Wide spectrum of fibrocystic changes: MR findings

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Purpose

Fibrocystic breast conditions, formerly referred to as "fibrocystic breast disease", with proliferative epithelial cell elements have been associated with increased risk of subsequent breast cancer, especially if accompanied by atypical cellular changes (1).

In general, using MRI, the nature of the breast tumor is determined by observation of its morphology and enhancement kinetics, with a tendency toward strong initial rapid contrast enhancement with a late plateau or washout in malignant lesions. However, it is known that increased uptake of contrast agent is not only a characteristic of malignancies, but can also occur in benign breast conditions such as FCC. This may lead to false-positive results and unnecessary biopsies for benign findings (2).

The objective of this study is to analyze the magnetic resonance imaging (MRI) features of fibrocystic change of (FCC) of the breast.
Methods and Materials

In a period of 4 years from Jan. 2005 to Dec. 2009, 32 patients (28-67 years old, mean 53) of pathology-proven FCC were retrospectively reviewed. All patients received breast MRI examination because of either having suspicious lesions found using mammography or sonography. The MR imaging was performed with a 1.5-T system (Signa; GE Medical Systems, Milwaukee, Wis) with a standard bilateral breast coil. The imaging protocol consisted of high-resolution pre-contrast imaging and dynamic contrast-enhanced axial imaging. Whole breast rapid dynamic MR images and high spatial resolution MR images were contemporaneously acquired by using a combination of dynamic 3D spiral MR imaging during the washin phase of an intravenous injection of gadolinium contrast material followed immediately by high spatial resolution 3D spectral-spatial excitation magnetization transfer (3DSSMT) imaging. Dynamic imaging 3D-spoiled gradient-echo spiral pulse sequence of the entire breast included the following parameters: spectral spatial RF, on-resonance magnetization transfer, TR/TE 38/12.3 ms, 40° flip angle, 20 k-space encoded spiral interleaves, 188 x 188 matrix, 4.5-6-mm thickness, field of view 20 cm, 20 slice volume, time scan 213 seconds. The 3D spiral acquisition was repeated 20 times for a dynamic series of 213 (3.5 minutes) duration. Forty seconds after the start of the dynamic series, 0.1 mmol/kg gadolinium was injected at 2 mL/s through an antecubital vein. Two MR breast imaging radiologists reviewed the MR images on an Advantage Windows GE workstation categorizing the lesions according to the ACR BI-RADS-MRI Lexicon criteria. The enhancement kinetics was analyzed from manually-drawn tumor ROI (region of interest) on the lesion on subtraction images. The morphologic criteria included mass type lesion, including focus/foci (smaller than 5mm) and mass (equal to or greater than 5 mm), and non-mass type enhancements (focal area, linear, regional, multiple regions, and diffuse enhancement). The evaluation of enhancement kinetic curve was based on the total tumor enhancement (blue curve) which was consisted of initial wash-in phase (within the first 2 minutes or when the curve starts to change slope), and the late phase (after 2 minutes or after the change of the slope). The initial wash-in phase was categorized into fast, medium, and slow. The late phase was described as persistent, plateau, and wash-out.

The pathological reports were obtained by excisional or core biopsy.
Results

The age of the 32 FCC patients ranged from 28 to 67 years (mean age, 53 years). Patients were referred for x-ray mammography and sonography because of having suspicious findings.

The MRIs were evaluated for kinetic curves and morphology. Two types of lesions were found including more diffuse type and focal type.

For 22 lesions presenting with more diffuse type of FCC, nonmass type of enhancement lesions were found, including 11 regional enhancement (Figure 1), 4 focal enhancement (Figure 2), 4 linear enhancement (Figure 3) and 3 diffuse heterogeneous enhancement (Figure 4). Eleven patients with regional enhancement showed homogeneous low enhancement magnitude by subjective evaluation on the gray scale image. Nine patients with FCC showed focal-type lesion. MRI demonstrated mass type of enhancement lesion with size <2 cm in 4 patients (Figure 5) and focus lesion (#4 mm) in 5 patients (Figure 6). Four lesions of focal FCC were diagnosed as malignant because of their spiculated margins (Figure 7). The other 5 lesions of focal FCC with smooth lesion margins (Figure 8) and all 22 lesions of diffuse-type FCC were diagnosed as benign.

Sixteen nonmass-type lesions showed benign enhancement kinetics of medium or slow up-slope followed by persistent enhancement (Figure 9, 10). Six nonmass lesion and 8 mass-type lesions showed rapid up-slope followed by wash-out or reaching plateau mimicking a malignancy (Figure 11,12). Three mass-type lesions showed medium up-slope with persistent enhancement which was suggestive of a benign lesion.

Although MRI has been proved to be very useful for detecting small, multiple or obscured breast lesions with high sensitivity when mammography and sonography cannot make the definite diagnosis, the drawback of this imaging modality is its low specificity. Both benign and malignant breast lesions can share common morphological and kinetic features. When suspicion occurs, careful correlation of MR imaging findings with sonography and mammography is needed (3).

Studies specifically focused on MRI of FCC are very few and the case number is limited. Chen et al. (2) reported that either morphological or kinetic criterion, 11 patients were suspected as malignant lesions in their study. Of these, 9 were suggested by kinetic features and 3 by morphological features. From Chen et al. and our study, morphological criteria have fewer false-positive diagnoses of malignant lesions than that of kinetic criteria. Also, Goto et showed that the sensitivity and specificity of the morphologic criteria were significantly higher than those of the enhancement patterns in their study (4,5).

Four FCCs in our study presented with focal-type lesions <2 cm. Liberman et al. reported lesions less than 5 mm in size had a 3% chance of being malignant, lesions 5-9 and
10-14 mm in size had respective malignancy rates of 17% and 25% respectively. This article concluded that biopsy is rarely necessary for lesions <5 mm (6).
Fig. 0: MR image of the left breast with FCC of a 33-year-old woman. Gray map image demonstrated that regional enhancement suggesting a benign breast lesion.

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Fig. 0: MR image of the right breast with FCC of a 54-year-old woman. Note the speculated appearance of the lesion which raises the suspicion of malignancy. Kinetic curve shows rapid up-slope with mild washout, also suspicious for malignancy (not shown).

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Fig. 0: 42 year-old woman with focal fibrocystic change and nipple discharge of the left breast. Mammography and sonography showed no abnormality. The patient's post-contrast subtracted image demonstrates linear enhancement in the left retroareolar region.

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Fig. 0: MR image of the breast with FCC of a 38-year-old woman. Note the diffuse heterogeneous enhancement in both breasts with medium up-slope and reaching the plateau, a feature identified in both breasts. Sonography and mammography did not demonstrate any abnormal lesions.

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Fig. 0: 45 year-old woman with focal fibrocystic change in the bilateral breasts. Sonography showed small hypoechoic lesions in the bilateral breasts. Core biopsy of these lesions showed fibrocystic change. A post-contrast subtracted gray color images demonstrate small enhanced lesions in the both breasts. The enhancement kinetic curve of the small lesion in the left breast reveals rapid up-slope followed by washout (not shown). Pathologic examination showed fibrocystic change with stromal fibrosis and diffuse sclerosing adenosis.

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**Fig. 0:** 49 year-old woman with fibrocystic change in the bilateral breasts. Axial MR image of the left breast shows FCC as a multipl small focuses.

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**Fig. 0:** MR image of the right breast with FCC of a 50-year-old woman. Sonography of the right breast showed an 8-mm hypoechoic lesion in the right breast. The post-enhanced subtracted image demonstrates an enhanced focal lesion with smooth margins in the same location. Core biopsy of the lesion under sonography-guided showed FCC with focal sclerosing adenosis.

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Fig. 0: MR image of the left breast with FCC of 34-year old women. Note the speculated appearance of the lesion in which raises the suspicion of malignency.

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Fig. 0: Nonmass-like regional enhancement of the left breast showed benign enhancement kinetics of medium or slow up-slope followed by persistent enhancement.

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**Fig. 0:** Nonmass-like regional enhancement of the left breast showed benign enhancement kinetics of medium or slow up-slope followed by persistent enhancement.

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**Fig. 0:** 47 year-old woman with FCC in the bilateral breasts. The patient's post-contrast subtracted gray scale image demonstrates enhanced lesion. An enhancement kinetic curve of the focal lesion in the left breast reveals rapid up-slope followed by washout a feature suspicious for malignancy. US guided tru-cut biopsy showed benign FCC.

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Fig. 0: 47 year-old woman with FCC in the bilateral breasts. The patient's post-contrast subtracted gray scale image demonstrates enhanced lesion. An enhancement kinetic curve of the focal lesion in the left breast reveals rapid up-slope followed by washout a feature suspicious for malignancy. US guided tru-cut biopsy showed benign FCC.

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Conclusion

FCC is the most common benign condition in the breast and has been reported in up to 58% of women. Although most of the FCC patients show typical clinical symptoms and require no further work-up, some patients may need imaging studies when suspicion arises in the nature of the palpated lump (2, 6). Familiarity and understanding of the MRI characteristics of FCC when evaluating patients with suspicious MR-detected breast lesions would be useful to decrease the rate of false-positive findings and to diminish unnecessary biopsies.

MRI, it most often present as a mass or nonmass-like regional enhancement.
References


