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MRI manifestations of sclerosing adenosis of the breast: a single institution experience

Evangelia Panourgias[1], Charis Bourgioti[1], George Skountzos[2], Vassilis Koutoulidis[1], Lia Moulopoulos[1]

[1] *1st Department of Radiology, Areteion University Hospital, Athens, Greece*
[2] *Radiology Department, Hippocration General Hospital, Athens, Greece*

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ABSTRACT

Purpose: Sclerosing adenosis (SA) of the breast is a benign proliferative lesion that may mimic malignancy on imaging. We present the magnetic resonance imaging (MRI) features of 26 patients with breast adenosis.

Material and Methods: Within a 2-year search of our PACS system, we identified breast MRI examinations of 26 female patients (age: 46 years, mean age: 35-70 years) with histological proof of SA. All patients were initially classified as BI-RADS category 4 on MRI. Four out of 26 patients had SA and fibrocystic changes or other benign pathologies while 22/26 patients were diagnosed with pure adenosis. One patient had coexisting in situ intraductal cancer. The MRI morphologic features and enhancement characteristics of mass-like adenosis as well as the morphology, distribution and enhancement pattern of non-mass enhanced (NME) SA lesions were retrospectively assessed by two radiologists experienced in breast imaging.

Results: Eighteen patients presented with a palpable lesion and 8 patients had a suspicious or indeterminate finding on screening mammogram. Mass lesions were observed in 19/26 (73%) patients and 7/26 (27%) patients displayed NME patterns. The diameter of SA lesions ranged from 0.5 to 2.5cm (mean: 1.4cm). On dynamic contrast-enhanced MRI, time-signal intensity curve was type I in 15/26 (57.7%), and type II in 11/26 (42.3%) SA lesions.

Conclusions: SA most often presents as a mass lesion with benign contrast kinetics on MRI of the breast.

CORRESPONDING AUTHOR, GUARANTOR

Evangelia Panourgias, 1st Department of Radiology, Areteion University Hospital, School of Medicine, National and KapodistrianUniveristy of Athens, 76 Vasillisis Sofias, Athens 11528, Greece, Email: epanourgias@yahoo.com

KEY WORDS

Sclerosing adenosis; Breast imaging; Magnetic resonance imaging; Dynamic contrast-enhanced MRI (DCE-MRI)

Introduction

Sclerosing adenosis (SA) lesions are benign proliferative masses of the breast which form part of the fibrocystic changes spectrum. They are characterised by lobulocentric proliferation, usually starting from the terminal duct lobular units with expanded lobules and small ductules, together with proliferation of the stromal connective tissue [1, 2].

Most cases of SA are asymptomatic and are incidentally found on histopathologic examination. However, the confluence of the affected lobules may result in a clinically palpable mass and is referred to as nodular sclerosing adenosis or adenosis breast tumour [3]. On few occasions, non-invasive carcinoma can coexist with such lesions [4].

SA lesions may mimic malignancy, both clinically and on imaging. Few articles describe the imaging findings of SA [5-8]. On mammography, SA can present as a mass, area of microcalcifications, focal asymmetry or architectural distortion [9, 10]. On ultrasound it may manifest as a mass lesion or as focal acoustic shadowing [5, 9]. There is little information on the magnetic resonance imaging (MRI) appearance of SA. On dynamic contrast-enhanced (DCE) MRI, it manifests as a non-specific enhancing mass, non-mass enhancement (NME), or architectural distortion, with type I or type II enhancement curves [10, 11]. According to a study by Gity et al. [12], the most commonly observed mass features of SA on MRI included irregular shape of the lesion in 37.5% of cases, non-circumscribed margins in 62.5% and heterogeneous internal pattern of enhancement in 50% of lesions. Diffusion-weighted imaging of SA typically shows a hyperintense lesion without diffusion restriction (Apparent Diffusion Coefficient-ADC values), consistent with a benign process. Knowledge of SA findings on MRI may help radiologists suggest this diagnosis on breast MRI, minimising the number of lesions that require histopathological verification.

The purpose of this study was to describe the imaging findings of SA on dedicated breast MRI in 26 histologically confirmed cases.

Material and Methods

The clinical records and breast MRI examinations of 26 female patients (age: 46 years, mean age: 35-70 years) with pathologically confirmed SA, by biopsy or surgery, were retrospectively reviewed; 21/26 patients were premenopausal and 5 were postmenopausal. A total of 20 patients underwent breast surgery for the removal of the lesion identified on imaging. The remaining six patients underwent core-biopsy under ultrasound guidance, using an 11-gauge needle. Informed consent was waived due to the retrospective nature of the study.

Eighteen patients presented with a palpable breast mass and eight patients were asymptomatic with an incidental finding on screening mammography. Eight of 26 women had a family history of breast cancer.

All patients underwent a mammogram prior to breast MRI; 20 patients underwent ultrasound examination of the breast as well. All patients were diagnosed with BI-RADS category 4 lesions on MR mammography.

MRI protocol

All preoperative breast MRI studies were performed on a 1.5 Tesla scanner (Phillips Healthcare, Best, Netherlands) using a surface coil with the patient in a prone position.

The MRI protocol included: axial fat-suppressed T2-weighted images (TR/TE, 10000/70 ms; Field of View (FOV), 360 x 360 mm; matrix, 288 x 288 mm; slice thickness (ST)/gap, 2.5/1.0 mm; axial T2-weighted turbo spin echo (TSE) images (TR/TE, 5000/120 ms; FOV, 359 x 359 mm; matrix, 560 x 560 mm; ST, 2.0 mm); axial T1-weighted images (TR/TE, 550/8 ms; FOV, 360 x 360 mm; matrix, 512 14 x 512 mm; ST, 2.5 mm). Axial high spatial resolution T1-weighted gradient echo DCE images with fat suppression were also obtained, including one native and five acquisitions after gadolinium injection (TR/TE, 5/2 ms; flip angle 10°; FOV, 362 x 362 mm; matrix, 640 x 640; ST, 1.2 mm; temporal resolution, 70 sec).

Image Analysis

MRI studies were reviewed by two expert radiologists (7 and 15 years of experience in breast imaging) independently. In cases of disagreement, a consensus was reached.

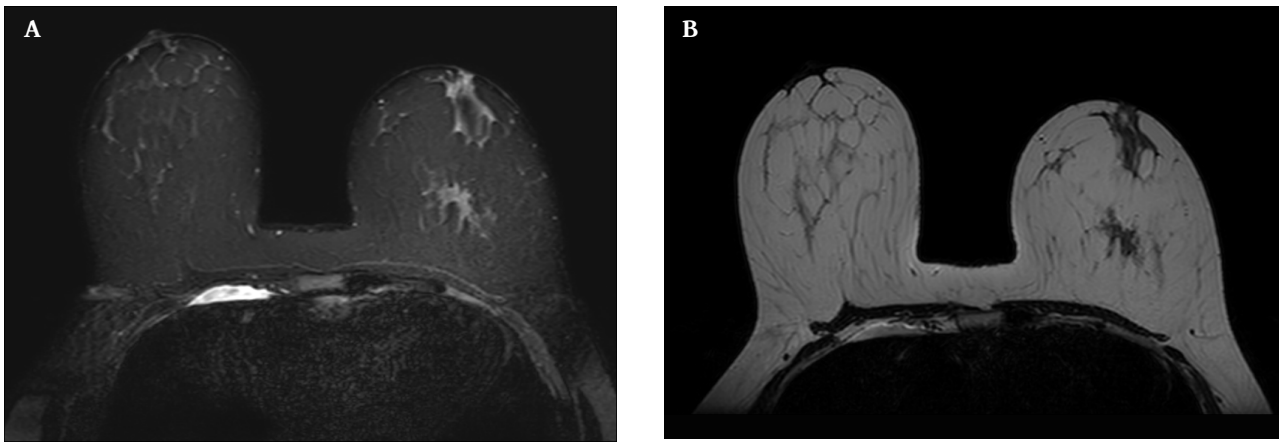

Fig. 1. A. *Sclerosing adenosis of the left breast in a 40-year-old woman. Axial T1-weighted image displays a centrally located low signal intensity stellate lesion in the posterior aspect of the left breast.* ***B.*** *The corresponding STIR image shows increased signal intensity of the stellate lesion in the posterior aspect of the left breast.*

The readers marked and categorised each lesion according to the descriptors and modifiers analysed in the BI-RADS lexicon (5th edition) [13].

We assessed the morphologic features of enhancing masses, including shape, margin, and internal enhancement pattern, as well as the dynamic characteristics of time-signal intensity curves on the initial phase and post-initial phase. For non-mass enhancement, in addition to time-signal intensity curves, we evaluated morphologic findings of contrast distribution and internal enhancement patterns.

The mass descriptor, according to the BI-RADS lexicon [13] refers to a space-occupying enhancing or non-enhancing lesion displaying imaging features that distinguish it from surrounding structures. NME describes an area of unique and discrete enhancement. The shape, margin and enhancement characteristics of masses, as well as the internal enhancement characteristics of NME were also recorded, based on the BI-RADS lexicon descriptors [14].

On DCE-MRI, time-intensity curve (TIC) type (persistent, plateau or wash out pattern) was recorded for each tumour. Type I curve consists of a progressive enhancement pattern with a continuous increase in signal intensity throughout time and it is associated with benign lesions in >95% of cases. Type II curve shows initial uptake, is followed by a plateau and is considered suggestive of malignancy. Type III curve has a washout component with a relatively steep initial part and is strongly suggestive of malignancy [14].

Results

All 26 patients had unilateral breast SA lesions, 20 lesions in the left and 6 lesions in the right breast. Histopathologically, 18/26 (69.2%) cases coexisted with other non-malignant proliferative lesions such as intraductal calcifications, typical and atypical hyperplasia of the ducts and lobular hyperplasia, metaplasia apocrine as well as papillomas. In 7/26 (26.9%) patients, pure SA was found on pathological examination. In only 1/26 (3.8%) patient SA coexisted with an extensive component of intraductal carcinoma.

The diameter of SA lesions ranged from 0.5 to 2.5cm with an average of 1.4cm. On pre-contrast images, 19/26 (73%) lesions showed low signal on T1-weighted images; 21/26 (80.7%) lesions showed high signal on T2-weighted images **(Fig. 1)**.

Mass lesions were observed in 19/26 (73%) of patients and NME in 7/26 (27%). All mass lesions enhanced. Most of them (17/19, 89%) displayed ill-defined or spiculated margins whereas 2/19 had well-defined margins **(Figs. 2, 3)**.

In NME, 3/7 lesions displayed a focal area of enhancement, 2/7 lesions regional enhancement and 2/7 linear enhancement **(Fig. 4)**.

In 15/26 (57.7%) SA lesions, TIC was type I and in 11/26 lesions (42.3%) type II. No patient displayed a type III TIC **(Table 1)**.

Discussion

In recent years, the incidence of SA diagnosis has increased due to an increase in breast percutaneous biopsies [15]. SA is a benign proliferative breast disease, mostly

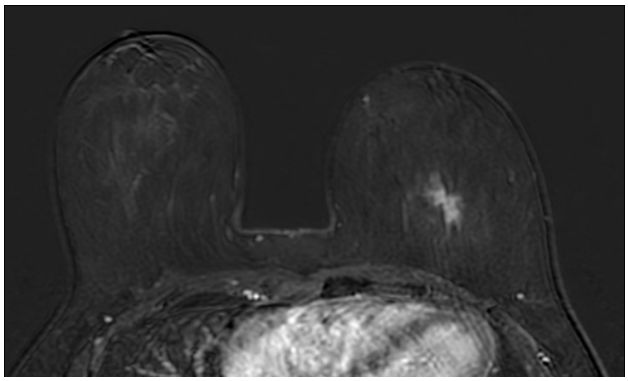

Fig. 2. *Same patient as in* ***fig. 1****. Axial contrast-enhanced T1-weighted MR image showing homogeneous enhancement of the centrally located lesion in the posterior left breast.*

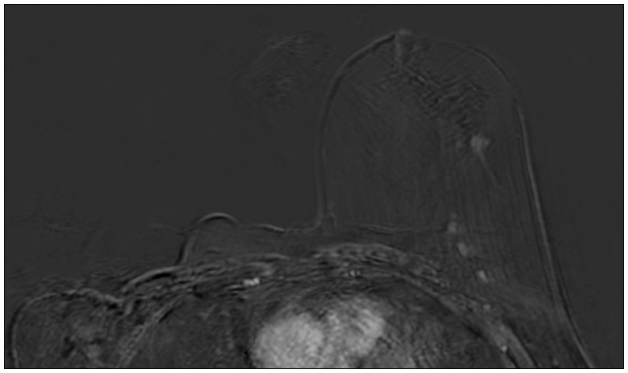

Fig. 3. *Axial contrast-enhanced T1-weighted MR image in a 67-year-old woman with prior mastectomy of the right breast. Mass lesion of the upper outer quadrant of the left breast with ill-defined and spiculated borders was histologically proven sclerosing adenosis.*

found in women between 35 and 50 years of age [16, 17]. It is relatively common and found in about 28% of all benign biopsies. In the Mayo benign breast disease (BBD) cohort, which included 3,733 women with SA who were followed for a median of 15.7 years, standardised incidence ratios (SIRs) for breast cancer were 2.10, within the range of other proliferative breast lesions without atypia [1, 16, 18].

According to several studies, the commonest form of breast cancer associated with SA is carcinoma in situ (CIS), predominantly lobular and, less frequently, ductal (DCIS) [19, 20]. In few studies, DCIS and in particular, low-grade DCIS was more common than lobular CIS [21-23]. In our series, only one case of SA was associated with low-grade DCIS, which was unilateral. Some studies have previously demonstrated that breast cancer associated with SA is frequently hormone-positive, with luminal A molecular subtype being the commonest observed [21, 24].

On clinical examination, SA may present as a palpable mass, although most lesions are non-palpable on clinical examination; on mammograms, SA may present with microcalcifications, mass, focal asymmetry or architectural distortion. The commonest mammographic finding is a focal area of microcalcifications, even though Tan et al. observed architectural distortion more often on mammograms of patients with SA [24-27]. On ultrasound the most common finding of SA was a mass with or without calcifications [5, 9, 26]. Due to suspicious or atypical imaging features on mammography and ultrasound, core biopsy is often necessary to rule out malignancy. More often, SA is an incidental microscopic finding on core biopsies [7].

Few articles have been published regarding the appearance of SA on MRI [11, 24]. The published data state that SA displays a wide spectrum of morphologic and contrast kinetic features on MRI, such as presence of a mass, NME, architectural distortion or non-enhancing lesions with suspicious morphology. The majority of lesions displayed enhancement, with a type I or II curve, which is consistent with our findings.

Table 1. MRI findings in Sclerosing Adenosis.

MRI FINDINGS	n	%
Type of lesion		
Mass	19	73.1
NME	7	26.9
T1 weighted imaging		
Low signal intensity	19	73.1
High signal intensity	7	26.9
T2 weighted imaging		
Isointense	5	19.2
High signal intensity	21	80.8
Low signal intensity	0	0
Time-signal intensity curve		
Type I	15	57.7
Type II	11	42.3
Type III	0	0

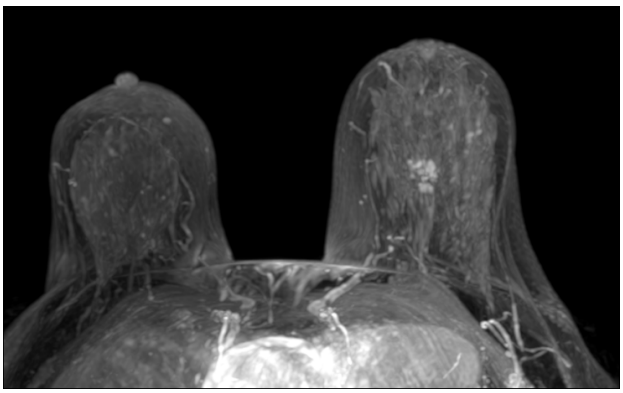

Fig. 4. *Maximum intensity projection image. Focal area of non-mass enhancement of the left breast in a woman with sclerosing adenosis and low-grade ductal carcinoma in situ.*

In our series, 19/26 (73%) patients of SA lesions were ill-defined or stellate-enhancing masses and 7/26 (27%) patients were NME lesions, in keeping with previously published data. Tan et al. reported that 82.4% SA lesions appeared with mass-like enhancement and 17.6% with NME [27].

Even though the morphologic features of SA may mimic malignancy, the dynamic characteristics of these lesions reflect a more benign underlying pathology. Of the 26 patients in our study, 15 (57.7%) displayed type I TIC and 11 (42.3%) a type II haemodynamic curve. In Cao's study, most SA lesions showed type I or II kinetic curves (26/30, 87%) and in Tan's series the results were similar (32/34, 94% had type I or II TIC) [10, 27]. The incidence of a type I kinetic curve in otherwise suspicious lesions for malignancy implies a less aggressive pathology and the differential diagnosis includes radial and complex sclerosing lesions, adenomas, papillary lesions, atypical hyperplasia of ducts or lobules, postoperative changes and tubular cancer. On occasion, these lesions are confusing even on histologic examination [28, 29]. When an enhancing lesion with suspicious morphological features and benign kinetics (type I or II dynamic curve) is observed on breast MRI, the diagnosis of SA should be included in the differential diagnosis. However, due to the non-specific MRI imaging findings, biopsy may still be necessary for a definitive diagnosis.

Conclusions

The radiological features of sclerosing adenosis may sometimes mimic malignancy and histopathologic examination is necessary for definite diagnosis. However, in the case of lesions with morphological characteristics that are suspicious for malignancy but benign contrast kinetics on DCE-MRI of the breast, SA should be considered in the differential diagnosis. **R**

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Ethical approval

The study was approved by Ethics committee of Areteion University Hospital.

Conflict of interest

The authors declared no conflicts of interest.

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