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## Arteriovenous Malformation of the Breast; Report a Case

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### ABSTRACT

**Background:** Arteriovenous malformation (AVM) of the breast is a rare condition that is usually incidentally detected as discoloration of the skin. Patients are asymptomatic, and it is mostly left undisturbed. However, the closest differential diagnosis of primary angiosarcoma of the breast can have a similar imaging appearance. Multimodality imaging will help to differentiate between the two, and in very few cases, tissue diagnosis warrants confirmation.

**Case presentation:** We hereby report the case of a young female who initially presented with swelling and discoloration near her face and neck and who, on a one-year follow-up, incidentally noticed discoloration over her left breast. She underwent an ultrasound, a dynamic contrast-enhanced MRI of both breasts and a dedicated left breast X-ray mammogram.

**Conclusion:** With all these modalities confirmed, the discoloration was caused by an AVM of the breast.

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### INTRODUCTION

Arteriovenous malformation (AVM) is an abnormal anatomical characteristic of vessels where a larger number of dilated inflows and outflows of vessels are seen, which extend to other surrounding tissue layers.<sup>1</sup> Breast AVMs are slow flow malformations (Feeding artery and Draining vein) that can be diagnosed with the help of ultrasound, color Doppler, dynamic contrast-enhanced MRI, and also X-ray Mammogram, depending on the age of the patient to look for calcifications.<sup>2</sup> An early diagnosis of AVMs can be treated with sclerotherapy or ablative techniques, or surgery.<sup>3</sup>

### CASE PRESENTATION

A female patient in her early 20s presented to the hospital with discoloration and swelling near the neck and chin region. The patient underwent an MRI (Figure 1 A, B, C) of the face which revealed venous malformation for which the patient underwent

sclerotherapy (Figure 1 D, E, F). Before her one-year follow-up visit for previously treated head and neck AVM, she had an incidentally discovered bluish-red discoloration in the upper inner quadrant of her left breast.

On clinical examination, a compressible 2x2cm swelling in the upper inner quadrant of the left breast with mild warmth was present. The swelling was soft in consistency with no tenderness and blanched on pressure. Clinical examination of previously treated sites of AVM was done which revealed no further abnormality at the treated site.

Ultrasound of the left breast showed an oval circumscribed hypoechoic mass with gentle lobulations with significant internal vascularity (Figure 2A, B) in the left breast at the 10 o'clock position in circle 2, beneath the superficial skin discoloration. On colour doppler, the venous flow was noted within the lesion and a small artery was noted at the periphery of the lesion (Figure 2C). The ultrasound of the right breast was unremarkable.

Dynamic contrast-enhanced MRI of both breasts was advised which showed an irregular T1 iso and T2 hyperintense mass with micro-lobulated margins in

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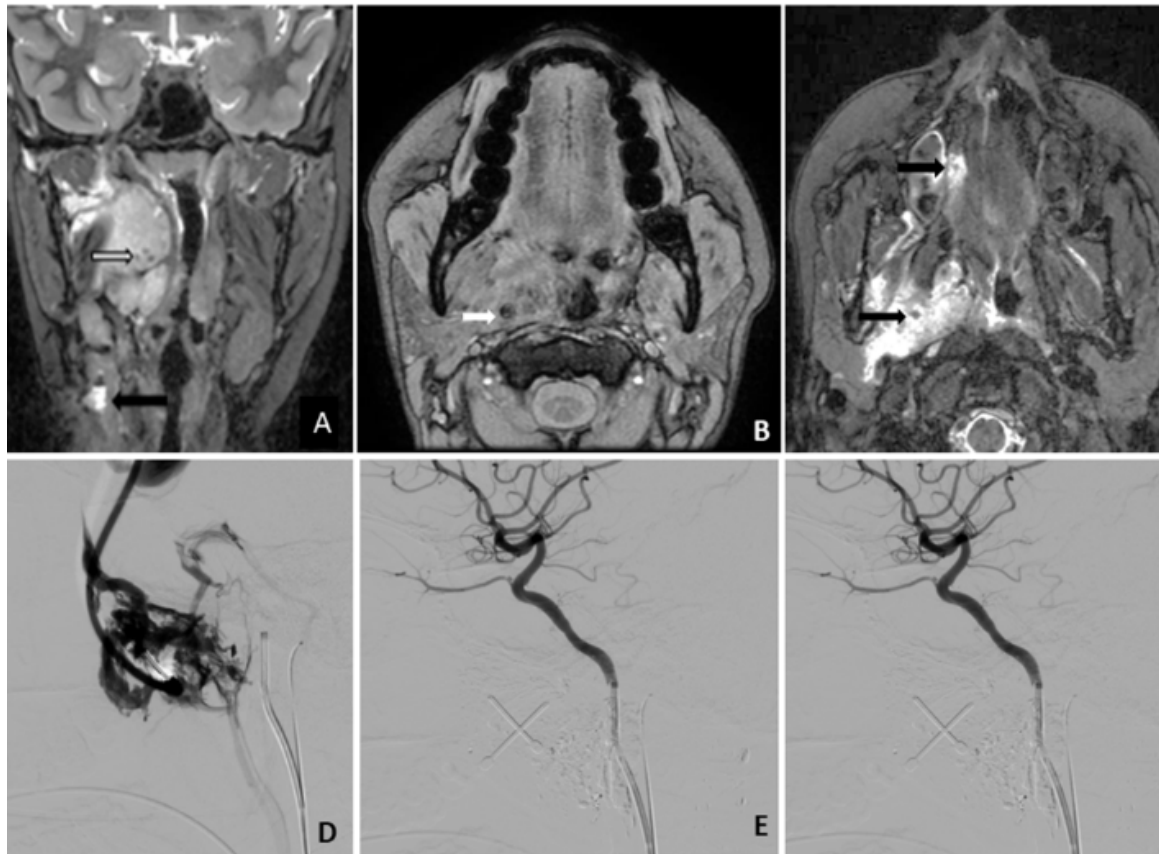
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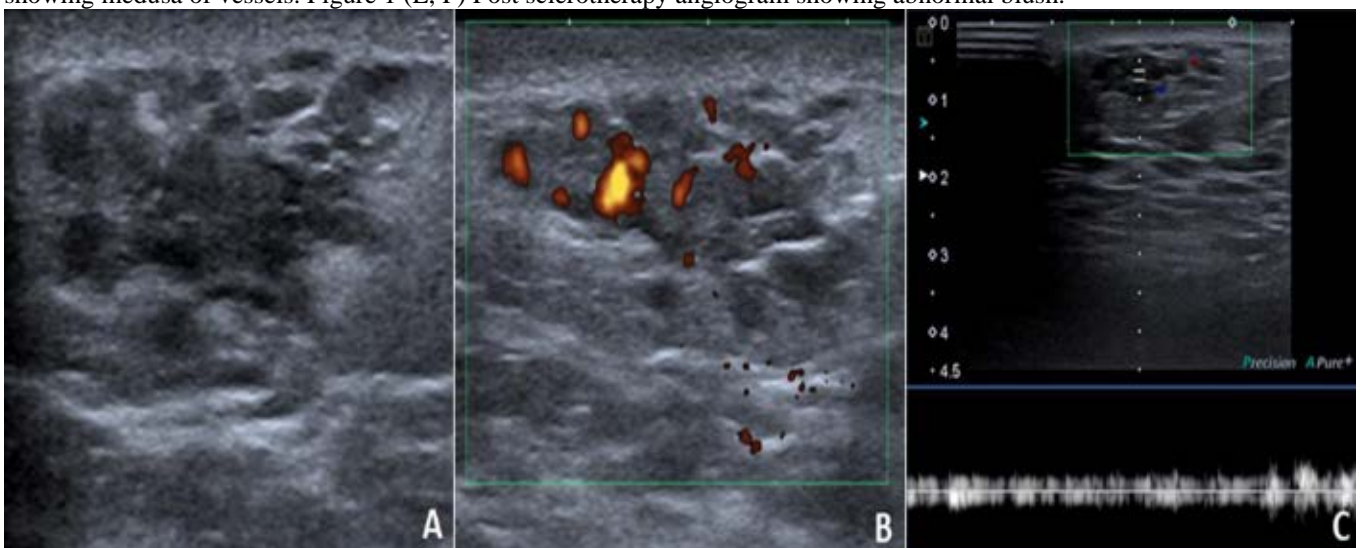
the upper inner quadrant of the left breast between 9-10'o clock position about 3.5cm away from the nipple Figure 3 (A, B, C)

A few areas of gradient blooming indicating vessels along with a few T2 hypo intensities suggestive of flow voids were also noted within the mass (Figure 3 D). In post-contrast TRICKS imaging,

feeding arteries arising from the anterior intercostal and perforating branches of the left internal mammary artery and the anterior intercostal branch of the right internal mammary artery were seen supplying the mass with a slow gradual filling mass. No evidence of any nidus within the mass was found (Figure 3 E, F). No infiltration of the tissue planes was seen..

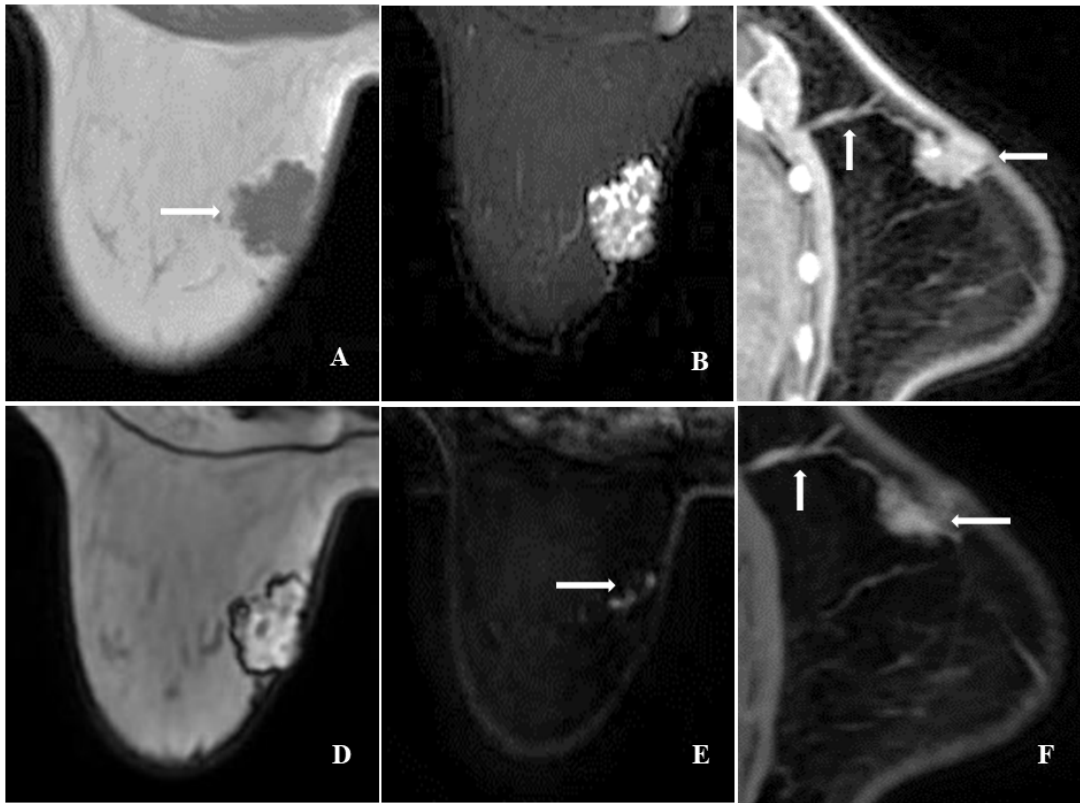


**Figure 1.** (A, B, C) Coronal T2, (B) axial T2 & T1 STIR weighted sequences: An ill-defined T2 hyperintense lesion with lobulated margins is seen in the right para pharyngeal space with few small T2 hypo intensities (white arrows) within likely to represent phleboliths – suggesting a venous malformation. Figure 1 (A, C): A small discrete component of the malformation is also noted on the right side of the hard palate shown with the (black arrow). Figure 1 D Pre-sclerotherapy angiogram showing medusa of vessels. Figure 1 (E, F) Post sclerotherapy angiogram showing abnormal blush.



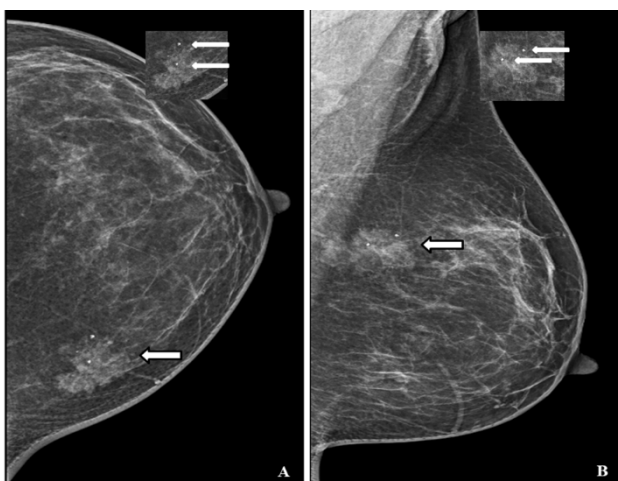


**Figure 2 (A, B, C):** Ultrasound images depicting an irregular hetero-echoic mass with indistinct margins in the superficial plane of the left breast showing vascularity within with a venous pattern.



**Figure 3 (A, B, C):** An irregular T1 iso and T2 hyperintense mass with micro-lobulated margins in the upper inner quadrant of the left breast. Figure 1D: A few areas of gradient blooming indicating vessels along with a few T2 hypo intensities suggestive of flow voids are noted within the mass. Figure 1E: Feeding arteries arising from the anterior intercostal and perforating branches of the left internal mammary artery and anterior intercostal branch of the right internal mammary artery supplying the mass seen. Slow gradual filling of the mass in post-contrast TRICKS imaging.

To confirm the presence of calcifications within the mass, an x-ray mammogram was done which showed an irregular circumscribed high-density mass in the upper inner quadrant of the left breast with few punctate and round calcifications within -indicative of phleboliths (Figure 4 A, B).



**Figure 4 (A, B):** X-ray mammogram CC & MLO view of the left breast: An irregular equal density mass with indistinct margins in the lower inner quadrant of the left breast (bold arrow). A few benign coarse calcifications

within the mass-suggestive of phleboliths are also evident, clearly visible on zoomed image (white arrow).

*Differential Diagnosis*

Chest wall lesions can mimic masses on mammograms and can cause diagnostic difficulty in interpretation. Vascular chest wall lesions are extremely uncommon, of which venous malformations (VM) are the most common type of congenital malformation with an estimated incidence of 1%, arising due to abnormal vasculogenesis or angiogenesis.<sup>4</sup> When large enough, they may project into the overlying breast tissue and be visible on mammograms causing a diagnostic dilemma. The differential diagnosis of these kinds of symptoms may be atherosclerosis, superficial thrombophlebitis, Varix, venous collaterals, Pseudoangiomatous stromal hyperplasia (PASH), symmetric in congestive heart failure, Osler-weber syndrome fibroadenoma, complex cyst, hemangioma, Lymphangioma, Angiolipoma, Angiosarcoma, and Hemangiopericytoma.<sup>5-7</sup>

Usually, biopsy is not recommended in this kind of case. In AVM, there is an involvement of arteries and veins, rather than the lesion or mass. Profuse



bleeding may occur if a biopsy is attempted and left undisturbed, with most of the AVMs remaining stable.

Risk factors in causation and association of cancer: Rare cases of malignant degeneration into squamous cell carcinoma,<sup>8</sup> in a long-standing lesion and lymphangiosarcoma<sup>9</sup> at the site of irradiated lymphangioma circumscriptum have been reported. Although these tumors are rare, the breast is one of the more common locations in which they occur.<sup>10</sup>

## DISCUSSION

Breast venous malformations are benign vascular malformations of breast tissue and are slow-flow venous malformations (nomenclature according to ISSV classification).<sup>2</sup> They are mostly incidentally found and patients do not have any symptoms except for cosmetic reasons at times. Very rarely post-surgical venous malformations are also seen. The venous malformations that occur within the breast are mostly cavernous type, hence similar to cavernous hemangiomas occurring elsewhere in the body,<sup>11</sup> and these appear as a lobulated cluster of non-neoplastic vessels filled with slow-moving blood.<sup>12</sup> No predilection is seen for any side of the breast or quadrant.

### Imaging:

X-Ray Mammogram – malformations are usually seen as oval circumscribed equal or high-density masses with benign calcifications (phleboliths); Ultrasound of the breast - malformations usually appear as parallel oriented predominantly hypoechoic masses with vascularity and few calcifications. These masses are mostly superficial with overlying skin discoloration. Dynamic contrast-enhanced MRI of the breasts appears hypointense on T1 and T2 with

flow voids in T2 and shows early enhancement and slow washout on post-contrast images. These masses often have type 2 or type 3 kinetic curves.<sup>13</sup>

## CONCLUSION

When a patient presents with a new lesion suggesting suspicious MR curves, the preference is to exclude malignancy. It should be noted that both may have similar imaging characteristics and that AVM is one of the lesions which results in a false positive diagnosis of malignancy. It is also important to note that both morphology and kinetic curves should be considered in the grading of a lesion on MR (alongside other available imaging). It has been shown that suspicious morphology offers a higher yield than a suspicious kinetic curve. If an imaging modality like mammography, ultrasound, or MR increases the suspicion of a malignant lesion, a tissue diagnosis is then essential to exclude it. If a lesion cannot be localized on a second-look ultrasound, an MR biopsy is the next appropriate course to obtain a tissue diagnosis.

## ETHICAL CONSIDERATIONS

The patient provided written informed consent to publish the information and images contained in the case report.

## CONFLICT OF INTERESTS

None to declare.

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