Clinical Reviews & Cases

Don't Get Scared but Be Aware: Focal Fibrocystic Changes

Eduarda Castelo Branco Araujo Bernal[1], MD, Guilherme Wilson Otaviano Garcia Chaves[1], MD, Isabela dos Santos Alves[1], MD, Carolina Rossi Saccarelli[1], MD, Danúbia Ariana de Andrade[3], MD, Claudia Costa Leite, MD, PhD[1,2] and Marcos Fernando Lima Docema, MD, PhD[1*]

[1]Department of Radiology, Hospital Sírio-Libanês, São Paulo, Brazil.

[2]Instituto de Radiologia (INRAD)-HCFMUSP, São Paulo, Brazil.

[3]Department of Mastology, Hospital Sírio-Libanês, São Paulo, Brazil.

*Correspondence:
Marcos F. L. Docema, MD, PhD. Department of Radiology, Hospital Sírio-Libanês, Adma Jafet, 91, Bela Vista, São Paulo, SP, 01308-050, Brazil; +55 11 33940000.

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ABSTRACT

Breast focal fibrocystic changes (FCC) are a rare form of fibrocystic breast disease and a benign condition that may be present as a non-mass enhancement (NME) in magnetic resonance imaging (MRI) due to an inflammatory process caused by cyst fluid extravasation to surrounding tissues. This enhancement can mimic a malignant lesion, especially if not correlated to a cystic area detected on T2-weighted image (T2WI) in the enhancement site. In this study, we aim to describe the imaging characteristics of FCC, that is a benign lesion, Breast Imaging Reporting and Data System category 2 (BI-RADS 2), through analysis of T2WI and post-contrast sequences, to illustrate how a simple cyst or clustered microcysts on T2WI image may be found in the NME area allowing the diagnosis of FCC.

Keywords
Focal fibrocystic changes, Multiple cysts, Magnetic resonance imaging, Benign lesion.

Introduction
Breast fibrocystic changes (FCC) are a common finding, affecting over half of women between 20 and 50 years-old [1]. The breast tissue hormonal monthly changes of estrogen and progesterone levels are probably associated with FCC pathogenesis [2].

Breast FCC is a rare form of fibrocystic changes and can occasionally appear as a focal lesion that can mimic a tumor on imaging [3,4]. Currently, breast magnetic resonance imaging (MRI) is increasingly been used in the diagnostic routine and it is an important tool to recognize this benign condition, in order to avoid unnecessary biopsies [1,5].

Dynamic contrast-enhanced MRI (DCE-MRI) of the breast has a high specificity for breast cancer detection and can help in the differentiation of suspicious lesions seen on ultrasound (US) and mammography [6]. Breast background parenchymal enhancement (BPE) on post-contrast T1-weighted images is commonly

diffuse and symmetric, ranging in degrees from minimal, mild and moderate to mark. However, it may sometimes raise doubts about its benignity, especially when it is asymmetric, focal or if it presents regional heterogeneity. In this setting, the radiologist should consider whether the enhancing area represents focal BPE or non-mass enhancement (NME), either benign or suspicious [7]. An alternative to minimize this confounding factor is to perform breast MRI during the second week of the menstrual cycle, because transiently asymmetric enhancements are usually seen during the second half of menstrual cycle [8].

Discussion
NME in breast MRI refers to lesions with abnormal enhancement, and ill-defined margins without mass effect [9]. The distribution of non-mass-like enhancement is defined on BI-RADS lexicon as focal, linear, segmental, regional, multiple regions, or diffuse. Internal enhancement patterns of NME are described as homogeneous, heterogeneous, clumped or clustered ring [10].

NME with linear or segmental distribution with any internal enhancement patterns should be considered suspicious. However, a benign condition such as breast FCC may present as NME on

MRI, mimicking suspicious malignant enhancement. Thus, it is important to recognize FCC imaging features, as well as to know the pathophysiology, clinical and epidemiological characteristics associated with the disease. For better understanding we created a flowchart to recognize breast FCC (Figure 1).
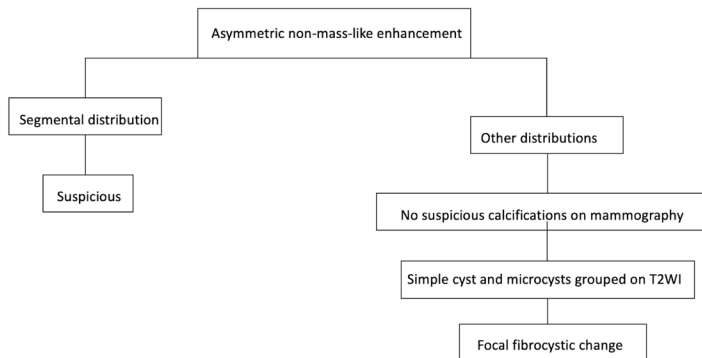
Figure 1: Flowchart to recognize FCC. When there is an asymmetric NME on MRI, we need to look the distribution, if it is segmental, there is suspicion of malignancy. Asymmetric NME without segmental distribution is doubtful if there are suspicious calcifications on mammography. Discarding this possibility, to characterize the NME as FCC, a benign lesion (ACR BI-RADS 2), we have to look for multiple clusters of cysts, best seen on T2WI.

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Breast FCC are histologically characterized by combinations of cysts, stromal fibrosis, and epithelial proliferation [5]. Estrogen stimulates proliferation of connective and epithelial tissues while progesterone modulates the effects of estrogen, allowing normal lobular-ductular-alveolar development [2,12]. In addition to stromal stimulation (fibroblast hyperactivity, edema), estrogen causes proliferation of ductal-alveolar epithelium [13]. Usually, fibrosis precedes and predominates in epithelial proliferation. In histologic preparation, polymorphism of fibrocystic disease is documented by fibrosis, cyst formation, epithelial proliferation, and lobular-alveolar atrophy, processes that may be coexisting in the same biopsy specimen [14]. Accordingly, fibrocystic disease entails simultaneous progressive and regressive changes. Ductal branching, intraductal epithelial proliferation (papillomatosis), lobular hyperplasia, and proliferation of intralobular connective tissue may undergo regressive changes such as adenofibrosis, sclerosing adenosis, duct dilation, cyst formation, and calcification.

In FCC, these cysts occur due to involution process of mammary lobe. The lobe has a specialized stroma around it and during the involution of this stroma apocrine epithelium secretes fluids that gradually fill the terminal lobular duct unit, dilating and forming simple cyst and clustered microcysts. The distension of these cysts can cause extravasation of fluid to the surrounding tissues leading to chemical irritation. It is common that during this process NME is seen around these cysts in breast MRI, which, if evaluated without correlation with the cyst areas, can be considered suspicious of malignancy.

These series of cases from our institution illustrate how detection of FCC is important, especially in cases where the patient had a previous diagnosis of breast cancer and MRI was performed before surgery to rule out other malignancies. The correct interpretations of NME with clustered microcysts and simple cysts as a benign condition, ensured, in some cases, a more conservative surgery, and, in patients without a diagnosis of breast cancer, avoid unnecessary biopsies.

Case 1

A 36-year-old woman with a palpable mass on the right breast after an episode of mastitis 1 month ago. Breast ultrasonography (US) showed an area with multiple cysts and ductal ectasia, in the palpable mass region (Figure 2), classified as ACR BI-RADS Category 0, being suggested diagnostic complementation with mammography and MRI. Mammography showed focal asymmetry in the right breast (Figure 3), in the same topography as the US lesion, classified as ACR BI-RADS Category 3. DCE-MRI showed NME with regional distribution in the inner quadrants, associated with multiple simple cysts (Figure 4), characterizing FCC, classified as ACR BI-RADS Category 2.
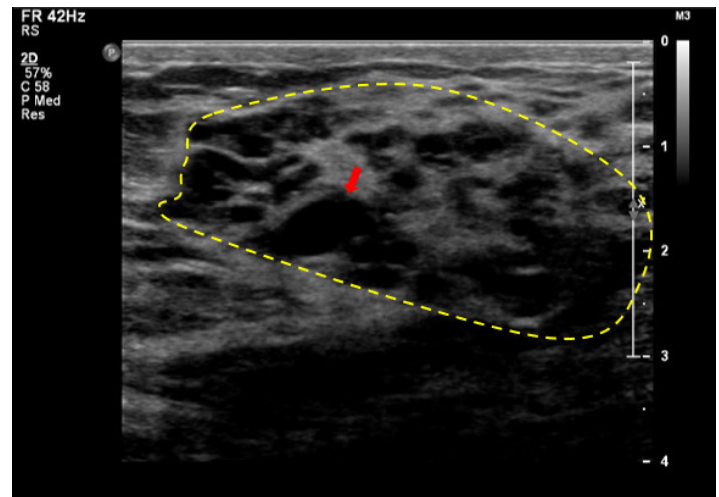
Figure 2: US of right breast showing area (yellow dotted line) with multiple cysts (red arrow) and ductal ectasias, measuring approximately 5.0 cm, located at the junction of inner quadrants of the right breast. ACR BI-RADS Category 0, being suggested diagnostic complementation with Mammography and MRI.

Case 2

A 49-year-old woman after neoadjuvant chemotherapy (NAC) for right breast cancer. Post-NAC DCE-MRI (Figure 5) showed in the right breast the invasive cancer as an irregularly shaped mass with spiculated margins, and also NME with regional distribution. This area of NME could cause some confusion in this context, however, the presence of multiple simple cysts associated with it characterizes as a FCC, a benign abnormality.
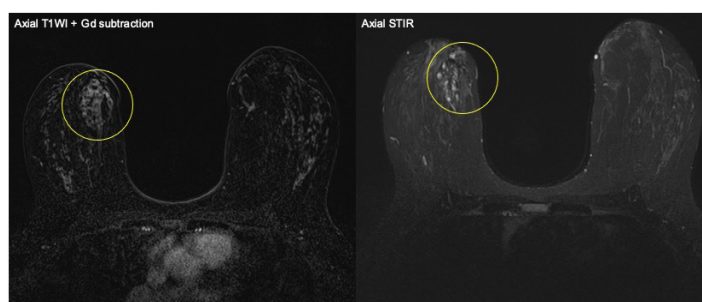
Case 3

A 39-year-old woman with right breast pain. DCE-MRI showed NME with regional distribution (Figure 6), associated with clustered microcysts and simple cysts, characterizing FCC, classified as ACR BI-RADS Category 2 (Figure 7).

Case 4

A 35-year-old woman mammography with architectural distortion of the mammary parenchyma in the upper outer quadrant of the left breast, with associated grouped pleomorphic calcifications, in correspondence with US showing an irregular mass with spiculated margins. Classified as ACR BI-RADS Category 4. Patient underwent biopsy; the result was ductal carcinoma in situ (DCIS). The DCE-MRI showed NME with regional distribution associated with clustered microcysts and simple cysts, compatible with FCC. Another NME was seen, but with segmental distribution, corresponding to the pre-established diagnosis of DCIS (Figure 8).
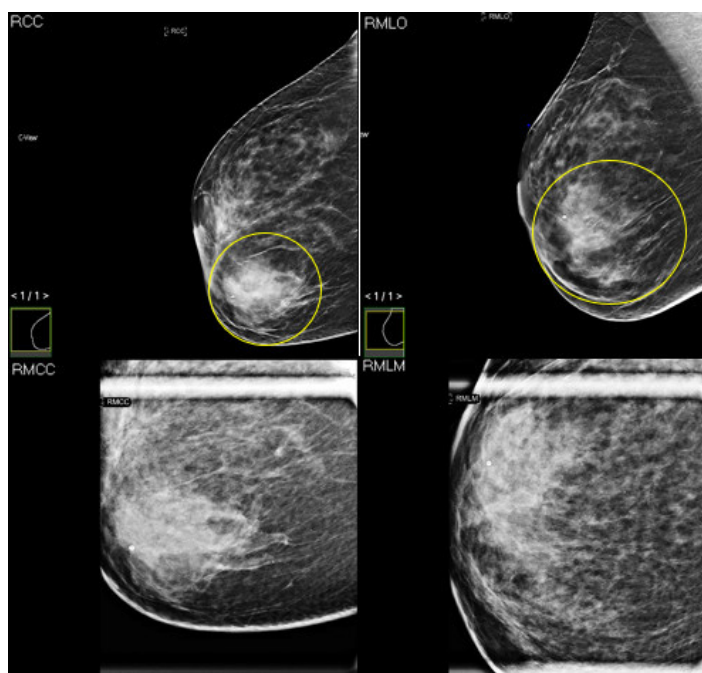

Figure 3: Mammography showing focal asymmetry in junction of inner quadrants / lower inner quadrant of right breast (yellow circle), with punctate calcifications, some with intracystic morphology, in an extension of approximately 5.0 cm, with US correspondence, in the previous mastitis topography. ACR BI-RADS Category 3.
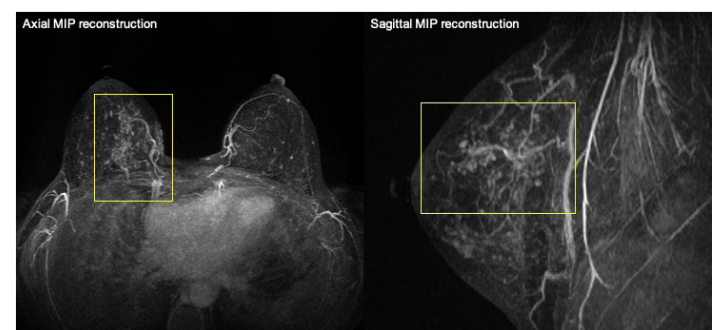

Figure 4: DCE-MRI T1WI after intravenous contrast and post-processed subtraction image and STIR showing NME with regional distribution in inner quadrants of the right breast, associated with clustered microcysts

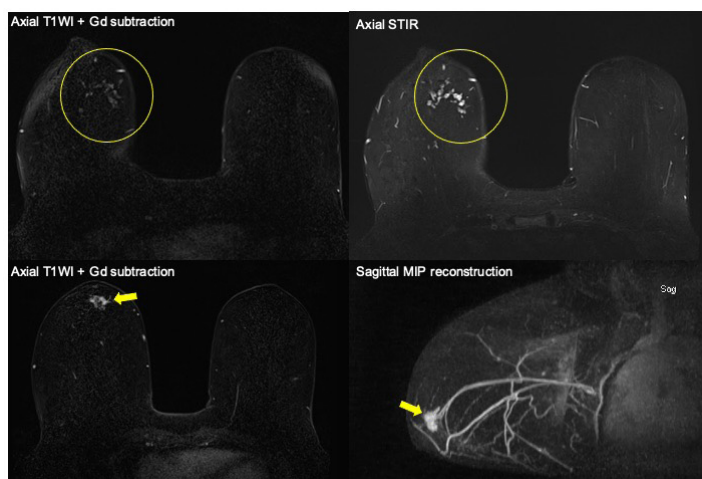and simple cysts (yellow circle), characterizing a FCC, classified as ACR BI-RADS Category 2.
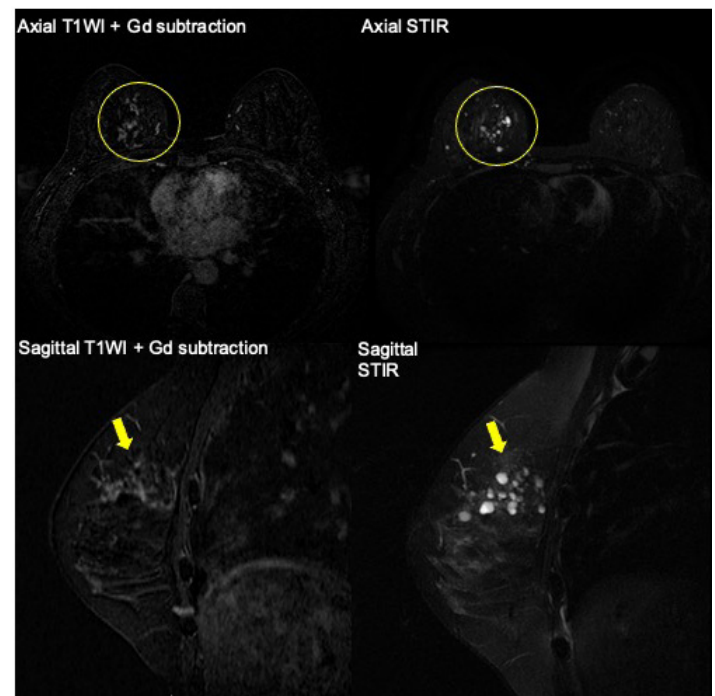
Figure 5: DCE-MRI T1WI and post-processed subtraction image and STIR showing NME with regional distribution at the junction of inner quadrants of the right breast, associated with clustered microcysts and simple cysts (yellow circle), characterizing a FCC. Note in the same breast, the presence of an irregularly shaped mass and spiculated margin, with heterogeneous enhancement, located in the retroareolar region / junction of the upper quadrants of the right breast (yellow arrow), with established diagnosis. ACR BI-RADS Category 6.


Figure 6: DCE-MRI MIP reconstruction showing NME with regional distribution (yellow rectangle) in upper inner quadrant of the right breast in axial and sagittal image.

Conclusion

The fibrocystic breast disease is a spectrum of benign alterations, and the most common finding is the presence of simple cysts and clustered microcysts. Breast FCC is a rare form of fibrocystic breast disease that presents as NME in DCE-MRI associated with clustered microcysts on T2-weighted images, and its recognition as a benign condition is important, avoiding pitfalls and unnecessary biopsies.

Figure 7: DCE-MRI T1WI after intravenous contrast and post-processed subtraction image and STIR showing NME with regional distribution (yellow circle) in upper inner quadrant of the right breast, associated with clustered microcysts and simple cysts (yellow arrow), characterizing a FCC, classified as ACR BI-RADS Category 2.
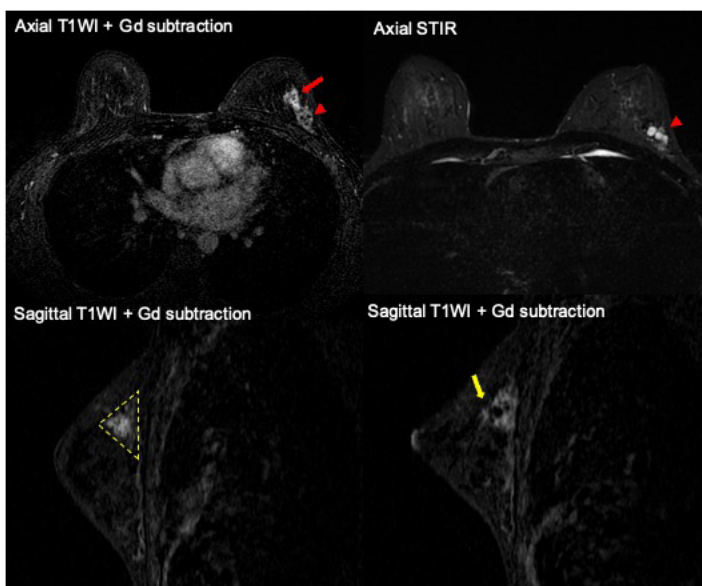
Figure 8: DCE-MRI T1WI after intravenous contrast and post-processed subtraction image and STIR showing NME with regional distribution (red arrowhead) in upper outer quadrant of the left breast, associated with clustered microcysts and simple cysts (red arrowhead), characterizing FCC. Adjacent to this area, we see NME with segmental distribution (red arrow), that is, suspect, and with a pre-established diagnosis of DCIS. Sagittal images show better the segmental distribution of the NME, characterizing a suspicious distribution.

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