Radiology Case Reports 17 (2022) 2492–2500

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Case Report

Small vascular lesions of the breast diagnosed by magnetic resonance imaging-guided vacuum assisted biopsy: Report of 2 cases

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ARTICLE INFO

Article history:
Received 27 November 2021
Revised 23 March 2022
Accepted 25 March 2022

Keywords:
Vascular breast lesions
Magnetic resonance imaging
MRI guided vacuum assisted breast biopsy

ABSTRACT

Vascular lesions of the breast comprise a heterogeneous group that includes a variety of benign, atypical, and malignant lesions. These are a diagnostic challenge given variable clinical, radiological and pathological presentation, especially when they are small and asymptomatic. We present 2 cases of these rare lesions of the breast which were occult to mammographics and ultrasound studies. Both the lesions were detected only on magnetic resonance imaging, most helpful in the diagnosis of these rare tumor. Histopathological examinations following the magnetic resonance guided biopsies, were initially interpreted as negative for breast cancer in both cases. These turned out to be respectively a low grade angiosarcoma and a benign vascular lesion after a new histopathological examination following a larger magnetic resonance guided biopsies performed in light of the radiology-pathology discordance. Although rare, it is important to consider vascular tumours of the breast; radiologists need to be aware such tumors may present non-specific imaging features.

Vascular lesions of the breast (VLB) represent a minority of tumors originating in the breast and may pose a diagnostic challenge.

They would be benign vascular tumours, relatively uncommon, include hemangioma, angiomatosis, and atypical vascular lesions according to the WHO classification [1] and

Abbreviations: VLB, Vascular lesions of the breast; MRI, Magnetic resonance imaging; VABB, Vacuum-assisted breast biopsy; MMG, Mammography; US, Ultrasonography; VALB, Vacuum-assisted Large-volume breast biopsy.

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https://doi.org/10.1016/j.radcr.2022.03.100

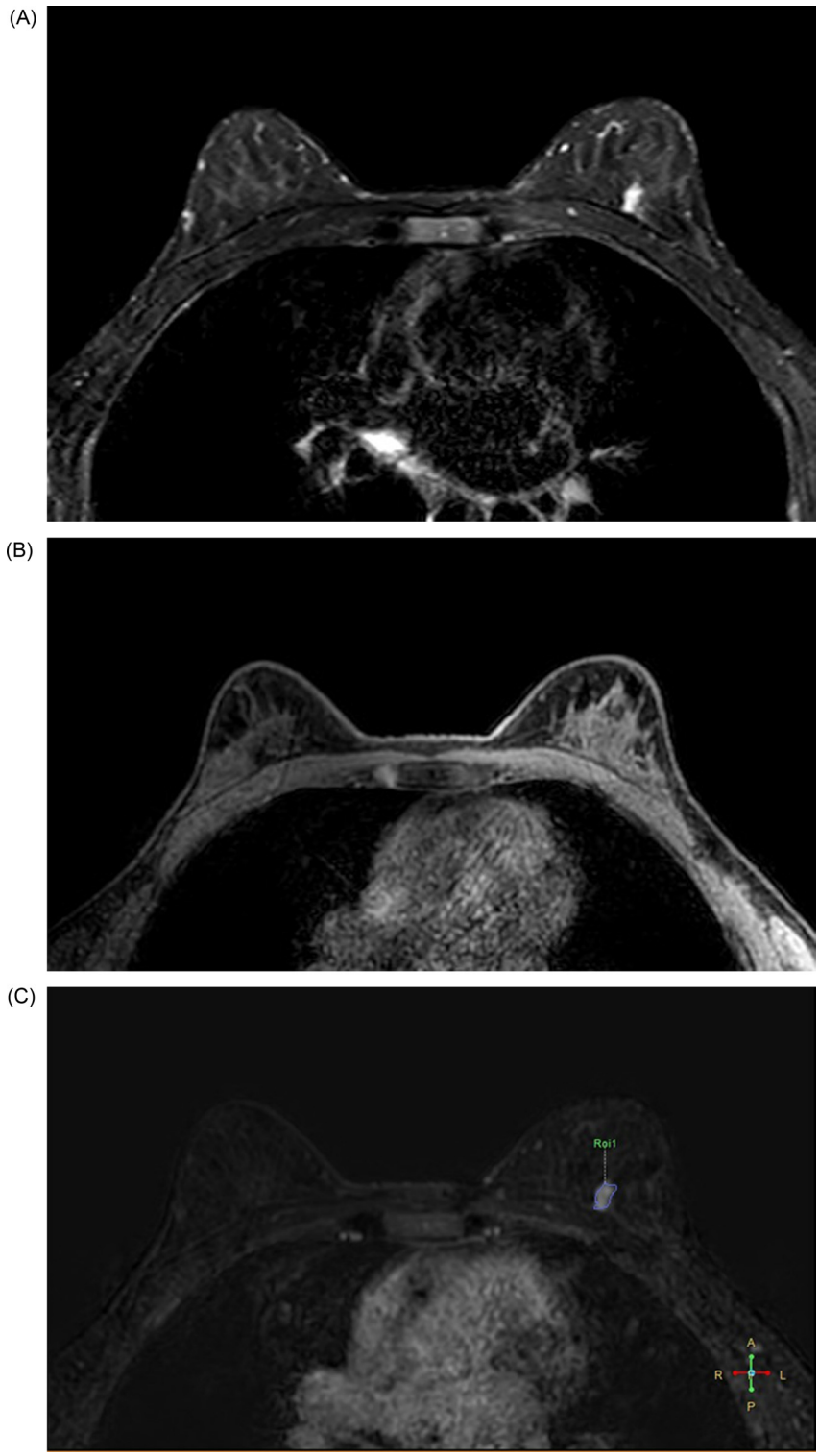

Fig. 1 – Appearance of the low-grade angiosarcoma on MRI. Axial T2 SPAIR (A) MRI demonstrates increased signal between superior quadrants of the left breast. Pre-contrast T1 non-fat-suppressed (B) MRI does not show a morphological image corresponding to the region seen in (A) and (C). Postcontrast axial T1 fat-suppressed (C) demonstrate mass enhancement between the superior quadrants of the left breast with rapid initial enhancement and persistent delayed enhancement corresponding to the region seen in (A). Derived parametric map (D) of perfusion: the lesion area is highlighted in the parameter image, which indicates a more higher permeability and perfusion. (E) Generated signal intensity curve demonstrates rapid initial enhancement and persistent delayed enhancement corresponding to the region marker with the ROI. MRI, magnetic resonance imaging; ROI, region of interest

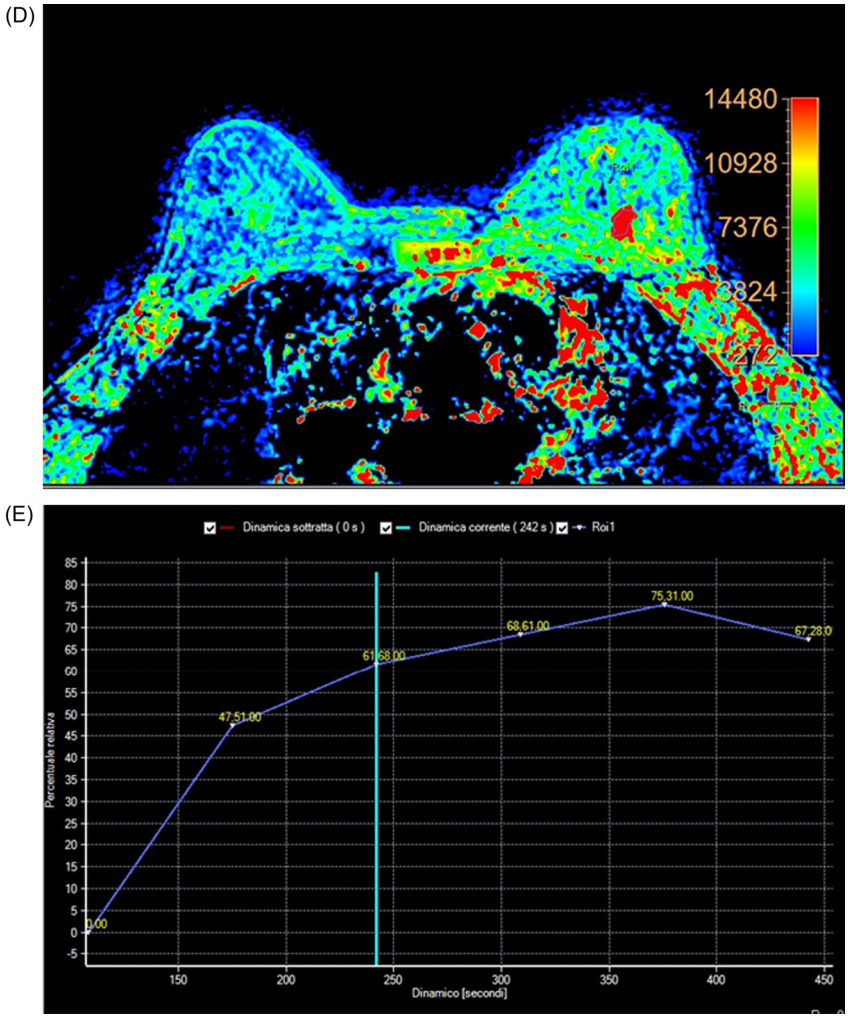

Fig. 1 – Continued

malignant vascular lesions represented by angiosarcomas which may be primary or secondary. Primary angiosarcoma is a rare malignant vascular neoplasm that originates from endothelial cells without any known risk factors, it represents nearly 0.05% of all breast cancers [2] and has a predilection for young women (median age 43 years). Secondary angiosarcoma is associated with radiation therapy to the breast/chest wall for breast cancer [3].

The presentation of VLB ranges from those that are subclinical and discovered incidentally, to large tumors that may extensively involve the breast parenchyma and skin.

These tumors are often occult to conventional imaging. Especially in the cases of small and asymptomatic VLB mammography (MMG) and ultrasonography (US) are often negative, studies in literature shows that magnetic resonance imaging (MRI) is superior to previous 2 imaging modalities for diagnosis of these small lesions [4,5]. At the MRI angiosarcoma often exhibits iso-ipointensity on T1-weighted images and markedly high signal intensity on T2-weighted images. On dynamic MR images, tumors demonstrate an intense and prolonged enhancement because of the blood-filled vascular spaces [5,6] and for these specific features are classified as suspicious or highly suggestive of malignancy lesions (BI-RADS 4 or BI-RADS 5) [7].

Considering the difficulty to identifying small vascular tumours of the breast both clinically and radiologically, the final diagnosis is obtained from histological analysis on tissue specimens obtained from local needle biopsy or surgery. MRI-guided-vacuum-assisted breast biopsy (VABB) represents a valid tool that allows the characterization of suspicious lesions that are detectable only by MRI.

This is a report of 2 different cases of small vascular lesions of the breast detected by MRI and diagnosed by MRI-guided VABB.

Case 1

A 41-year-old woman with family history as a risk factor for breast cancer came to our attention with a request for a breast MRI due to a palpable nodule in the right breast. The previous imaging were negative mammogram and breast US scan performed at another hospital.

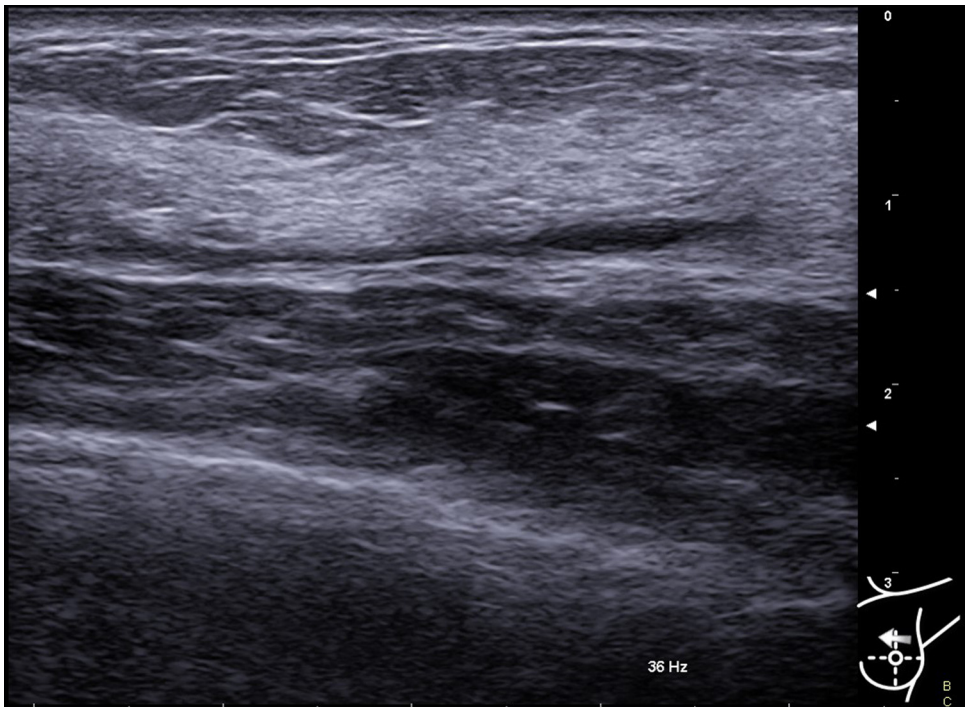

Fig. 2 – Targeted second ultrasound look of the left breast doesn't demonstrate any defined finding between superior quadrants

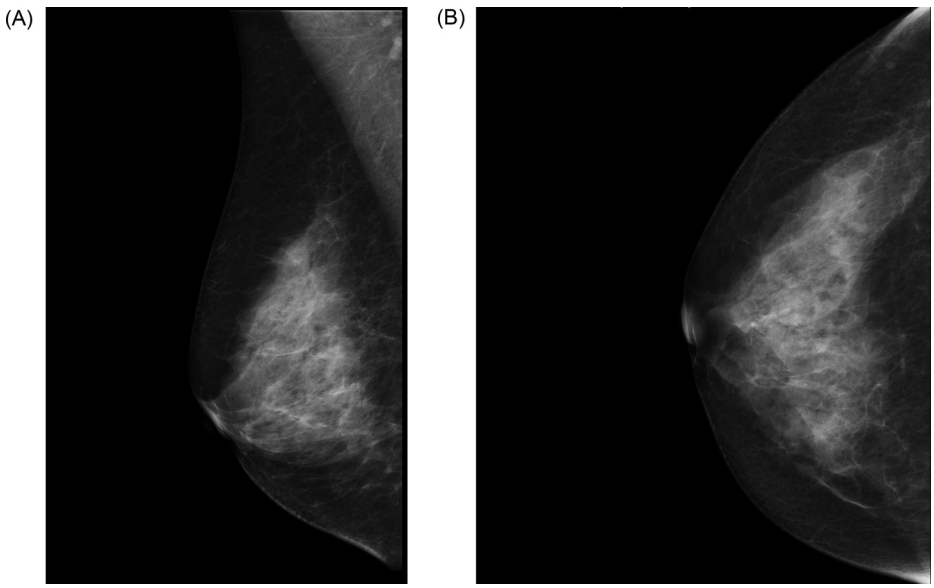

Fig. 3 – Digital mammography of the right breast in the mediolateral oblique (MLO) and craniocaudal (CC) view demonstrate extremely dense breast tissue with no underlying mass, calcifications, or architectural distortion

She had an MRI of the breast which identified a 10 mm mass enhancement (according to the Breast Imaging Reporting and Data System MRI lexicon of the American College of Radiology [BI-RADS MRI lexicon]) [7], with irregular borders and characterized by high signal intensity on T2-weighted images, distributed between the superior quadrants of the left breast (Fig. 1). No pathological findings were found on the right breast. After the MRI diagnosis, we performed a second ultrasound look that did not show any lesion in the left breast (Fig. 2).

We decided to perform an MRI-guided VABB in order to characterize the lesion.

It was performed by a radiologist specialized in breast imaging with a long experience in performing breast inter-

vention using a 1.5 T MRI system (Philips Intera Achieva, Best, the Netherlands) equipped with a dedicated surface coil (Open Breast Array Coil, Invivo, Phillips, Amsterdam, The Netherlands). He employed an 11-gauge VABB device (Mammotome, Roma, Italy) with lateral access. The Mammotome MRI-dedicated VABB system consists of a control module that keeps the vacuum constant between 23 mm/Hg and 25 mm/Hg, which is the range used for stereotactic and US guidance. At the end of the procedure, the operator released an MRI-compatible titanium clip (Mammotome, Roma, Italy). He collected 16 histological specimens. The histological examination results were negative for breast cancer lesions (B1), we underline that the only detected abnormality was the presence of dilated small blood vessels. We compared pre- and post-biopsy images, and we made sure that the patients did not move.

The control MRI exam post-VABB procedure confirmed the persistence of the previous mass enhancement; due to the lack of concordance between histological and radiological results, we decided to repeat the MRI-guided biopsy with an 8-gauge VABB device to collect more specimens and avoid subsampling.

Histological examination showed interanastomosing vascular spaces lined by endothelial cells that exhibited hyperchromatic nuclei with mild atypia. The vascular spaces dissected through the mammary stroma and adipose tissue and surrounded, invaded, and disrupted normal lobules. Hemorrhagic areas were present. No mitotic activity was identified. Immunophenotypic profile of atypical endothelial cells showed CD34 positive, CD31 positive, Erythroblast transformation specific (ETS) related gene (ERG)-positive, Estrogen receptor (ER)-negative, and cluster of differentiation (CD) 30-negative. These features were suspicious for low grade angiosarcoma (Figs. 8A and B).

The patient underwent surgery to remove the lesion: the histological exam of the removed section confirmed the diagnosis of low-grade Angiosarcoma sec. WHO [1].

The definitive treatment consisted of adeno-mastectomy Nipple Areola Complex-sparing.

Case 2

A BReast CAncer gene (BRCA) mutated 61-year-old woman presented to our attention to undergo breast screening by MMG, US, and MRI for a lesion detected on previous breast MRI performed at another hospital a year before.

We performed at the beginning MMG and US which were negative (Fig. 3), so we decided to perform a new MRI that detected a non-mass linear enhancement measuring 13 mm distributed between the superior quadrants of the right breast (Fig. 4). After the MRI diagnosis, a second ultrasound look was performed that did not show any lesion (Fig. 5). Due to this evidence, we proceeded with an MRI-guided biopsy using an 11-gauge VABB device with the same modalities described in the previous case (Fig. 6).

The histological exam reported fibrocystic mastopathy with ductal ectasia (B2).

The control MRI performed post-VABB procedure showed the persistence of non-mass enhancement and a peripherical reactive enhancement in the site of the previous biopsy.

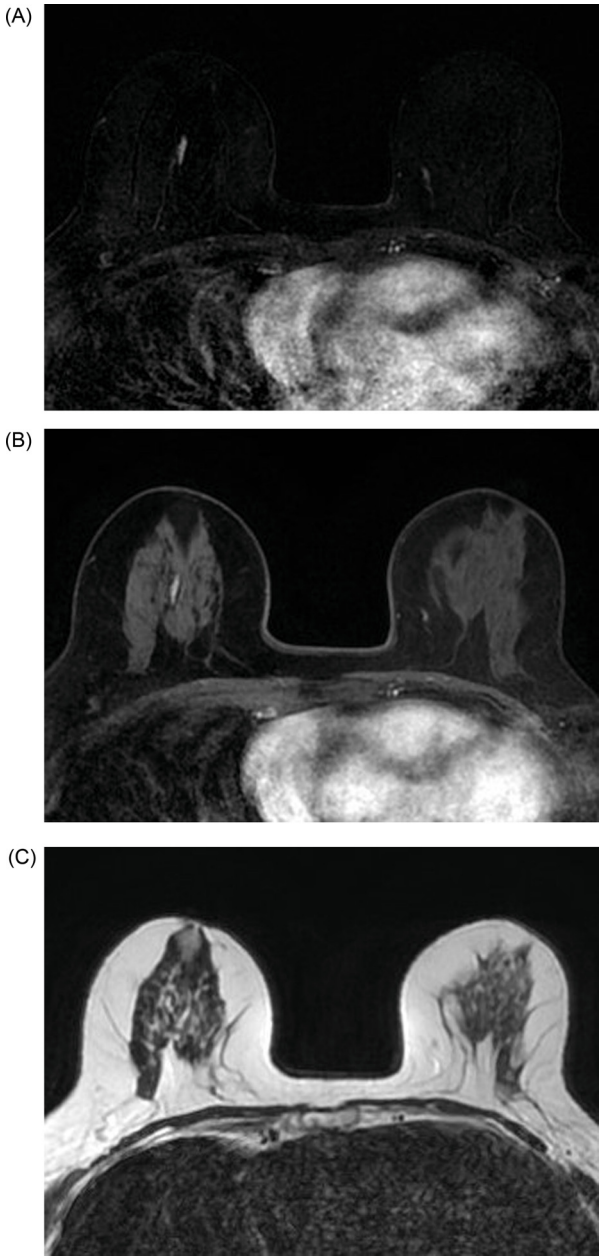

Fig. 4 – Appearance of the benign vascular lesions on MRI. Postcontrast T1 fat-suppressed (A) and non-fat-suppressed (B) axial breast MRI demonstrate a linear non mass enhancement between the superior quadrants of the right breast with rapid initial enhancement and persistent delayed enhancement. Axial T2 (C) MRI does not shows a morphological image corresponding to the region seen in (A) and (B). MRI, magnetic resonance imaging

Due to the absence of concordance between histological and radiological results we decided to repeat the MRI-guided VABB, using an 8-gauge VABB device to collect more specimens and avoid sub-sampling.

The histological results described a nodular benign vascular lesion with small no-anastomosing vascular spaces. The

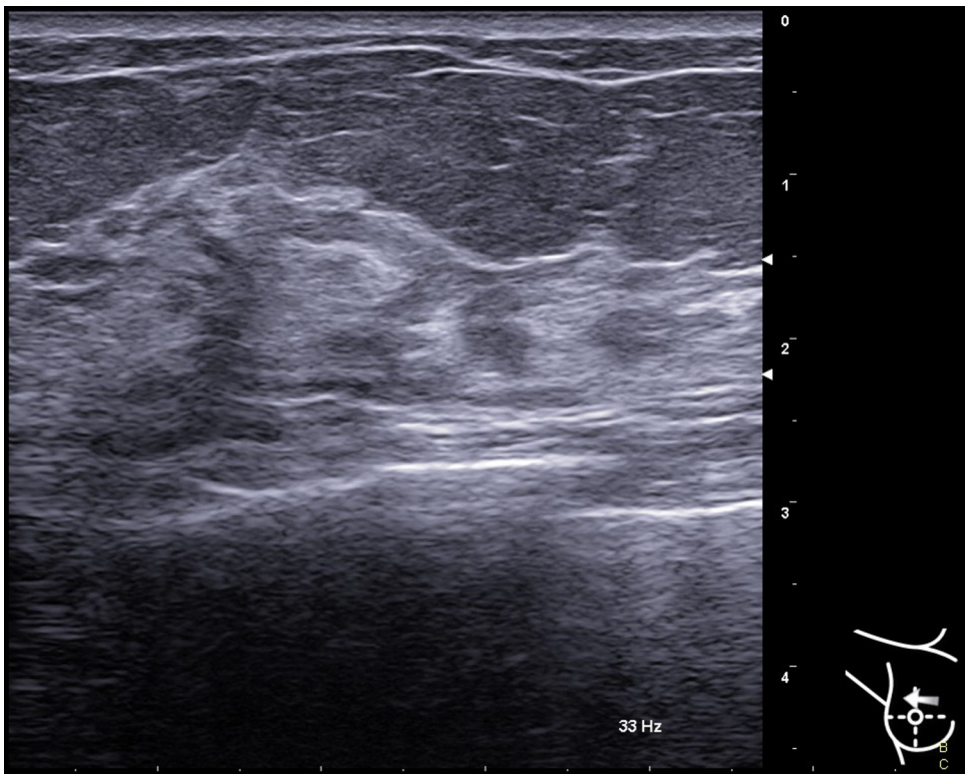

Fig. 5 – Targeted second ultrasound look of the right breast doesn't demonstrate a defined finding between superior quadrants

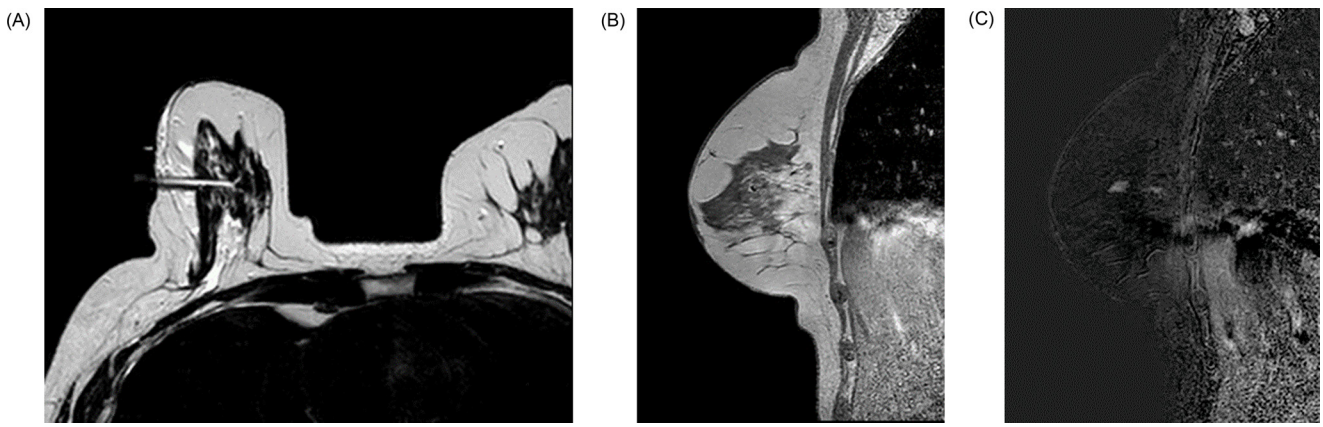

Fig. 6 – Steps of the MRI-guided VABB: (A) axial and (B) sagittal T2 pre contrast control scan immediately before MRI-guided VABB show a seemingly correct position of the biopsy marker. (C) Early contrast enhanced sagittal T1-fat suppressed MRI demonstrates non-mass enhancement between the superior quadrant of right breast. MRI-guided VABB, magnetic resonance imaging guided vacuum-assisted breast biopsy

vessels were lined by flat endothelium without atypia or mitosis, CD31 positive. Invasion of the intralobular stroma was absent. The findings were suggestive for benign vascular lesion (Figs. 8C and D).

Follow-up MRI performed 3 months later confirmed a size reduction of the non-mass enhancement area (6 mm vs 13 mm) due to the excisional biopsy (Fig. 7).

Discussion

Vascular tumours of the breast comprise a heterogeneous group that includes a variety of benign, atypical, and malignant lesions. We report the experience of Breast Unit, Department of Diagnostic Imaging and Anatomic Pathology of Policlinico Tor Vergata with these unusual diseases.

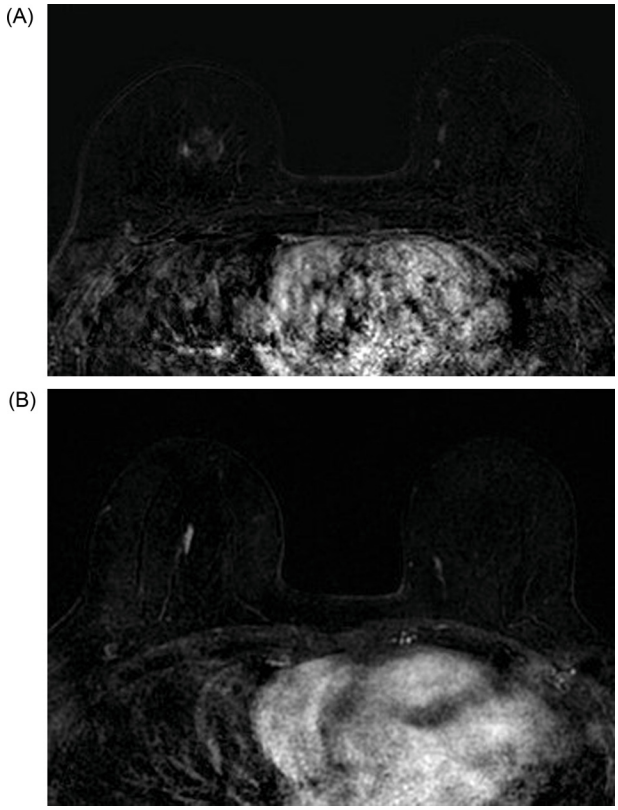

Fig. 7 – Follow-up MRI of benign vascular lesion. Postcontrast T1 fat-suppressed axial (A) MRI performed 3 months later MR-guided-VABB shows size reduction of non-mass enhancement previous detected between the superior quadrant of the right breast (B). MRI, magnetic resonance imaging; VABB, vacuum-assisted breast biopsy

The presentation of VLB ranges from those that are microscopic and discovered incidentally, to tumor that present as palpable mass [8] or large tumors that may extensively involve the breast parenchyma, with diffuse enlargement or swelling of the involved breast [9]. When absence of clinical signs and symptoms occurs, these lesions present as a diagnostic challenge. In this study both 2 cases were asymptomatic and one of them, low-grade angiosarcoma, was an incidental finding on MRI performed as additional imaging for the study of a palpable lesion in the contralateral breast. Our cases show how imaging plays an indispensable role, especially when VLB are small and asymptomatic.

In our patients, the MMG and US examinations did not show any abnormal finding. It is not uncommon that VLB are not identifiable by MMG and US. Mammography findings related to angiosarcoma are usually nonspecific and tumor may be frequently missed on mammograms due to the higher density of breast in young women, especially in low grade angiosarcoma [10], to the vague, isodense, noncalcified nature of the masses, the absence of architectural distortion and calcifications [4].

Yang et al. studied imaging findings of 24 cases of angiosarcomas and found that 3 of 16 angiosarcomas were mammographically occult; but all of them were identified with MRI examination. MRI showed VLB consisted of large, lobular masses that were heterogeneously hypointense on T1- weighted images and heterogeneously hyperintense on T2-weighted images. All tumors demonstrated intense and heterogeneous enhancement, with a typical malignant pattern on dynamic contrast images that was characterized by rapid initial enhancement followed by washout kinetic features in the delayed phase [4].

In our patients MRI allowed early identification of small VLB that were unrecognized with other imaging methods. In our experience we support the role of magnetic resonance imaging as gold standard for the diagnosis of VLB lesions and a first approach with MRI-guided VABB in order to characterize the lesion.

We confirm that MRI is superior to mammography for diagnosis of VLB and according to other studies we propose MRI to surveillance of these benign lesions [4].

For a suspicious MRI-only lesion an MRI-guided biopsy is recommended by the American Cancer Society and European Society of Breast Imaging [11,12]. For MRI enhancement, our patients underwent MRI-guided vacuum-assisted breast biopsy and in both cases the multidisciplinary team decided to repeat MRI biopsy because of radiological-pathological discordance. After the first histological exam at the beginning, we actually considered the possibility that we missed the lesion during the first biopsy. We compared pre- and post-biopsy images, and we made sure that the patients did not move. Because of abnormalities and uncertainties of histology reported by pathologist and the strong clinical suspicion for the MRI finding, a second MR guided VALB (Vacuum-assisted Large-volume breast biopsy) with an 8 G needle allowed to obtain a diagnosis. When we got the result of the second biopsy, pathologists retrospectively analysed the first sample and they found similar pathological findings to the second one: "*presence of dilated small blood vessels*." So, at the end, we were sure that we had not missed the lesion in both biopsies. We used an MRI-guided vacuum-assisted breast biopsy protocol that avoids procedural failures (ie, false-negatives due to sub-sampling) [13]. In literature the reported technical success rate of the free-hand large MRI-guided vacuum-assisted breast biopsies with manual approaches is about 95% [13–16]. MRI was also useful in evaluating residual disease after excisional biopsy in the patient with benign vascular lesion who did not undergo surgery according to the literature. Recently, Sebastiano et al. investigated 76 benign vascular lesions with an approximately 22% surgical excision rate suggested benign vascular lesions of breast diagnosed on core biopsy with concordant radiological and pathological findings do not require excision. [17].

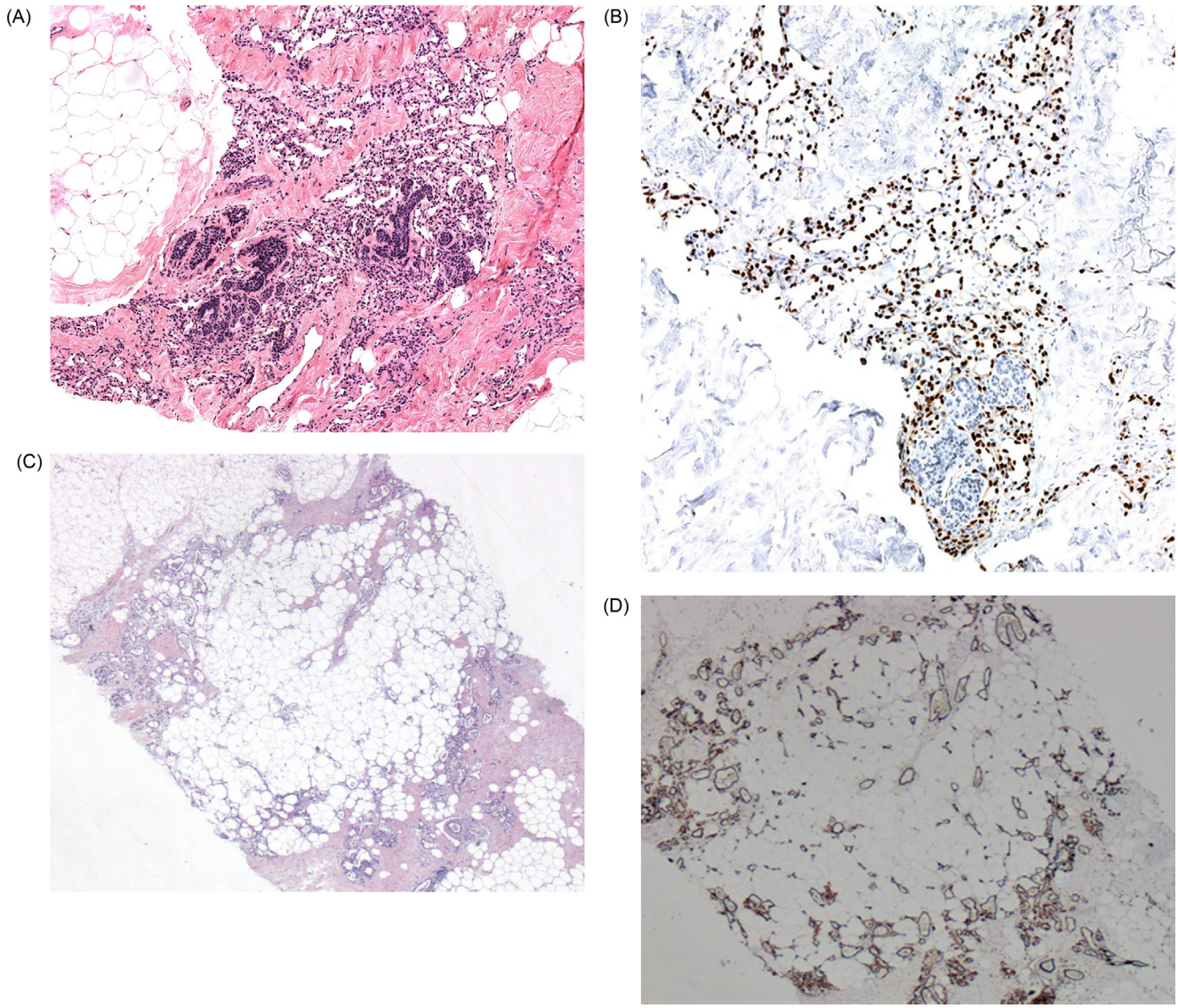

Fig. 8 – Histological photomicrographs for the low grade angiosarcoma (A, B) and benign vascular lesion (C, D) of the breast. (A) Interanastomosing vascular spaces lined by endothelial cells that exhibited hyperchromatic nuclei with mild atypia. The vascular spaces dissected through the mammary stroma and adipose tissue and surround, invade, and disrupt normal lobules. Hemorrhagic areas were present (hematoxylin and eosin stain, low magnification × 10). (B) Immunohistochemical stains showed vascular phenotype CD31 (magnification × 20). (C) Benign vascular lesion with small no-anastomosing vascular spaces. The vessels were lined by flat endothelium without atypia or mitosis. Invasion of the intralobular stroma was absent (hematoxylin and eosin stain, high magnification × 10). (D) Immunohistochemical stains vascular phenotype CD31 (magnification × 20)

Conclusion

These reports presented 2 cases of small asymptomatic vascular lesions of the breast that were detected only by MRI. A large 8 G MRI-guided vacuum-assisted large volume breast biopsy provides a diagnosis in case of radiological-pathological discordance and high suspicious findings on MRI (BI-RADS 4 or BI-RADS 5).

Our experience supports that radiological-pathological correlation is essential for a correct management of breast suspicious lesions also considering a wider variety of lesions as well as breast epithelial tumors.

Furthermore, we suggest MRI for surveillance of benign VLB.

Patient consent

Informed consent was obtained from all individual participants included in the study. The participants have consented to the submission of the case report to the journal.

Conflict of Interest

The authors declare that they have no conflict of interest.

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