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Carcinoma of the Breast: A Study of the Mammographic Findings and Histological Spectrum

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Abstract
Background: *Mammography is the primary investigative modality in the background of a clinical suspicion of carcinoma breast. This study correlates the mammographic findings in histologically proven cases of carcinoma breast.*
Aim: *To evaluate the mammographic features and histologic spectrum of carcinoma breast in a group of histo/cytopathologically proven carcinoma breast patients.*
Study Setting: *Study setting at Dr. SMCSI Medical College, Karakonam. Time period April 2014 to March 2015.*
Materials and Methods: *A retrospective analysis of the mammographic findings in 20 histo/ cytopathologically proven cases of carcinoma breast was undertaken.*
Results: *All cases included in this study had at least one primary mammographic sign of malignancy in the form of a mass and/or micro calcification. However, only 4/20(20%) cases showed microcalcification typical of malignancy. Secondary mammographic signs of malignancy were present in 19/20(95%) cases. Histopathology showed Duct carcinoma in 17/20(85%) cases.*
Conclusions: *Through this study we concluded that mammography is an accurate, simple and low cost technique to identify breast carcinomas in the background of a clinical suspicion.*
Keywords: *Microcalcification, quadrant, metastasis.*

Introduction

Breast cancer is the second most common cause of cancer death in women worldwide. Mammography is the primary investigative modality in a clinical suspicion of carcinoma breast. Mammograms depict all the significant changes in breast disease, except heat and color, that are detectable on clinical examination. The typical malignant tumour of the breast not only produces localized changes at the primary site of the lesion but may also excite diffuse alterations in some or all of the breast structures at a distance from the lesion[1].

Changes on the mammograms indicating the diagnosis of cancer of the breast may be thought of as primary (or local) signs and secondary (or distant) signs[1]. The primary mammographic signs of malignancy are density of the lesion, relative size of the lesion, shape of the lesion and type of calcification within the lesion. The secondary mammographic signs are nipple and areolar changes, skin thickening, skin retraction,

increased vascularity of the lesion, ductal hyperplasia, asymmetry in breast parenchyma, distortion of breast architecture, straightened trabeculae, increased stromal density, nonspecific duct prominence, axillary lymph nodes and intramammary lymph nodes. In this study we are trying to retrospectively observe the presence/ absence of the mammographic signs of carcinoma in histopathologically proven cases of breast cancer.

Materials and Methods

Study design and setting: The hospital numbers of patients whose mammograms were reported to be either positive for or suspicious of malignancy between April 2014 and March 2015 at Department of Radiodiagnosis, Dr. SMCSI Medical College, Karakonam, were obtained. The charts and histo /cytopathological reports of these patients were reviewed.

Inclusion and exclusion criteria: The mammograms of those patients whose biopsies/ FNACs were positive for malignancy were reviewed. However, due to incomplete records only 20 cases were available.

Equipment used and technique: All mammograms had been performed on a dedicated Siemens Mammomat 3000 Nova mammography unit. Standard craniocaudal and mediolateral oblique views, with additional cone compression views when considered necessary had been taken. The patients had undergone surgical excision (l7/20), biopsy (1/20) or fine needle aspiration (2/20).

Parameters studied: The mammograms were studied in retrospect. The breast density was categorised as fatty, intermediate or dense[2] and the primary & secondary mammographic signs (as mentioned in introduction) of breast cancer were recorded.

Ethics

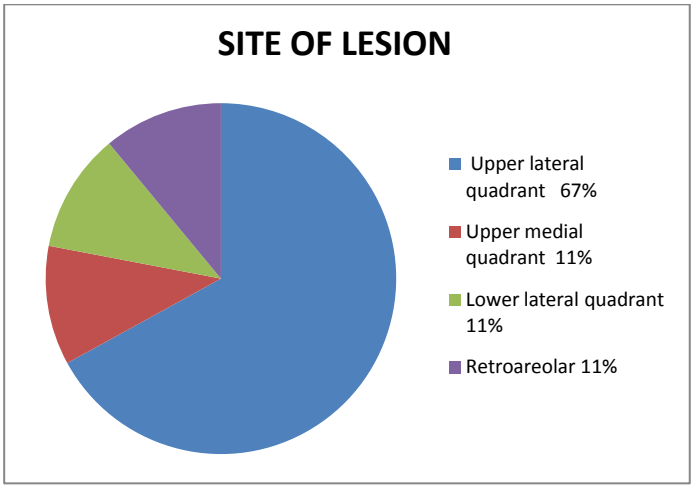
All the procedures followed were in accordance with the ethical standards of this institution.

Results

The average age of presentation in this study was 45 years, the range being 30 to 65 years. The left side was involved in 11/20(55%) and the right side in 9/20(45%) cases.

The site of the lesions is depicted in the pie diagram below. In 12/18(66.6%) the lesion was in the upper lateral quadrant. No lesion was seen in the lower medial quadrant. In 2/20 cases the lesion could not be assigned a quadrant, as it was seen only on one view.

Figure/Table 1 –Site of Lesion



The most common primary mammographic sign seen was a mass (18/20 cases) as shown in Table 2.

Figure/Table 2 -Primary Mammographic Signs

Mass	14	70%
Mass and Microcalcification	4	20%,
Microcalcification	2	10%

A definite mass was seen in 15/18(83.3%) cases- while in three cases there was only an illdefined increase in density. The average size of the mass was 38mm, taking into account the largest dimension of each mass. The margins of the lesions were spiculated in 7/18(38.9%)cases, ragged in 8/18(14.4%)cases and indistinct in 3/18 (16.6%)cases. The density of these masses was mildly increased in 5/18(27.7%) and moderately or grossly increased in 13/18(72.3%).

Correlation between histopathologic and mammographic sizes was seen in 11/17(64.7%) cases as shown in Table 3 below.

Figure/Table 3: Size of the Mass in Centimeter- Mammographic Vs. Pathological Comparison

Pathologic \ Mammography	NO MASS	<2cm	2-5cm	>5cm	TOTAL
NO MAS	1	0	0	0	1
<2cm	0	2	1	0	3
2-5cm	0	1	7	2	10
>5cm	1	0	1	1	3
TOTAL	2	3	9	3	17

Three cases who underwent biopsy / fine needle aspiration cytology were not included in Table 3.

The average size of the mass on mammography, in these 17 cases was 35mm and on histopathology was 33mm. However in 1 case, though mammography was negative for a mass, a 6 cm mass was seen on gross examination of the specimen. In this case, the mammogram showed generalized increase in density within which a mass could not be discerned and histopathology reported infiltrating duct carcinoma associated with mammary dysplasia.

Microcalcification was seen in 7/20(35%) cases, of which 4 were in clusters, 2 were scattered and 1 was single. Microcalcification was within the lesion in all but one case. In 4 cases, macrocalcification (> 1 mm) was also seen. Clustered heterogeneous micro calcification typical of malignancy was seen in 4/20(20%) of cases. All cases with microcalcification were infiltrating duct carcinoma.

Secondary Mammagraphic Signs

Atleast one secondary mammographic sign of malignancy was seen in 19/20 (95%) cases. The number of cases in which each secondary sign was seen is shown in Table 4.

Figure/Table 4: Secondary Mammographic Signs

SIGNS	Number Of Cases	%
Nipple retraction	1/19 *	5.2
Areolar thickening	6/19 *	31.5
Skin thickening	6/20	30
Skin retraction	4/20	20
Hypervascularity	5/20	25
Trabecular distortion	17/20	85
Increased stromal density	13/20	65

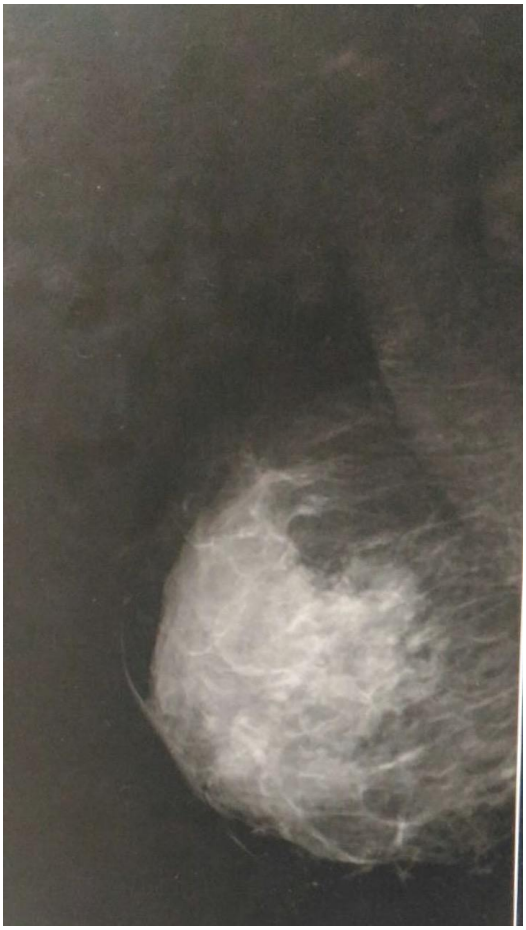
*Nipple and areola were not visualised in 1 case due to suboptimal positioning.

No secondary signs were seen in one case with a dense fibroglandular breast in which a 3.5cm stellate mass was detected. The average number of secondary signs seen was 2.45, the commonest being trabecular distortion (straightening). Ipsilateral axillary nodes were identified in 4/20(20%) cases, of which central lucency was present in 2 cases. No intra mammary nodes were seen in this study.

Figure/Table 5:

*Mammogram of right breast showing peripheral focal radiodense lesion with partial ill-defined borders and skin thickening in inferior medial quadrant. Few axillary lymph nodes seen. HPE showed infiltrating ductal carcinoma (figure 8) with axillary metastasis.

Figure/Table 6:



*Mammogram of right breast showing assymetrical density with architectural distortion. Focal radiodense lesion with partial illdefined borders predominantly in retroareolar region. Few axillary lymph nodes seen. HPE showed Invasive carcinoma breast NOS (Figure 9).

Histologic Spectrum of Disease: Duct carcinomas constituted 85% of the cases seen. The pathological spectrum is shown in Table 7.

Figure/Table 7: Pathological Types

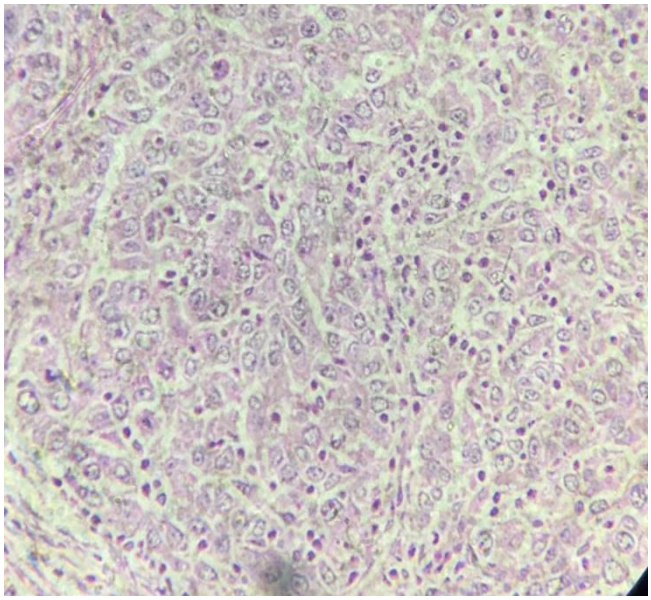
DUCT CARCINOMA	17	85%
INFILTRATING	14	70%
METAPLASTIC	1	05%
UNCLASSIFIED *	2	10%',.
:LOBULAR CARCINQMA	2	10%
MEDULLARY CARCLNOMA	1	05%

*Further sub classification was not possible as the mode of pathological diagnosis was fine needle aspiration cytology.

Two cases of infiltrating duct carcinoma were associated with Paget's disease of the breast. The presence of microcalcification was reported on histopathology in 3 cases. Mammography showed the presence of microcalcification in 2 of these 3 cases.

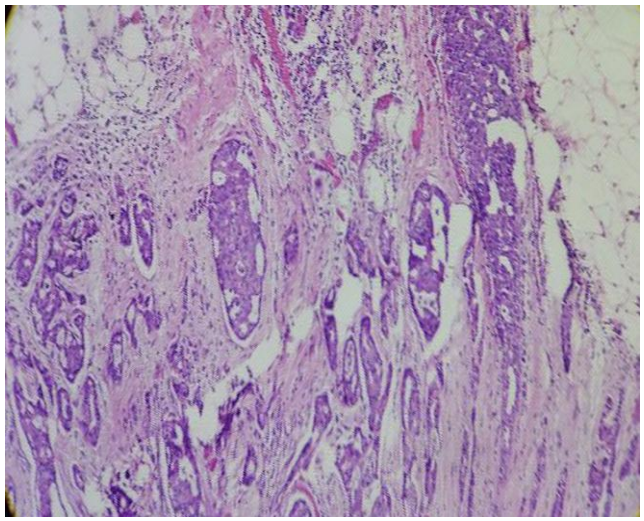
Axillary nodes were positive for tumour metastasis in 9/17 cases in which simple mastectomy with axillary node sampling was done. 2 of these 9 cases were positive for axillary nodes on mammography.

Figure/Table 8:



HPE showing intraductal carcinoma (corresponding Figure 5)

Figure/Table 9:



HPE showing Invasive carcinoma NOS (corresponding Figure 6)

Limitations

The sample size of our study was low due to incomplete hospital records.

Only histopathologicaly proven cases of breast carcinoma were reviewed to look for mammographic signs of malignancy. The presence or absence of these signs in benign diseases of breast were not studied.

Discussion

Age: The average age at presentation in our study was 45 years. According to the study conducted by the American Cancer society the median age of diagnosis of carcinoma breast was 61 years[3].

Site: Most of the cases (12/18) in this study were located in the upper outer quadrant. This is consistent with the study conducted by Robin L. Birdwell & Debra M Ikeda[4]. In the study from Emory University, 50% of malignancies were found to lie in this quadrant[1].

Mass: The definition of a mammographic mass encompasses the specific localised density of elements found in the breast and also its distinction from other nonspecific, localised, less compact and less well outlined densities of coalescent tissues or altered architecture.

According to the latest ACR BIRADS 5th edition, 'mass' is defined as a space occupying 3D lesion which is seen on two projections

Shape: round, oval or irregular

Margins: obscured, indistinct, circumscribed, microlobulated, or spiculated

Density: equal, low or high

Malignant masses always show a definite increase in relative density, the character being nonhomogenous (densest at the centre). When the margins of the mass is indistinct or microlobulated or speculated, there is more suspicion of malignancy[5,6]. In a study by Egan, 75.2% of breast cancers revealed a mass on the mammogram[1]. In our study, a mass was identified in 18 of 20 cases (90%). A well defined mass was seen in 15/18(88.8%) cases and the mass was poorly defined in 3/18(11.2%) cases. No mass was identified on mammography in one case, while clinical and gross examination of the mastectomy specimen revealed a 6cm mass. In this case there was a generalised increase in density the density of the breast and histopathology reported infiltrating duct carcinoma associated with mammary dysplasia. Out of 18 cases with a mass on mammography in this study,13 (72.2%) showed a moderate to gross increase in our study. The margins of the lesion was spiculated in 7/18(38.8%), ragged in 8118(44.4%) cases and indistinct in 3/18(l6.6%) cases.

Microcalcification: Mammography is the only examination that can consistently identify calcification within the breast which can signify early malignancy[2].

Clustered microcalcification is defined as 5 or more calcifications each under lmm in diameter isolated in a small volume of the breast and projected within a 1 sq cm area on the mammogram. A loose cluster (<10/sq cm) is thought to be benign, whereas a dense cluster (>20/sq cm) is more in favour of malignancy[7].

In Egan's study 60% of intraductal carcinomas had microcalcification on mammography[1]. It is interesting that in our study only 4/20(20%) of cases had microcalcification typical of malignancy. In another 2 cases scattered microcalcification was seen. All cases with microcalcification were histopathologically proved to be duct carcinoma. Another interesting correlation between microcalcifiation and lymph nodal involvement by tumour was pointed out by Holm Te et al[8]. This study states that lymph nodal involvement by tumor was present in 50% of patients with mammographic microcalcification in relation to the primary tumor, but only 24% of patients without microcalcification. A similar trend was observed in our study. However, no definite conclusions could be drawn as the numbers were small. 5/10 cases with axillary node metastasis had microcalcification. On the other hand, only 1/17 cases which were negative for axillary nodal metastasis was positive for microcalcification.

Secondary Signs: Secondary signs of malignancy (as mentioned above) occurs in such a high percentage of these lesions that the diagnosis is

even more definite in the majority of carcinomas. These are nonspecific but extremely valuable nonetheless[1]. All but one case in this study of 20 cases showed one or more secondary signs; straightening of trabeculae (85%) and increase in stromal density(65%) being the most common.

Axillary Nodes: Spread of tumour to axillary nodes significantly worsens the prognosis. Normally axillary nodes are small, oval in shape with lucent center due to the presence of hilar fat[9]. Often axillary lymph node of size less than 15mm is considered benign, though this is a highly non-specific criterion[10]. Abnormal axillary lymph nodes are usually round or oval, high density, absent hilar fat, with or without calcifications[9]. In this study, 4/20 cases of ductal carcinoma showed ipsilateral axillary nodes on mammography. In 2 of these 4 cases; the nodes had lucent centres and one case was positive for axillary node metastasis. **It** is of course possible that the nodes seen on the mammogram were not those positive for tumour metastasis. The other 2 cases which showed solid axillary nodes' on mammography were not histopathologically evaluated as the diagnosis of carcinoma was made on the basis of biopsy in one case and fine needle aspiration cytology in the other case

Intraiintramammary Nodes: According to the study done by McSweeney & Egan using breast specimens sliced to 5mm thick sections, intramammary nodes were identified in 29% of breasts with carcinoma[11]. Egans study showed the presence of a positive intramammary node in 10% of breast carcinomas[1]. No intramammary nodes were found in our study.

Histologic Spectrum: Over 90% of breast cancers arise from ductal epithelial cells[12]. Intraductal carcinomas have an extremely high potential for metastasis. In this study, 90%, cases were duct carcinoma consistent with the reports of other studies. 2/18(11.1%) cases of ductal carcinoma were associated with Paget's disease of the breast. Intraductal carcinoma is often associated with Paget's disease of the breast as it has a propensity to grow along the ducts. According to one series at Emory University this disease constituted 2% of the total number of primary operable breast carcinomas[1]. The incidence of medullary carcinomas ranges from 4.3 to 7% and that of lobular carcinoma is about 5%. In our study, lobular carcinoma was seen in 2/20 cases and medullary carcinoma in 1/20 cases.

Conclusion

This study was done to analyse the mammographic features seen in cases of histopathologically proven cases of breast carcinoma. Although many cancers produce specific recognisable growth patterns, there is an unavoidable similarity between many benign and malignant lesions. Mammography remains the gold standard among the imaging modalities of the breast due to its overall accuracy, relative simplicity and low cost. Mammography in the presence of a clinical diagnosis will help to clarify the exact position of the tumour, the extension of tumor outside the palpable mass and the presence of multiple foci of carcinoma as well as the status of the contralateral breast.

Through this study we also conclude that in the present era of advanced diagnositic modalities, mammogram still holds a vital role in the diagnosis of carcinoma breast.

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