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Patterns of Microcalcification in Mammography Done In Benign and Malignant Breast Lesions

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Abstract
Introduction: *Breast cancer is the most common cancer among women in India. The incidence of breast cancer is on its rise.*
Materials and Methods: *A descriptive study was conducted among 75 female patients above 20 years of age with palpable breast lesions. Patients with advanced carcinoma, patients with history of previous breast biopsy and previously treated cases were excluded from the study.*
Results: *Twenty three subjects had microcalcifications and twenty seven with macrocalcifications.*
Conclusion: *This study shows that certain findings in mammography can differentiate benign and malignant breast lesions*
Keywords: *Benign, breast, mammography, microcalcifications.*

Introduction

Microcalcifications are tiny calcium deposits in breast tissue. Approximately 30% of early invasive breast cancers have granular microcalcifications which are detectable on mammography. One of the easily detectable and the earliest signs of a malignant breast disease, are tiny deposits of calcium in the breast soft tissue[1]. It was first reported in 1913 by a German surgeon, Solomon, who conducted a radiographic examination of a mastectomy specimen[2]. Radiologists make active efforts to identify microcalcifications in mammograms making them one of the most important diagnostic markers of breast lesions[3].

Although these are also associated with benign conditions such as fat necrosis and secretory diseases, around
40% of breast cancers present with microcalcifications and indicate the presence of a tumor[4]. Type I MCs are calcium oxalate crystals, while Type II MCs are composed of another bone specific mineral called hydroxyapatite[1]. Type II MCs are exclusively found in malignant breast disease. These crystals are known to accelerate the pathological process in breast cancer.
Malignant MCs can have three appearances: crushed stone (pleomorphic), casting-type or powdery[5]. The patients presenting with casting-type MCs have aggressive tumor pathology, with

a death rate five times that of patients who do not present with it[6]. Calcifications can be benign or malignant. They can appear as either macrocalcifications or microcalcifications on a mammogram. Macrocalcifications look like white large dashes or dots and are mostly noncancerous. Microcalcifications can also give an idea of the extent of the disease. Breast microcalcifications can occur in many different forms. They can be linear, round, granular, coarse, monomorphic when all of them having the same shape, or pleomorphic when different shapes are present. They can also form groups. When they are clustered, their homogeneous or non-homogeneous nature should be noted. Radiologists rely on breast microcalcifications as a possible indicator for breast cancer; however, only histological analysis can confirm this. When the distribution of microcalcifications is bilateral diffuse or diffuse, when they have a round and/or punctuate shape, or when they are scattered, the condition is usually benign. If microcalcifications have a linear or branching pattern with irregular borders, or if they have variable density, or when they are distributed in a haphazard or segmental way, there is a high probability that it is ductal carcinoma *in situ* or malignant cancer. If the distribution of the microcalcifications is linear and they are in round, oval, or amorphous form, they are termed as 'suspicious'. Studies have shown that screening mammography reduces breast cancer mortality by around 40%[7]. Mammography is therefore recommended for the early detection of breast cancer among women more than 40 years[8]. Cancer progression can be halted by early diagnosis and timely management[9]. The presence of microcalcifications has resulted in the diagnosis of 62% to 98% of ductal carcinomas in situ (DCIS)[10]. Mammography is said to have a sensitivity of 95.2% and a specificity of 41.4% in detecting microcalcifications[11]. The American College of Radiology (ACR) standardized reporting system, called the Breast Imaging Reporting and Data System (BIRADS) has classified microcalcifications associated with breast cancer as pleomorphic or heterogeneous and as fine and/or branching (casting) calcifications[12]. The positive predictive value (PPV) of different categories of microcalcifications according to BI-RADS found that 92% of linear and 67% of pleomorphic microcalcifications were malignant[13]. There are other uses of mammography in evaluation of systemic diseases- although mammography is primarily used for the detection of breast cancer, it may reveal breast abnormalities related to extra-mammary disease such as congestive heart failure and central venous obstruction which may manifest as venous engorgement and breast edema. Some diseases such as neurofibromatosis type 1 and filariasis may manifest with pathognomonic findings at mammography, whereas other systemic diseases such as Sarcoidosis, Wegener granulomatosis, and amyloidosis can manifest as non-specific breast masses that are indistinguishable from breast cancer and usually require tissue biopsy for confirmation(14). The characteristics suggestive of malignant lesions are greater anteroposterior diameter, markedly hypo echoic nodule, presence of many microlobulations on the surface of a solid breast nodule, distal shadowing and the presence of punctate calcifications. Lucent-centered calcifications may be spiculated, with local thickening, branching, rod-like or angular. In early stages of development, calcifications in the wall of an oil cyst may simulate malignancy(15). Breast abscess- Sonographic features suggestive of a breast abscess include – hypoechoic collection, mostly multiloculated, no vascularity within the collection, acoustic enhancement due to fluid content, an echogenic, vascular rim.

Aim

The aim of the study was to find out the patterns of microcalcification in mammography done in benign and malignant breast lesions

Objectives

1. To assess the patterns of microcalcification in mammography

2. To differentiate the benign and malignant breast lesions in mammography
3. To assess microcalcification in mammography done in benign and malignant breast lesions

Material and Methods

A descriptive study was conducted among female patients with breast lesions at the Department of Radiodiagnosis, Government Medical College, Thiruvananthapuram for one year from July 2013 to July 2014. The study sample consisted of patients referred to Department of Radiodiagnosis for mammogram. All female patients above 20 years of age with palpable breast lesions and bloody discharge from the nipple were included for the study. Patients with advanced carcinoma, previously treated cases and those with history of previous breast biopsy were excluded. Consecutive sampling method was used for data collection using a pre-tested structured questionnaire. There were 75 patients satisfying the inclusion criteria during the study period. After obtaining the proper history, clinical examination and consent, the patients were subjected to mammography. The need and aim of study were explained to the patients and informed written consent was obtained before including the subject in the study.

Data Collection

Patients who satisfied the inclusion criteria were subjected to undergo SS with 17mHz linear array probes. Data collection was started after obtaining the Institutional Research and Ethical Committee Clearance.

Benign criteria studied with mammography: 1. low density 2. Smooth margins 3. coarse calcifications

Malignant criteria were: 1. High density 2. Spiculated margins 3. Micro calcifications 4. Perifocal haziness

Data Analysis

Data was analysed using SPSS 16.0 and Microsoft Excel has been used to generate graph and tables. Data is described in frequency and percentages.

Results

The youngest patient was 23years and the oldest one was 67years old. 33.3% of them were in 50-59years age group, followed by 26.7% in 40 -49 years range and 18.7%in 30- 39 years range. 12% of the patients were of 60-69 years age group and 9.3% in 20-29 years age group.

Table 1: Distribution of study subjects according to age

Age in years	Frequency	Percentage(%)
20-29	7	9.3
30-39	14	18.7
40-49	20	26.7
50-59	25	33.3
60-69	9	12
Total	75(100)	100(100)

Table 2: Distribution of study subjects according to clinical diagnosis

Clinical diagnosis	Frequency	Percentage(%)
Benign	27	36
Malignant	28	37.3
Indeterminate	20	26.7

Table 3: Distribution of subjects according to the margin of lesion in mammography

Margins	Frequency	Percentage(%)
Smooth	29	38.7
Spiculated	18	24
Irregular	28	37.3
Total	75	100

Table 4: Distribution of subjects according to Calcification

Margins	Frequency	Percentage(%)
Nil	25	33.3
Microcalcification	23	30.7
Macrocalcification	27	36
Total	75	100

Table 5: Distribution of benign and malignant lesions according to type of calcification versus FNAC

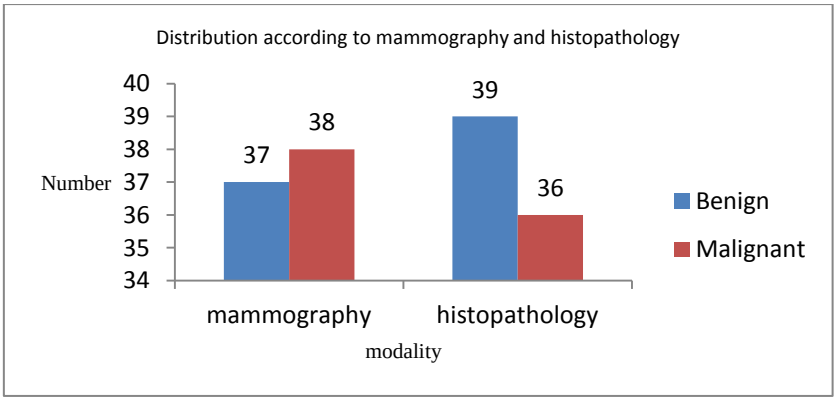
Calcification	FNAC findings				Total	
	Malignant		Benign			
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Nil	12	33.3	13	33.3	25	33.3
Microcalcification	23	63.9	0	0	23	30.7
Macrocalcification	1	2.8	26	66.7	27	36
Total	36	100	39	100	75	100

The type of cancer into benign and malignant types based on calcification and FNAC findings were found to be significant ($p < 0.001$).

Table 1: Distribution of benign and malignant cases according to margin

Margins	Malignant Number n (%)	Benign Number n (%)	Total(%)
Smooth	1(2.8)	28(71.8)	29(38.7)
Irregular	8(22.2)	10(25.6)	18(24)
Spiculated	27(75)	1(2.6)	28(37.3)
Total	39(100)	36(100)	75(100)

Graph 1. Distribution according to mammography, ultrasonography and histopathology



Discussion

The study was conducted among female patients with breast lesions. The most common benign lesion observed in the study was fibroadenoma which was present in 16 patients (21 %). According to literature, fibroadenoma is common before 40 years. In our study 10 out of 16 patients were below 40 years (62.5%). The youngest patient with malignancy was 23 years old and the oldest patient was 67 years old. Above the age of 60 years, 4 out of 9 patients were malignant (44.5%) and rest were benign cases which consisted of oil cysts, simple cysts and breast abscesses. In our study, only 44.5% in the age group above 60 years were malignant. There is higher chance of malignancy in a breast lump in patients older than 60 years. This may be due to the advanced stage of presentation which was an exclusion criterion in our study.

According to histopathology, 39 lesions were benign and 36 lesions were malignant. Benign lesions that came across the study were simple cysts, breast abscess, galactocele and fibrocystic breast disease. Among the six cases of simple

cyst, 3 were in the age group of 40- 49 years and 3 in 30-39 years. According to histopathology, 48% of all the lesions were malignant and 52% were benign. malignant features were shown in mammography by 91.7%. Among the benign criteria for mammography 67% had macro calcifications and most of them were calcified fibroadenomas. The malignant criteria in mammography were high density, speculated margins, microcalcifications and perifocal haziness (if 2 or more criteria are satisfied it is taken as mammographically malignant). 64% of the cases showed micro calcifications. Positive predictive value of micro calcification is 100% as all the cases with this finding were malignant. 95% of malignant cases showed high density. 75% had spiculated margins and 89% had perifocal haziness. The positive predictive value of high density, spiculated margins and perifocal haziness were 60, 96, and 71 respectively.

In the present study, microcalcifications are found in mammography. The correlation between mammographic and histopathologic findings are so comparable, to other studies where microcalcifications were the dominant finding, noted in 25 (42%) of the 60 cases. In this study, twenty three had microcalcification and all the study subjects who had microcalcifications turned to be malignant on histopathology, comparable with other studies also where microcalcification was the most frequent lesion reported among various studies and DCIS was also the common malignancy finding. The mammographic findings of invasive ductal carcinoma showed mass with microcalcifications and architectural distortion in 49 cases which is 48% of invasive ductal carcinoma cases(16,17,18). The malignant criteria in mammography were high density, speculated margins, microcalcifications and perifocal haziness (if 2 or more criteria are satisfied it is taken as mammographically malignant). 64% of the cases showed micro calcifications.

Conclusion

In this study, it was found that those lesions with characteristic features of malignancy in mammography, like spiculated borders and micro-calcifications with the branching pattern, can be considered as malignant and can be directly taken for surgery even without FNAC as these are more specific findings in malignancy and has a high positive predictive value. The possible clinical implications of this study is that mammography can be a useful diagnostic armamentarium for the clinician.

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References

1. Bellahcene A, Castronovo V. Increased expression of osteonectin and osteopontin, two bone matrix proteins, in human breast cancer. Am J Pathol. 1995;146(1):95–100.
2. Nalawade YV. Evaluation of breast calcifications. Indian J Radiol Imaging. 2009;19(4):282–6.
3. Bansal GJ, Thomas KG. Screen-detected breast cancer: does presence of minimal signs on prior mammograms predict staging or grading of cancer? Clin Radiol. 2011;66(7):605–8.
4. Castronovo V, Bellahcene A. Evidence that breast cancer associated microcalcifications are mineralized malignant cells. Int J Oncol. 1998;12 (2):305–8.
5. Zunzunegui RG, Chung MA, Oruwari J, Golding D, Marchant DJ, Cady B. Casting-type calcifications with invasion and high-grade ductal carcinoma in situ: a more aggressive disease? Arch Surg. 2003;138(5):537–40.
6. Palka I, Ormandi K, Gaal S, Boda K, Kahan Z. Casting-type calcifications on the mammogram suggest a higher probability of early relapse and death among high-risk breast cancer patients. Acta Oncol. 2007;46(8):1178–83.

7. The Swedish Organised Service Screening Evaluation Group: Reduction in breast cancer mortality from organized service screening with mammography: 1. Further confirmation with extended data. Cancer Epidemiol Biomakers Prev. 2006, 15:45-51. 10.1158/1055-9965.EPI-05- 0349
8. Weir HK, Thun MJ, Hankey BF, et al.: Annual report to the nation on the status of cancer, 1975-2000, featuring the uses of surveillance data for cancer prevention and control. J Natl Cancer Inst. 2003, 3:1276-1299. 10.1093/jnci/djg040
9. Tabar L, Dean BP: Thirty years of experience with mammography screening: a new approach
2019 Hadi et al. Cureus 11(10): e5919. DOI 10.7759/cureus.5919 10 of 11 to the diagnosis and treatment of breast cancer. Breast Cancer Res. 2008, 10:3. 10.1186/bcr2163
10. Shin HJ, Kim HH, Kim SM, Kwon GY, Gong G, Cho OK: Screening-detected and symptomatic ductal carcinoma in situ: differences in the sonographic and pathologic features. AJR Am J Roentgenol. 2008, 190:516-525. 10.2214/AJR.07.2206
11. Fischer U, Baun F, Obenauer S, Luftner-Nagel S, von Heyden D, Vosshenrich R, Grabbe E: Comparative study in patients with microcalcifications: full-field digital mammography vs. screen-film mammography. Eur Radiol. 2002, 12:2679-2683.
12. Sickles EA, D'Orsi CJ, Bassett LW, et al.: ACR BI-RADS® Mammography. ACR BI-RADS®Atlas, Breast Imaging Reporting and Data System. American College of Radiology, Reston, VA, USA; 2013. 5:
13. Uematsu T, Kasami M, Yuen S: Usefulness and limitations of Japan mammography guidelines for the categorization of breast microcalcifications. Breast Cancer. 2008, 15:291-297. 10.1007/s12282-008-0033-4
14. Jerrold T. Bushberg JAS, Edwin M. Leidholdt Jr, John M. Boone. The Essential Physics of Medical Imaging. 2009.
15. Craft M, Bicknell AM, Hazan GJ, Flegg KM. Microcalcifications Detected as an Abnormality on Screening Mammography: Outcomes and Follow up over a Five-Year Period. Int J Breast Cancer.2013:458540
16. Cao MM, Hoyt AC, Bassett LW. Mammographic signs of systemic disease. Radiographics. Jul-Aug;31(4):1085-100.
17. Haus AG, Metz CE, Chiles JT, Rossmann K. The effect of x-ray spectra from molybdenum and tungsten target tubes on image quality in mammography. Radiology. 1976 Mar;118(3):705-9.
18. Sickles EA. Breast calcifications: mammographic evaluation. Radiology. 1986 Aug;160(2):289-93.