Original Article

DOI: 10.7860/JCDR/2023/55632.17675

Radiology Section

Morphological and Distribution Pattern of Calcifications on Full Field Digital Mammography versus Digital Breast Tomosynthesis and Comparison of Diagnostic Abilities of the Two Modalities: A Retrospective Study

NEHA SINGH[1], JAMES MARAK[2], PRANJALI JOSHI[3], DEEPAK KUMAR SINGH[4]

ABSTRACT

Introduction: Microcalcification (MC) is an effective and sometimes the only indicator of breast cancer. Early detection and characterisation of malignant MC can facilitate early diagnosis and timely treatment of breast cancer. However, due to the small size and low contrast as compared to the background parenchyma, it is difficult and time-consuming for radiologists to accurately evaluate MC.

Aim: To compare the diagnostic abilities of Full Field Digital Mammography (FFDM) and Digital Breast Tomosynthesis (DBT) in the detection and characterisation of breast calcifications.

Materials and Methods: This retrospective descriptive study was conducted in the year 2022 at the breast imaging unit of Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow, Uttar Pradesh, India and data of patients who had undergone FFDM and DBT between March 2019- September 2020 was collected. Mammograms of 702 women with 1217 breasts were evaluated and MC was detected in 622 breasts. Based on the morphology and distribution pattern, Breast Imaging Reporting and Data System (BI-RADS) assessment Category was assigned from 2-5. Cases with BI-RADS 2 and 3 were followed-up by repeat Mammograms at 6-month to 1-year intervals. Cases with BI-RADS 4 and 5 were biopsied under stereotactic or ultrasound guidance. Histopathology findings and the stability of the calcifications on sequential mammograms were considered the gold standard for final BI-RADS categorisation. The Chi-square test was applied for the comparison of FFDM and DBT.

Results: Typically benign morphology MC was noted in 508 (81.67%) of breasts on FFDM and 505 (80.67%) on DBT. Suspicious morphology MC was noted in 114 (18.33%) of breasts on FFDM and 121 (19.33%) on DBT. Vascular calcification was the most common benign MC seen in 233 cases (37.45%) on FFDM and 244 cases (38.9%) on DBT. Similarly, fine pleomorphic was the most common suspicious morphology MC on FFDM and DBT both seen in 47 cases (7.5%) and 44 cases (7.02%), respectively. The most common distribution pattern was diffuse seen in 582 cases (93.56%) on FFDM and 583 cases (93.13%) on DBT, respectively. No significant difference was observed (p=0.283) in the rate of detection or characterisation of MC by FFDM or DBT. The sensitivity of both modalities were almost similar (97.7% and 97.9%) without any significant difference (p=0.278). Similarly, there was no difference in the specificity (94.9% and 94.4%, respectively, p=0.289).

Conclusion: According to the observation of the present study the performance of FFDM and DBT for the detection and characterisation of MC was not significantly different.

Keywords: Breast imaging reporting and data system, Calcification, Microcalcification, Mammogram

INTRODUCTION

Breast cancer is the most common cancer in the world, accounting for 2261419 new cases in 2020 with 685000 deaths recorded in the same year [1]. At the end of 2020, 7.8 million women were alive, who was diagnosed with breast cancer in the past five years [2]. In India, breast cancer is the most common cancer in women and accounts for 27.7% of all cancers occurring in women. According to Global Cancer Observatory (GLOBOCAN) 2018: India factsheet, the reported number of new cases of breast cancer was 1,62,468 and the total number of disease-specific deaths was 87,090 [3]. In urban areas, 1 in 22 women is at risk of developing breast cancer during her lifetime in comparison to rural areas, where 1 in 60 women manifests the same [4]. Overall, 1 in 28 women is likely to develop breast cancer during her lifetime [5]. In India, the incidence rates begin to rise in the early 30's and peak at ages 50-60 years [6]. Most of the breast carcinoma cases present as a palpable lump, pain or discharge. Approximately, 55% of non palpable breast malignancies present as MCs and are responsible for the detection of 85-95% of cases of Ductal Carcinoma In-Situ (DCIS) by screening mammography, although they can also represent invasive cancers [7,8]. MC in radiography was first described by Salomon A in 1913, who described the association of MC with breast cancer [9]. MC occurs due to the deposition of calcium oxalate and calcium phosphate within the ductal system, the breast acini, stroma, and vessels [10]. Calcium phosphate is more commonly associated with malignant lesions than calcium oxalate [11]. The BI-RADS of the American College of Radiology (ACR) describe breast calcifications according to their morphology and distribution [12]. In the period of Digital Mammography (DM), calcification-specific cancer detection rates range from 1.9-3.2 per 1000 screening mammograms [13]. MC is seen in 1/3rd of all malignant lesions detected on screening mammography. Calcifications are associated with 50% of all breast cancers and 15.30% of calcifications that undergo biopsy are proven to be malignant [14].

Conventional FFDM is a two-dimensional imaging method that is commonly used for screening and detection of breast cancer. However, there are some drawbacks to its ability, to differentiate suspicious lesions from the adjacent overlapping tissue, especially in dense breasts [15]. DBT is a three-dimensional imaging modality that shows better outcomes in cancer detection, when combined with FFDM. However, the detection of calcification by DBT alone is controversial. Some studies showed no significant differences in the detection of MC by DBT in comparison to FFDM [16-19].

In contrast, FFDM showed better results in the detection of MC than DBT [20,21]. In the present study, aim was to:

- Estimate the prevalence of different morphology patterns of MC based on FFDM and DBT;
- Estimate the prevalence of the distribution pattern of MC based on FFDM and DBT;
- Compare the abilities of FFDM and DBT in the detection and characterisation of MC.

MATERIALS AND METHODS

This retrospective descriptive study was conducted in the year 2022 at the breast imaging unit of Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow, and data of patients who had undergone mammography between March 2019-September 2020 were collected. The study was approved by the Ethics Committee of our institute (IEC no- 16/22). The Ethics committee waived the requirement for written consent.

Inclusion criteria:

- All women who underwent FFDM and DBT for screening, diagnostic or surveillance purposes.
- MC seen on FFDM or DBT or both.
- Microcalcifications that were either histopathologically proven or remained stable on follow-up mammograms.

Exclusion criteria:

- Subjects who had undergone breast surgery.
- Pregnant or lactating women were excluded from the study.

Study Procedure

Mammograms of 702 women with 1217 breasts were evaluated and MC was detected in 622 breasts which constituted the final sample set. All the patients underwent FFDM of each breast in Cranio-Caudal (CC) and Medio-Lateral Oblique (MLO) views, and tomosynthesis in one view (MLO) using DM Unit (GE Healthcare Senographe Essential 54020/CESM1/SenoClaireA.6). Additional views like axillary tail view, cleavage view were taken whenever required. Images were analysed by a radiologist with more than 12 years of experience in breast imaging on a BARCO workstation model-MDNC-6121. Breast calcifications were identified and characterised according to their morphology and distribution pattern as per ACR-BI-RADS Atlas 5th edition [18].

According to morphology, the following types of calcifications were classified as "typically benign".

Skin- Usually lucent-centered deposits, located along the inframammary fold parasternally and in the axilla and areola.

Vascular- parallel "tram- track", discontinuous linear appearance of a tubular structure.

Round- small (<1 mm), if (<0.5 mm) termed as punctate.

Dystrophic- irregular in shape usually >1 mm in size often have lucent centres.

Suture- typically linear or tubular in shape and, when present, knots are frequently visible.

Coarse or popcorn like- large (>2-3 mm) calcifications with a 'popcorn-like' appearance.

Milk of calcium- usually grouped, often round and less evident smudgy deposits on CC view but more clearly defined, crescent shaped, curvilinear or linear on MLO or true lateral views.

Rim/eggshell- round or oval and appear as calcific deposits (<1 mm in thickness) on the surface of a sphere.

Large rod like- thick continuous rods that may occasionally be branching and follow a ductal distribution, radiating toward the nipple and are usually bilateral.

Calcifications with "suspicious morphology" include:

1. **Amorphous**- Small and/or hazy in appearance that a more specific particle shape cannot be determined. These calcifications in a grouped, linear or segmental distribution are considered suspicious.
2. **Fine pleomorphic:** More conspicuous than amorphous, vary in size and shapes and are usually <0.5 mm in diameter.
3. **Fine-linear or fine-linear branching:** Thin, linear, irregular calcifications, which may be discontinuous and <0.5 mm in caliber.
4. **Coarse heterogeneous:** These are irregular, conspicuous calcifications that are generally between 0.5-1 mm and tend to coalesce.

Distribution pattern of calcification was assigned as follows:

1. **Diffuse**- distributed randomly throughout the breast.
2. **Grouped**- when atleast five calcifications are grouped within 1 cm of each other or larger number within 2 cm of each other.
3. **Segmental**- calcification seen in ducts or a segment or a lobe.
4. **Regional**- numerous calcifications occupying a larger area (>2 cm in greatest dimension), not conforming to a duct distribution.
5. **Linear**- calcifications along the ducts, may show branching pattern.

Based on the morphology and distribution pattern, BI-RADS assessment category was assigned from 2-5. Cases with BI-RADS 2 and 3 were followed-up by repeat mammograms at 6-months to 1-year intervals. Cases with BI-RADS 4 and 5 were biopsied under stereotactic or ultrasound guidance. Pathology reports of the biopsied specimens were collected and documented. So, histopathology findings and the stability of the calcifications on sequential mammograms were considered the gold standard for final BI-RADS categorisation.

STATISTICAL ANALYSIS

Statistical analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0 Software. The values were represented in number (%) and mean±SD. The Chi-square test was applied for the comparison of FFDM and DBT with the calculation of p-values. A p-value <0.05 was considered to be statistically significant.

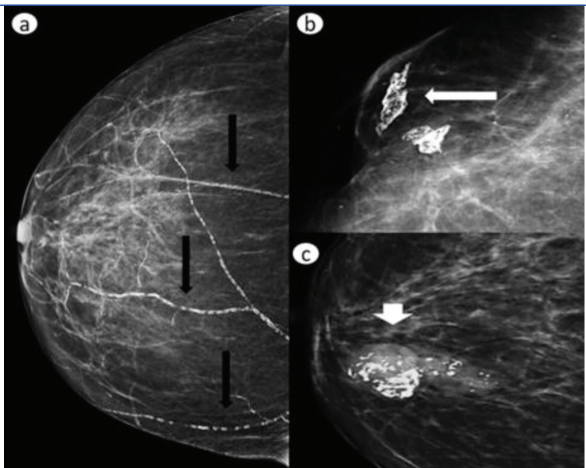
RESULTS

Mammograms of 702 women (age range 28-83 years, mean age 48.8±10.9 years) with 1217 breasts were evaluated and MC was detected in 622 breasts (51.10%) on FFDM and in 626 breasts (51.43%) on DBT. On FFDM, 508 breasts (81.67%) showed typically benign morphology and 114 (18.33%) showed suspicious morphology calcifications. On DBT, 505 breasts (80.67%) showed typically benign morphology and 121 breasts (19.33%) showed suspicious morphology calcifications [Table/Fig-1].

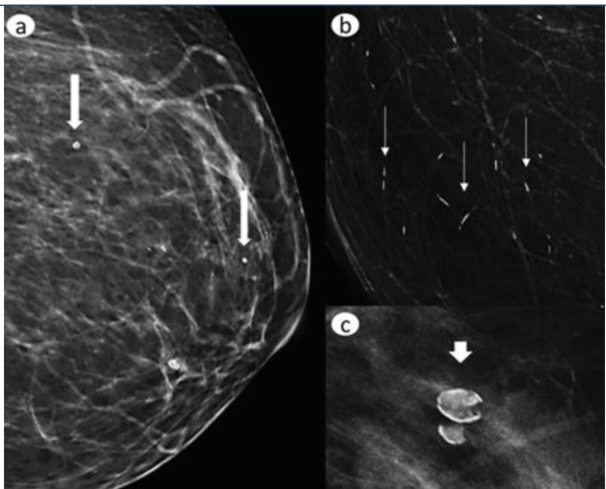
The most commonly found "typically benign" morphological pattern detected on FFDM was vascular (n=233, 37.45%) followed by round (n=144, 23.15%), rim (n=45, 7.21%), dermal (n=37, 5.94%), large rod-like (n=23, 3.69%), popcorn (n=19, 3%), dystrophic (n=5, 0.8%), milk of calcium (n=1, 0.16%) and suture (n=1, 0.16%) calcification in decreasing order of their frequency [Table/Fig-2,3].

Morphology	FFDM (n=622)		DBT (n=626)	
Typically benign	Total	%	Total	%
Vascular	233	37.45	244	38.9
Round	144	23.15	143	22.8
Rim	45	7.21	39	6.2
Skin	37	5.94	39	6.2
Large rod like	23	3.69	19	3.03
Popcorn	19	3	15	2.39
Dystrophic	5	0.8	4	0.63
Milk of calcium	1	0.16	1	0.15
Suture	1	0.16	1	0.15
Suspicious				
Fine pleomorphic	47	7.5	44	7.02
Coarse heterogeneous	33	5.3	40	6.38
Amorphous	25	4	28	4.47
Fine linear and branching	9	1.44	9	1.43
Distribution				
Diffuse	582	93.57	583	93.13
Grouped	20	3.22	16	2.56
Linear	9	1.45	10	1.60
Regional	6	0.96	9	1.44
Segmental	5	0.80	8	1.27

[Table/Fig-1]: Morphology and distribution characteristics of microcalcification (MC) as seen on FFDM and DBT.

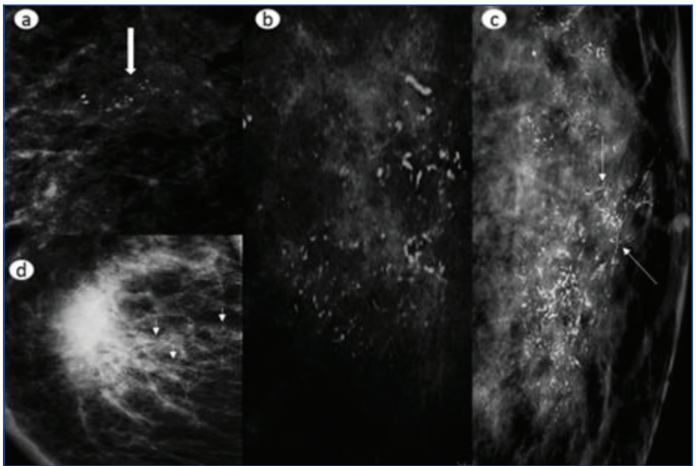


[Table/Fig-2]: Mammogram in Cranio-Caudal (CC) view of right breast shows: (a) Tubular, parallel orientation of vascular calcification (black arrow); (b) Irregular shaped dystrophic calcification at postoperative site (long white arrow); (c) An oval circumscribed mass with popcorn calcifications of involuting fibroadenoma (short white arrow).



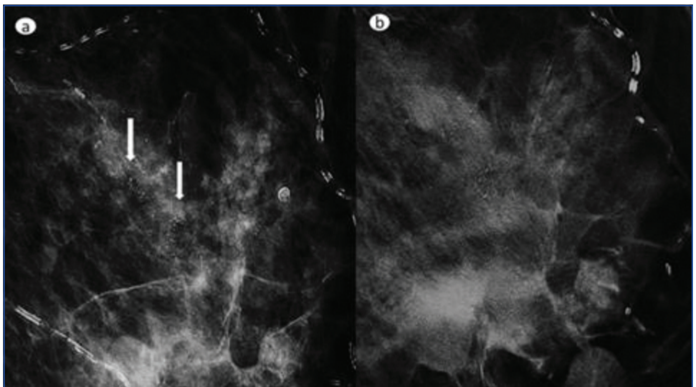
[Table/Fig-3]: Mammogram shows: (a) Round calcifications with central lucency (long thick white arrows); (b) Multiple thick rods like calcifications (long thin white arrow); (c) DBT shows rim calcification (short white arrow).

The most common suspicious morphology calcification pattern was fine pleomorphic (n=47, 7.5%), coarse heterogeneous (n=33, 5.3%), amorphous (n=25, 4%), and fine linear and linear branching (n=9, 1.48%) pattern. The most commonly found "typically benign" morphological pattern detected on DBT was vascular (n=244, 38.9%), round (n=143, 22.8%), rim and skin (n=39, 6.2%), large rod-like (n=19, 3.03%), popcorn (n=15, 2.39%), dystrophic (n=4, 0.63%), milk of calcium and suture (n=1, 0.15%) calcifications in decreasing order of their occurrence. The most common type of suspicious morphology calcification was fine pleomorphic (n=44, 7.02%) followed by coarse heterogeneous (n=40, 6.38%), amorphous (n=28, 4.47%) and fine linear and branching (n=9, 1.43%) pattern [Table/Fig-4].



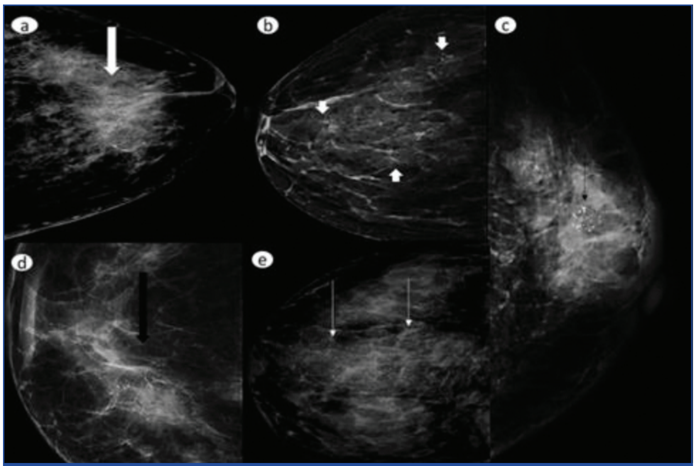
[Table/Fig-4]: Mammogram shows: (a) Coarse heterogeneous grouped calcifications (long thick white arrow); (b) Calcification of different shapes consistent with fine pleomorphic calcifications; (c) Irregularly arranged thin linear and branching calcification (long thin white arrow); (d) Hazy and cloudy type amorphous calcifications (long thin white arrow).

Discrepancy in detection of MC by FFDM and DBT was noted in 42 mammograms. Of these, DBT missed or suboptimally demonstrated MC in 19 breasts which were well seen on FFDM. Similarly, FFDM missed or suboptimally demonstrated MC in 23 breasts which were well seen on DBT. Chi-square test was applied to compare the rate of detection or characterisation of MC by FFDM or DBT and no statistically significant difference was observed (p=0.283) [Table/Fig-5].



[Table/Fig-5]: Comparison of FFDM and DBT for detection of calcification. Mammogram of a 56-year-old woman shows punctuate and amorphous calcifications in ductal distribution on FFDM (long thick white arrow): (a) In comparison to DBT where calcifications are less conspicuous; (b). A biopsy was performed and confirmed Ductal Carcinoma In-Situ (DCIS).

On FFDM, majority of mammograms showed diffuse distribution of calcification (n=582, 93.56%) followed by grouped (n=20, 3.21%), linear (n=9, 1.44%), regional (n=6, 0.96%), and segmental (n=5, 0.80%) distribution. Similarly, on DBT majority showed diffuse (n=583, 93.13%) distribution followed by grouped (n=16, 2.55%), linear (n=10, 1.43%), regional (n=9, 1.27%) and segmental (n=8, 1.59%) [Table/Fig-6].



[Table/Fig-6]: Mammographic distribution pattern of calcifications: (a) Linear distribution of calcifications along duct (long thick white arrow); (b) Diffuse and randomly distributed calcifications throughout the breast (short thick white arrow); (c) Calcifications which are grouped together or clustered (long thin black arrows); (d) Calcifications in a segment of a breast (long thick black arrow); (e) Calcifications distributed in an area larger >2 cm of breast not conforming to a duct distribution suggesting regional distribution (long thin white arrow).

Based on the morphologic and distribution characteristics of MC, BI-RADS categorisation was done. BI-RADS 2 was assigned to 488 breasts (78.5%) and 481 breasts (76.8%) on FFDM and DBT, respectively. Similarly, BI-RADS 3 was assigned to 20 breasts (3.2%) and 24 breasts (3.8%), respectively. Among BI-RADS 3 cases, two patients revealed mild change in appearance of calcification on follow-up mammogram so they were biopsied and proved to be low grade DCIS. BI-RADS 4 and 5 was assigned to 100 breasts (16.1%) and 14 breasts (2.2%) on FFDM and 102 breasts (16.3%) and 19 breasts (3.1%) on DBT, respectively. Out of the FFDM and DBT based BI-RADS 4 cases, malignancy was proven in (74/100 i.e., 74%) cases and (76/102 i.e., 75%) cases, respectively [Table/Fig-7].

BI-RADS score	MC detected by FFDM (n=622)			MC detected by DBT (n=626)		
	Total (%)	Bx proven Benign	Bx proven Malignant	Total	Bx proven Benign	Bx proven Malignant
2	488 (78.5%)	*	*	481 (76.8%)	*	*
3	20 (3.2%)	*	* #2	24 (3.8%)	*	* #2
4	100 (16.1%)	27 (%)	74	102 (16.3%)	27	76
5	14 (2.2%)	0	13	19 (3.1%)	0	18
Total	622	27	89	626	27	96

[Table/Fig-7]: Distribution of different BI-RADS categories in cases in which calcifications were detected on FFDM or DBT.
*: These cases were followed-up by repeat mammograms
#: Biopsy was performed in one case after documenting increase in number of calcifications on follow-up mammogram

The FFDM diagnosed benign MC in 508 cases. A total of 27 cases which were categorised as suspicious on FFDM were proven benign. On the contrary, two cases categorised as benign were proven malignant. So, a total of 508+27-2=533 cases were proven benign. Similarly, DBT diagnosed benign MC in 505 cases. A total of 27 cases which were categorised as suspicious on DBT were proven benign and 2 cases categorised as benign were proven malignant. So, a total of 505+27-2=530 cases were proven benign.

The FFDM accurately diagnosed 506/533 (94.93%) benign and 87/89 (97.75%) malignant MC. DBT accurately demonstrated benign MC in 503/530 (94.90%) and malignant MC in 94/96 (97.91%) cases. Two cases which were categorised as BI-RADS 3 on both FFDM and DBT came out to be malignant. On the contrary, 27 cases categorised as BI-RADS 4 were proven benign. None of the BI-RADS 2 or BI-RADS 5 cases showed discordant histopathology results [Table/Fig-8].

Calcification type	FFDM based	DBT based	Both
Benign	506/533 (94.93%)	503/530 (94.90%)	503/532 (94.54%)
Malignant	87/89 (97.75%)	94/96 (97.91%)	85/87 (97.7%)

[Table/Fig-8]: Percentage of calcification accurately detected by FFDM and DBT.

Comparative evaluation of the role of FFDM and DBT in characterisation of suspicious MC was done. Sensitivity of both the modalities were almost similar (97.7% and 97.9%) without any significant difference (p=0.278). Diagnostic accuracy of FFDM and DBT were 70.4% and 71.2%, respectively with the p-value of 0.185. So, there was no statistical difference between the diagnostic performances of the two modalities with regard to MC [Table/Fig-9].

Parameters	FFDM	DBT	p-value
Sensitivity	97.7	97.9	0.278
Specificity	94.9	94.4	0.289
False positive rate	5.0	5.0	0.291
Positive predictive value	76.35	77.6	0.238
Negative predictive value	99.6	99.6	0.245
Accuracy	70.4	71.2	0.185

[Table/Fig-9]: Comparative evaluation of diagnostic measurements of FFDM and DBT in characterisation of suspicious microcalcifications.

DISCUSSION

Breast cancer is the leading cause of cancer deaths among women, so, early diagnosis and treatment are important in reducing the mortality rate [22]. Triple assessment by clinical examination, imaging, and biopsy remains the fundamental approach to diagnose breast lesions. The shift to Digital Mammography (DM) has dramatically increased the conspicuity of mammographically detected MC, as it employs postprocessing of the image to enhance the appearance of MC. Magnification views can further be added to display the morphology more clearly and demonstrate very fine calcifications that are not visible on routine mammography. True lateral views are useful to demonstrate the layering of calcifications, eliminating the need for biopsy [23]. Magnetic Resonance Imaging (MRI) can be considered for further assessment of calcifications and has the capability to enhance the specificity by accurately characterising benign changes, and reducing the number of unnecessary biopsies [24]. Breast MCs are commonly found, the majority being benign, and are characterised by their morphology and distribution [25]. But, these MCs are also considered the early and sometimes the only sign of breast cancer [26]. They are more commonly found in DCIS than in invasive carcinoma [8,10]. Microcalcifications are also seen associated with the mass lesions and in such cases, they should be analysed meticulously as some of these are certainly benign (like rim calcifications or popcorn calcification in an involuting fibroadenoma), but malignancy may emerge in any part of the breast parenchyma and, one may discover DCIS settling in a fibroadenoma.

The DBT is a novel technique that represents an improvement to FFDM and has the ability to reduce the overlap of breast tissue and improve lesion characterisation by obtaining images over multiple projections at different angles [27]. Therefore, the addition of DBT increases sensitivity in detecting otherwise occult malignancies. But masses that bear MC as the predominant or only feature may not be visualised at DBT, while a few may present as more or less suspicious as they would at FFDM [19,28].

The most common morphological pattern in the study was vascular calcification seen in 37.45% of "typically benign" calcifications. This type of calcification is uncommon in patients less than 50 years of age and is found in approximately 9.1% of mammograms [29]. The prevalence of vascular calcifications ranges from 9-17%, for the female population but it increases with age and exceeds 50% among women aged 65 years [30]. The clinical significance of Mönckeberg calcifications is controversial; however, some studies have found an association with diabetes, systemic arterial hypertension, coronary artery disease, kidney failure, autonomic neuropathy, and hypervitaminosis D [31,32].

In the present study, the proportion of large rod-like calcifications was 3.69% of all benign calcifications. This was in accordance with a previous study where such type of calcifications was detected in 239 of 7935 (3%) women undergoing screening or diagnostic mammography [33]. In present study, popcorn calcification was seen in 3% of all benign calcification and mostly found in involuting fibroadenomas. This type of calcifications may be considered "benign-looking", whereas the presence of a small, heterogeneous, and branching type of calcifications can represent foci of carcinoma in-situ colonising a fibroadenoma. On imaging, fibroadenoma containing foci of carcinoma in-situ can be indistinguishable from benign lesions, even if the incidence of carcinoma within fibroadenomas is estimated to be 0.1-0.3% only [34].

In the present study, fine pleomorphic calcification was seen in 7.5% of all mammograms showing calcification and 41.2% of suspicious morphology calcifications. Similarly, linear and linear branching calcification was seen in 1.44% of all mammograms showing calcification and 7.9% of suspicious morphology calcifications. Present study results were close to those published by Hadi Q et al., [35]. They found pleomorphic calcifications in 50.7% and linear and fine branching calcifications in 4.2% of all mammographically detected suspicious MC [35]. In the present study, coarse heterogeneous calcifications were noted in 5.3% and amorphous calcification in 4% of all mammograms showing calcification. Oligane HC conducted a review of prebiopsy mammograms, including magnification views from 1903 consecutive biopsies, of which 546 (28.7%) were performed for amorphous calcifications [36].

Do YA et al., in their study, characterised the morphology of suspicious MC and biopsied them. After histopathology results, they found that the percentages of amorphous, coarse heterogeneous, fine pleomorphic, and fine linear calcifications were 68.2%, 17.5%, 12.9%, and 1.4%, respectively, in the benign group, and 28.9%, 16.1%, 43.0%, and 12.1% respectively, in the malignant group [37].

In the present study, diffuse distribution of calcification was seen in 93.56% of all mammograms with calcifications. Grouped calcifications were noted in 3.21% of mammographically detected and 2.55% of DBT detected calcification, which was close to the study by Pao-chu Y et al., [38]. They found 252 patients, out of 15507 mammographic studies had clustered coarse heterogeneous or amorphous MC, accounting for an overall prevalence of 1.6% [38]. Linear, regional and segmental distribution was noted in 1.59%, 1.43%, and 1.27% of mammograms, respectively. The study by Do YA et al., has shown that the percentages of grouped, linear, and segmental calcifications were 67.8%, 0.4%, and 12.6%, respectively, in the benign group and 53.7%, 3.4%, and 23.5%, respectively, in the malignant group [37].

Present study did not find any significant difference in the rate of detection or characterisation of MC by FFDM or DBT. Present study findings were similar to those published by Choi JS et al., [16]. They found no significant difference between Synthetic Mammograms (SM) and DM with or without DBT in detecting microcalcifications ($p>0.05$). Similarly, no significant difference was found among readers' Area under curves for SM and DM with DBT or alone in predicting malignancy in detected microcalcifications, in the overall group or dense breast subgroup ($p>0.05$) [16]. Studies by Tagliafico A et al., and Spangler ML et al., found FFDM as a better modality in the detection of calcifications than DBT [20,21]. Li J et al., stated that the diagnostic accuracy of DBT was superior to FFDM for benign calcifications (87.9% vs 75.2%), but there was no difference in the characterisation of malignant calcifications. Diagnostic accuracy of DBT was particularly higher than FFDM in dense breast cases (89.4% vs 81.9%) but there was no advantage in non dense breast cases [39]. This difference can be explained by the fact that present study group had more number of old-aged females (above 50 years) where breast density was not obscuring the calcifications. Although, authors did not divide the patients into high and low-density groups.

Hence, present study suggests that there was no difference in the diagnostic performance of FFDM and DBT for the detection and characterisation of MC. But combining the two modalities may help in better detection and characterisation of calcifications with improvement in cancer detection rates.

Limitation(s)

The possible limitation of present study was that authors had not divided the mammograms based on the mammographic density, as this categorisation may have altered the results of comparison between the two modalities.

CONCLUSION(S)

Diagnostic performance of FFDM and DBT for the detection and characterisation of MC was not significantly different. Future studies comparing the two modalities with consideration of breast density may show even better performance in the detection of breast calcifications.

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PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Radiodiagnosis, Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow, Uttar Pradesh, India.
2. Junior Resident, Department of Radiodiagnosis, Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow, Uttar Pradesh, India.
3. Senior Resident, Department of Radiodiagnosis, Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow, Uttar Pradesh, India.
4. Professor, Department of Neurosurgery, Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow, Uttar Pradesh, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Neha Singh,
Gomti Nagar, Lucknow, Uttar Pradesh, India.
E-mail: neha.singh.dr@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: May 09, 2022
- Manual Googling: Nov 24, 2022
- iThenticate Software: Dec 09, 2022 (17%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? No
- For any images presented appropriate consent has been obtained from the subjects. No

Date of Submission: **May 08, 2022**
Date of Peer Review: **Jun 15, 2022**
Date of Acceptance: **Dec 10, 2022**
Date of Publishing: **Mar 01, 2023**