diagnosing asymmetry, neodensity, distortion of fibroglandular architecture and USG plays a key role in differentiating cystic and solid masses. The present study evaluated palpable breast masses using mammography and ultrasound and compared them with histopathological results.

Material and methods: A cross-sectional study was conducted at tertiary care hospital, which included sixty women more than or equal to 30 years with abnormalities of the breast such as palpable lump, thickening, nodularity were included in the study. After taking informed written consent the patients underwent the study, both mediolateral oblique and craniocaudal views were obtained followed by ultrasonographic evaluation. HPE was considered as gold standard and results were compared with image finding.

Results: Majority were in the age group (40%) between 41-50 years. The most common clinical complaint was 53.33% palpable lump. Image findings reported 42.22% of benign lesions and 13.33% were suspicious lesions. On histopathological examination 34.62% were malignant and 65.38% were benign lesions. The diagnostic accuracy of imaging findings in predicting HPE was 85.71%. The sensitivity and specificity of the image finding is 83.33% and 76.47% respectively.

Conclusion: Combined use of mammography and sonography is appropriate in most instances to characterize palpable lesions and avoids unnecessary interventions and biopsies.

Keywords: Breast Masses, Histopathology, Mammographic, Sonomammographic.

INTRODUCTION

Breasts are a secondary sexual characteristic in females. They are also the source of nutrition for the neonate and thus of mankind. This tender, sensitive and delicate complex structure is constantly under the influence of hormones.[1,2] Any aberration in this process leads to the susceptibility to a spectrum of localised pathologies like hyperplastic and neoplastic changes. Of the various pathologies that afflict the breast, cancers are most often encountered and are the most dreaded.[3] Breast cancer is the most common cause of cancer death in women and an overall fifth common cause of cancer deaths in the world. Incidence of breast cancer as per the ICMR studies show that one in every 22 women is likely to suffer from breast cancer. Incidence has almost doubled in the last 24 years and it is expected to increase per year by 3%. It is responsible for 20% of cancer-related deaths in women.[4] Triple assessment of clinical examination, breast imaging and needle biopsy remain the mainstay of a breast cancer diagnosis. The standard technique of breast imaging includes screen film X-Ray mammography and real-time ultrasound.

Other techniques are MRI, Colour Doppler, contrast-enhanced ultrasound, scientist mammography and digital mammography.[5]

The incidence of breast cancer deaths can be reduced by 30% by the routine screening of healthy women with Mammography. This is because breast changes like asymmetry, neodensity, distortion of fibroglandular architecture and microcalcifications are picked up earlier than lesions that become clinically palpable, or are sometimes detected by self-examination.[6] USG plays a key role in differentiating cystic and solid masses.[7] It is useful in the evaluation of palpable masses not visible in radiographically dense breasts, abscesses, masses that are not completely evaluable with MG and in young patients susceptible to radiation damage.

The sensitivity of mammography alone is between 45% and 90% depending on a number of factors including age and breast density. The sensitivity of ultrasound alone is generally reported as being 80–90%.[8] The Royal College of Radiologists guidelines also recommend the use of ultrasound as an adjunct to mammography in patients of all ages, although no explicit guidance is given.[9]

Keeping in view, the limitations of individual modalities, we aimed in our study to evaluate palpable breast masses using mammography and ultrasound than either method along and compared them with histopathological results.

MATERIAL AND METHODS

The study was conducted at tertiary care hospital which included ninety women more than or equal to 30 years referred to this centre with abnormalities of the breast during a period of 18 months between January 2015 and December 2017. Abnormalities of the breast with a variety of clinical descriptions, such as palpable lump, thickening, nodularity were included in the study. Abnormalities of sufficient clinical concern to be referred for imaging evaluation were studied.

Women below 30 years of age with palpable abnormalities, breasts with fungating mass per breast and mass adherent to the chest wall, where performing mammography was difficult were excluded from the study.

Time of initial visit, date of initial visit, age of the patient, site of the palpable abnormality and description of the abnormality were documented. After taking the informed written consent of the patient or her relative, patients were subjected to breast examination. Then patients underwent mammography in the presence of a female attendant. Both mediolateral oblique and craniocaudal views were done of each breast after firm compression. Mammography was performed with GE SENOGRAPHE DMR equipment. The mammographic assessment was followed by ultrasonographic evaluation of breast using a real-time scanner (Philips Envisor C 0.2) with a 7 to 10 MHz broadband linear array probe with a breast present. Each quadrant of the breast with lesion was scanned in radial and antiradial planes. Both breasts were scanned in every case for comparison. Axilla was also scanned for any enlarged lymph nodes.

HPE (Histopathological Examination) was considered as gold standard and results obtained from HPE were compared with mammography and ultrasonic finding. The sensitivity, specificity, predictive values and diagnostic accuracy of the screening test along with their 95% CI were presented. P-value < 0.05 was considered statistically significant. IBM SPSS version 22 was used for statistical analysis.[10]

RESULT

A total of 90 subjects were included in the final analysis. Among the study population, 20 (22.22%) participants belong to 30 to 40 years age group, 36 (40%) were in 41 to 50 years age group, 22 (24.45%) were in 51 to 60 years age group and 12 (13.33%) were aged > 60 years. (Table 1)

Among the study population, 48 (53.33%) participants had a palpable lump, 10 (11.11%) participants had Palpable thickening and 14 (15.56%) participants had nodularity. When breast parenchymal density pattern is observed, 38 (42.22%) participants had scattered fibro glandular density, 25 (27.78%) participants had Predominantly Fatty breast, 15 (16.67%) participants had dense breast and 12 (13.33%) participants had heterogeneously dense breast. (Table 2)

The frequency of benign lesions was 42.22% and suspicious lesions were 17.78%. On histopathological examination

26.92% were malignant and 73.08% were benign lesions. Among malignant lesions majority was 64.24% were Ductal carcinoma, 21.42% were Lobular carcinoma, 7.14% were Mucinous and Mixed carcinoma. Among benign lesions cysts were 44.73%, Fibroadenomas were 23.68%, Duct Ectasia and Fibrocystic diseases were 13.15% and Lipomas were 5.26%. (Table 3)

When imaging findings and HPE were compared with each other 85.71% were malignant lesions and 89.47% were benign lesions and it was statistically significant. (Table 4)

The diagnostic accuracy of imaging findings in predicting HPE was 85.71%. The sensitivity and specificity of the image finding is 85.71% and 89.47%. Positive predictive

Age Groups	Frequency	Percentages
30- 40	20	22.22%
41-50	36	40.00%
51-60	22	24.45%
>60	12	13.33%

Table-1: Descriptive analysis of age in groups in the study population (N=90)

Descriptor	Frequency	Percentages
Palpable lump	48	53.33%
Palpable thickening	10	11.11%
Nodularity	14	15.56%
Not specified	18	20.00%
Breast Parenchymal Density		
Scattered fibro glandular Density	38	42.22%
Predominantly Fatty	25	27.78%
Dense	15	16.67%
Heterogeneously Dense	12	13.33%

Table-2: Descriptive analysis of clinical and mammography findings (N=90)

	Frequency	Percentages
Imaging findings (N=90)		
Negative	38	42.22%
Benign	36	40.00%
Suspicious	16	17.78%
HPE findings (n=52)		
Malignant	14	26.92%
Benign	38	73.08%
Benign lesions (N=38)		
Cysts	17	44.73%
Fibroadenoma	9	23.68%
Duct ectasia	5	13.15%
Fibrocystic disease	5	13.15%
Lipoma	2	5.26%
Malignant (N=14)		
Ductal carcinoma	9	64.28%
Lobular carcinoma	3	21.42%
Mucinous carcinoma	1	7.14%
Mixed carcinoma	1	7.14%

Table-3: Descriptive analysis of Imaging findings in the study population

International Journal of Contemporary Medicine Surgery and Radiology Volume 5 | Issue 1 | January-March 2020

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Imaging Findings	HPE		Chi-square	P-value
	Malignant (N=14)	Benign (N=38)		
Malignant	12 (85.71%)	4 (10.53%)	27.151	<0.001
Benign/Negative	2 (14.29%)	34 (89.47%)		
Table-4: Comparison of HPE with Imaging findings (N=52)				

Parameter	Value	95% CI	
		Lower	Upper
Sensitivity	85.71%	57.19%	98.22%
Specificity	89.47%	75.20%	97.06%
False positive rate	10.53%	2.94%	24.80%
False negative rate	14.29%	1.78%	42.81%
Positive predictive value	75.00%	47.62%	92.73%
Negative predictive value	94.44%	81.34%	99.32%
Diagnostic accuracy	88.46%	76.56%	95.65%

Table-5: Predictive validity of imaging findings in predicting HPE (N=52)

value, negative predictive value, False positive rate, and False-negative rate are 75.00%, 94.44%, 10.53% and 14.29% respectively. (Table 5)

DISCUSSION

Breast cancer is the commonest cause of cancer mortality in females. Breast masses are common in female and amongst all the breast masses, malignant masses are the most feared.[11] The age group of 90 females varied from 30 to more than 60 years with maximum no. of cases being in the age group (40%) were aged between 41-50 years. It is in accordance with the study conducted by Ohri P et al[12], where the majority of them were in the age group 41 to 50 years.

The most common clinical complaint was 53.33% palpable lump. The mammographic parenchymal pattern of the breast according to Tabar's classify cation (42.22%) participants had scattered fibro glandular density which supports the theory that young virgin breast contains denser connective tissue. With progression in age, the dense breast becomes mixed glandular pattern tissue, and with further progression in age, breast begins to involute into fatty tissue. Whereas in a study conducted by Prasad SN et al[13], 17.74% reported fibro glandular density of the breast.

In young women and women with dense breasts, ultrasound appears superior to mammography. Dense fibro glandular tissue is the most important inherent limitation of mammography in the diagnosis of breast cancer. Bilateral whole-breast US can be an effective adjunct imaging examination in the evaluation of women with dense breast tissue.[14]

Image findings reported 40% of benign lesions and 17.78% were suspicious lesions. On histopathological examination 26.92% were malignant and 73.08% were benign lesions. Among malignant lesions majority was 64.28% were Ductal carcinoma. Among benign lesions cysts were 44.73%, fibroadenomas were 23.68%, duct ectasia and fibrocystic diseases were 13.15% and lipomas were 5.26%. According to Ghebriwet M et al[15], 23.68% had fibroadenoma, 13.15% had fibrocystic diseases and among malignant lesions, 46.6% had ductal carcinoma. Similarly, Murphy IG et al[16] reported

64.28% of ductal carcinoma which is line with our study.

On mammography, it was not possible to determine whether the lesion was solid or cystic. Cases of fibrocystic disease of breast were falsely diagnosed as being malignant. On ultrasound, out of 60 lesions, 3 were cystic. In our study, it was possible to correctly diagnose such cases with 100% accuracy with ultrasound. This was consistent with other studies in which accuracy of ultrasound to diagnose cystic lesions varied from 96-100%.[8,17] However with mammography it was not possible to differentiate these 3 cases of simple cysts from fibroadenomas.

MG can help physicians determine whether a lesion is potentially malignant and also screen for occult disease in the surrounding tissue. On mammography, features in favour of benign lesions included well defined smooth margins, oval or round shape and normal breast architecture (24/26). On the other hand, ill-defined speculated lesions taller than wider lesions, architectural distortion, are the features suggestive of malignancy (9/9).

In the current study when imaging findings and HPE were compared with each other 81.82% were malignant lesions and 87.5% were benign lesions and it was statistically significant. The sensitivity and specificity of the image finding is 85.71% and 89.47%. Positive predictive value, negative predictive value, False positive rate, and False-negative rate are 75.00%, 94.44%, 10.53% and 14.29% respectively. The results of several studies conducted by Kolb TM et al.[18] Flobbe K et al[19] have demonstrated that the addition of ultrasound to mammography has raised the sensitivity of imaging in breast carcinoma to 94–97%. Moss HA et al[20], reported sensitivity of 94.2% and specificity of 67.9% in 368 patients in whom combined mammographic and sonographic evaluation had been performed for palpable breast abnormalities and who underwent surgical biopsy. Shetty MK et al[21], findings reported a sensitivity of 100% and specificity of 80.1% in patients with palpable breast lumps. The high negative predictive value (91.3%) provides evidence to support the interpretation that two tests combined can reliably identify the case.

In our study, 14 (26.92%) of 90 lesions were categorized as benign and malignant after a combined mammographic and sonographic evaluation, clearly showing the value of imaging in helping avoid unnecessary biopsies.

CONCLUSION

In conclusion, imaging has an important role in the management of palpable abnormalities of the breast. The combined use of mammography and sonography is appropriate in most instances to characterize palpable lesions and to avoid unnecessary interventions in those cases in which imaging findings are unequivocally benign.

ACKNOWLEDGMENT

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