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Original Research Article

Assessment of breast carcinoma by correlating BI-RADS scoring with mammographic density

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ABSTRACT

Background: Breast density assessed by mammogram expressed in percentage of density of breast tissue reflects variations in breast tissue composition and is strongly associated with increased risk of breast cancer. The BI-RADS density method was created to indicate whether a mammogram represents a negative, benign or suspected malignant finding. To assess breast carcinoma by correlating breast imaging-reporting and data system (BI-RADS) scoring with mammographic density.
Methods: A total of 100 consecutive female patients with breast lump were assessed. The findings of the radiological examination and the histopathology results were subsequently analyzed to study the details of the breast disease in the group surveyed. BI-RADS classifications of breast density was extracted from mammography reports.
Results: Majority of patients were having BI-RADS score 4 (33%) followed by BI-RADS score 5 (30%). Majority of the patients were having percentage breast density 4 (35%) followed by Percentage breast density 3 (28%). BI-RADS score and percentage breast density had statistically significant correlation ($p<0.05$).
Conclusions: The BI-RADS score and percentage breast density by mammography had statistically significant correlation. Mammographic density is a strong breast cancer risk factor.

Keywords: Breast cancer, Mammography, BI-RADS score, Percentage breast density

INTRODUCTION

Breast cancer is the commonest cancer worldwide in women accounting for 25% of cancer in women.[1] The two most common screening tests for carcinoma of breast are physical examination by the medical practitioner and mammography. Biopsy is the only diagnostic procedure that can definitely determine if the suspicious lump is cancerous.

Mammography in all women above the age of 40 years with breast lump becomes mandatory to rule out malignancy. Breast density assessed by mammogram expressed in percentage of density of breast tissue reflects variations in breast tissue composition and is strongly associated with increased risk of breast cancer. Extent of radio-dense fibroglandular tissue of the breast is measured by breast density on mammography. Mammographically dense breast has been identified as an independent marker strongly associated with breast cancer risk and in particular with higher risk of interval cancer i.e. cancer detected between screening tests.[2,3]

The qualitative breast imaging reporting and data system (BI-RADS) method for density assessment developed by the American College of Radiology is one commonly used approach. This BI-RADS density method is the same as the clinical assessment categories that were created to indicate whether a mammogram represents a negative, benign or suspected malignant finding.[4] The successful incorporation of mammographic density into the clinical setting relies on an algorithm to accurately and reliably quantify density independent of a reader. The

present study was conducted to assess breast carcinoma by correlating BI-RADS scoring with mammographic density.

METHODS

In this prospective cross-sectional study, a total of 100 consecutive female patients with breast lump under study, who attended OPD or admitted to wards, in the period of August 2016 to August 2018, in the Department of Surgery were assessed.

Sample size

Sample size was calculated with the following assumptions. Based on the previous study, the prevalence of breast cancer was taken as 25%. Sample size was estimated at 5% level of significance with an allowable error of 10%, using the following formula:

$n=(Z(1-\alpha/2)2pq)/L^2$

Where, n= Sample size, Z= standard normal variate (at 5% type I error), p= prevalence, q= (1-p), L= allowable error, p = 25%= 0.25, q= (1 – p) = 1– 0.25=0.75 and L = 10%

So, $n = (1.96x1.96\ (0.25)\ (0.75))/(0.10)^2 = 75$.

Hence, a minimum sample size of approximately 100 cases during study period was included in present study.

Inclusion criteria

Inclusion criteria was all breast lump cases in women above the age of 40 years

Exclusion criteria

Exclusion criteria were previous surgery for Ca breast, known case of Ca breast, patients less than 40 years of age, patients unwilling for breast examinations.

The study was approved by the Institutional Ethical Committee. Informed consent was taken from the patients. A detailed history of the patient with complaints of breast lump was carried out. The findings of the radiological examination and the histopathology results were subsequently analyzed to study the details of the breast disease in the group surveyed. For each eligible biopsy with breast disease, most recent radiological investigation (mammogram) was used. If no screening mammography was done, we get a mammography done for correlative study.

The scoring system in BI-RADS classification includes 4.

1) Almost entirely fat. Glandular tissue is less than 25% 2) scattered fibro glandular tissue, ranging from 25-50% of the breast 3) heterogeneously dense parenchyma, ranging 51-75%of the breast tissue 4) breast contains greater than 75% glandular and fibrous tissue.

Statistical analysis

All data analysis had been done by using SPSS (version 22) for windows. Results were analyzed on the basis of radiological findings on mammogram and histopathology findings and co-relation between them and respective high incidence of breast diseases related to them by using two independent sample t test and Mann Whitney U-test.

RESULTS

The maximum numbers of patients were in the age group of 40-50 years (60%), followed by 51-60 years (18%). The mean age among the patients was 52.06±11.73 years. Most of the patients were with parity 4-5 (54%), followed by 2-3 (39%). The maximum numbers of patients were postmenopausal (87%) and premenopausal 13 (13%) patients. All the patients were married in the study. The maximum numbers of patients did not have family history of breast cancer (90%) while 10% patients had family history of breast cancer. The previous history of mammography was seen in 6% patients. The mean weight of the patients was 48.94±4.58 kg. The mean height of the patients was 151.11±2.79 cms while mean BMI of the patients was 21.37±1.84 kg/m^2. It was observed that majority of patients were having malignant lesion (62%) followed by benign lesion (38%).

Table 1: Distribution according to BI-RADS score.

BIRADS Score	No. of patients	Percentage
Negative	08	08%
Benign	15	15%
Probably benign	14	14%
Suspicious malignant	33	33%
Highly suggestive of malignancy	30	30%
Total	100	100%

It was observed that majority of patients were having BI-RADS score 4 (33%) followed by BI-RADS score 5 (30%), BI-RADS score 2 (15%), BI-RADS score 3 (14%) and BI-RADS score 1 (8%) (Table 1).

Table 2: Distribution according to percentage breast density.

Percentage breast density	No. of patients	Percentage
<25%	14	14.00
25-50%	23	23.00
51-75%	28	28.00
>75%	35	35.00
Total	100	100

Majority of the patients were having percentage breast density 4 (35%) followed by percentage breast density 3 (28%), percentage breast density 2 (23%) and percentage breast density 1 (14%) (Table 2). It was observed that BI-RADS score and percentage breast density had statistically significant correlation (p<0.05) (Table 3).

Table 3: Correlation of BI-RADS score and percentage breast density.

Percentage breast density	BIRADS score					Total	P value
	1	2	3	4	5		
1	08	06	00	00	00	14	X^2= 37.78 p<0.0001 (HS)
2	00	09	11	03	00	23	
3	00	00	03	25	00	28	
4	00	00	00	05	30	35	
Total	08	15	14	33	30	100	

It was observed that malignant lesion had higher breast density grade as compared to benign lesion with statistical significance (p<0.05) (Table 4).

Table 4: Co-relation of quantitative breast density with type of lesion.

Percentage Breast Density	Benign lesion	P value	Malignant lesion	P value
1	14	X^2=13.62 p<0.0001 (HS)	00	X^2=19.82 p<0.0001 (HS)
2	23		00	
3	01		27	
4	00		35	
Total	38		62	

DISCUSSION

In the present study, it was observed that majority of patients were having malignant lesion (62%) followed by benign lesion (38%). Eugênio et al studied imaging findings and correlation with histology and molecular subtype in breast cancer patients observed invasive carcinoma (73.8%).[5]

It was observed that majority of patients were having BI-RADS score 4 (33%). With percentage breast density 4 (35%). The BI-RADS score and percentage breast density had statistically significant correlation (p<0.05). van der Waal et al studied BI-RADS breast density and automated volumetric percentage breast density observed BI-RADS classification, 40.8% of the women had heterogeneously or extremely dense breasts statistically significant correlation.[6] Similarly, it was observed that histological findings and quantitative breast density i.e., benign and malignant had statistically significant correlation (p<0.05). Eng A et al and other studies have now definitively established mammography breast density as being an independent risk factor for breast cancer.[7,8] The highest categories of breast density are reported to confer relative risks (RR) of 4–8 fold compared to the lowest MBD categories, or approximately 2-fold compared to the population average breast density. Certain non-palpable breast diseases may be masked by dense breast tissue. However, these lesions maybe identifiable by the percentage breast density on mammography and the risk of these lesions turning into malignant maybe understood by the grading.

Women with high density and atypia on biopsy showed to have highest risk of breast carcinoma. Also, women with low density but proliferative lesions on biopsy were at a significantly higher risk for carcinoma. These co-relations of the breast density with breast diseases on biopsy is helpful in finding women at a higher risk for breast carcinoma as women above the age of 40 years must undergo a mammography, and percentage breast density grading would be helpful to find women at a higher risk. Percentage breast density and benign breast disease were found to be independent risk factors for breast cancer which are also associated with a gradual increase in risk of breast cancer with increasing breast density and increasing proliferation. Highest risk for breast cancer was seen in women with high breast density and proliferative lesions with atypia.

Breast density is mirroring of stromal and epithelial tissue of breast. Highly dense breast (ACR category 4) is at 4-6 times increased risk for breast cancer than almost entirely fatty tissue (category 1). Breast density is estimated to account for up to 30–40% of attributable risk among average risk population. The exact mechanism by which breast density is related to breast cancer risk is not completely clear. Although the exact causality is still under investigation, theories include local production of estrogen in breast is mostly responsible for breast density. Estrogen synthesis in breast tissue results from activity of the aromatase enzymes which converts major androgens, androstenedione and testosterone to estrogen, estrone and estradiol. Aromatase immunoreactivity is increased in dense breast. Aromatase inhibitors block local synthesis of estrogen in human breast tumours. This serves as an endocrine therapy. The BI-RADS assessment of mammographic density has been incorporated into several risk models including the breast cancer surveillance consortium's 1-year and 5-year models developed using over 1 million women.

Breast density is a grading included nowadays in mammographic reports as per the BI-RADS lexicon. As per the radiologist's interpretation, density of the breast is measured depending upon the percentage of stromal and epithelial tissue as compared to the fat content. Hence, there is an inherent degree of subjectivity in the measurement of breast density on mammograms. There are several studies that demonstrate only moderate inter-

observer agreement on the breast density levels, where least agreement has been reported in dense breast and distinguishing scattered fibro glandular from heterogeneously dense breasts. Inconsistency in assigning these levels of breast density could have significant clinical consequences as risk assessment and screening recommendations are being modified based on breast density. Newer methods of automated systems for measurement of breast density on mammograms have been commercially available. However, these systems use different techniques to quantify breast density and agreement between the different systems is unclear.

Limitations

Limitations of this study include the prospective nature and small population size, which may affect some of the statistical results and p values as it is dependent on sample size. Ideally, a larger group of study that includes a control group of women at normal risk for breast cancer may further elucidate the associations we found in our study.

CONCLUSION

The BI-RADS score and percentage breast density by mammography had statistically significant correlation. The histological findings and quantitative breast density i.e., benign and malignant diseases also had statistically significant correlation. Mammographic density is a strong breast cancer risk factor, one of the strongest risk factors known, apart from age and certain genetic mutations.

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REFERENCES

1. Ghoncheh M, Pournamdar Z, Salehiniya H Incidence and Mortality and Epidemiology of Breast Cancer in the World. Asian Pac J Cancer Prev. 2016;17(S3):43-6.
2. McCormack VA, dos Santos Silva I. Breast density and parenchymal patterns as markers of breast cancer risk: A meta-analysis. Canc Epidemiol Biomark Prev. 2006;15(6):1159-69.
3. Cummings SR, Tice JA, Bauer S, Browner WS, Cuzick J, Ziv E, et al. Prevention of breast cancer in postmenopausal women: approaches to estimating and reducing risk. J Nation Canc Inst. 2009;101(6):384-98.
4. Byrne C, Schairer C, Brinton LA, Wolfe J, Parekh N, Salane M, et al. Effects of mammographic density and benign breast disease on breast cancer risk (United States). Canc Caus Cont. 2001;12(2):103-10.
5. Eugênio DS, Souza JA, Chojniak R, Bitencourt AG, Graziano L, Marques EF. Breast cancer diagnosed before the 40 years: imaging findings and correlation with histology and molecular subtype. Appl Canc Res. 2017;37(1):16.
6. van der Waal D, den Heeten GJ, Pijnappel RM, Schuur KH, Timmers JM, Verbeek AL, et al. Comparing visually assessed BI-RADS breast density and automated volumetric breast density software: a cross-sectional study in a breast cancer screening setting. PLo On. 2015;10(9):e0136667.
7. Eng A, Gallant Z, Shepherd J, McCormack V, Li J, Dowsett M, et al. Digital mammographic density and breast cancer risk: A case–control study of six alternative density assessment methods. Brea Canc Res. 2014;16:439.
8. Bertrand KA, Tamimi RM, Scott CG, Jensen MR, Pankratz VS, Visscher D, et al. Mammographic density and risk of breast cancer by age and tumor characteristics. Brea Canc Res. 2013;15:R104.

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