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Axillary Venous Malformation Detected During Breast Imaging: A Case Report

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Abstract: Venous malformations (VMs) are rare congenital vascular anomalies characterized by clusters of dilated veins that can occur in various locations, including the skin, muscles, and internal organs. It is uncommon for these anomalies to be initially identified and described through breast imaging. Most of the reported cases of VMs identified on breast imaging have been detected within the pectoralis muscle and breast parenchyma. We present a unique case of an axillary VM identified in an asymptomatic woman during routine breast imaging and argue that, because of the risks of operating on VMs, this case highlights the importance of considering VMs in the differential diagnosis of non-lymph node axillary lesions to avoid unnecessary invasive procedures.

Keywords: *venous malformation, breast, mammography, ultrasonography*

Key Points

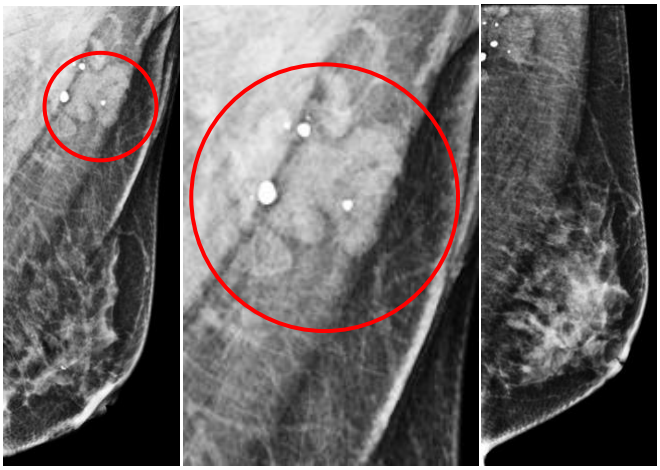
- It is rare that venous malformations (VMs) are initially detected on breast imaging.
- VMs can be identified by imaging characteristics such as a spongiform mass with hypoechoic spaces, slow flow, and compressibility, with diagnosis usually confirmed through ultrasound and Doppler.
- Most VMs remain clinically occult, suggesting that their true prevalence in the breast and axilla may be underreported.
- Considering VMs in the differential diagnosis of non-lymph node axillary lesions can help to avoid misdiagnoses and unnecessary invasive procedures.

Introduction

Venous malformations (VMs) are rare slow-flow lesions characterized by enlarged veins that are irregularly connected to the normal vasculature. VMs are believed to be caused by abnormal blood vessel formation during fetal development. The incidence of VMs is estimated to range between 1 in 5000 to 10 000 births, with a prevalence estimated at 1.5%.[1,2] Though they are present at birth, VMs often remain clinically undetected for an extended period.[1-3] VMs grow with the patient, but their growth can be exacerbated by factors such as trauma, infection, puberty, or pregnancy.[3] Although VMs are predominantly asymptomatic, clinical manifestations can include blue or purple discoloration of the overlying skin, compression neuropathy, and inflammation of the skin and subcutaneous tissue. Occasionally, the diminished blood flow characteristic of VMs may incite local inflammation, with resultant small blood clot formation, which can calcify over time and form phleboliths.[3] VMs represent the most prevalent form of vascular malformations, with the majority manifesting as cutaneous or intramuscular lesions. We present a case of a VM in axillary breast tissue that was first detected during breast imaging. It is important for radiologists to recognize the imaging characteristics of benign entities such as VMs to ensure accurate diagnosis and to avoid unnecessary invasive procedures that may result

Figure 1. Diagnostic Mammography of the Left Breast of a 45-Year-Old Woman.

A MLO view B MLO enlarged view C MLO view (3 years prior)



(A) Diagnostic mammogram of the left breast in mediolateral oblique (MLO) view shows a high-density, irregular 30 mm mass with circumscribed margins corresponding to the palpable area of concern (A, red circle).
(B) An enlarged view of the diagnostic mammogram demonstrates associated internal large coarse calcifications (B, red circle).
(C) A diagnostic mammogram conducted 3 years prior to the patient's presentation shows no significant difference in internal vascularity, likely due to the compressibility of the VM.

in uncontrolled bleeding due to the fragile and infiltrative nature of VMs.[3] This case report was prepared following the CARE Guidelines.[4]

Case Presentation

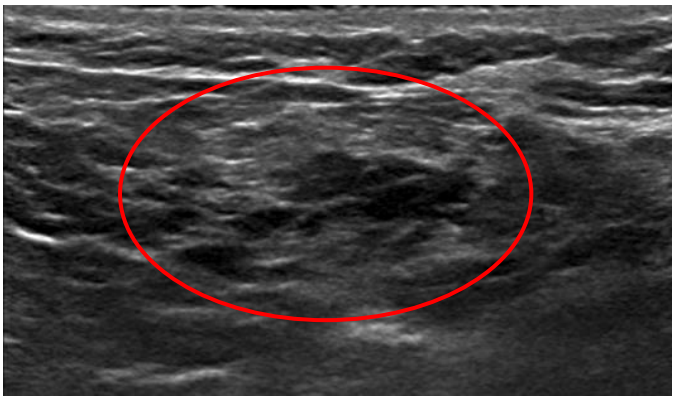
A 45-year-old woman with no personal or familial history of breast cancer presented for diagnostic breast imaging for the evaluation of an area of palpable concern in the left axilla. At the time of presentation, no prior breast imaging was available for review. However, the patient provided a breast imaging report from a routine screening performed 3 years prior at an outside clinic, which recommended the biopsy of a left axillary finding. This recommended biopsy was not performed.

Imaging conducted at the time of the patient's presentation included left breast diagnostic mammography and left breast ultrasonography. A diagnostic mammogram of the left breast demonstrated a high-density, irregular, 30 mm mass with circumscribed margins, which corresponded to the patient's area of palpable concern. Associated large coarse calcifications were also seen (Figure 1A and 1B).

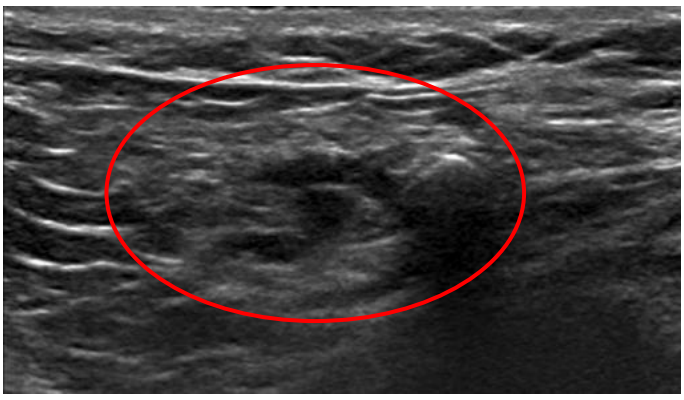
Targeted ultrasound demonstrated an anechoic irregular mass with circumscribed margins measuring 22 mm in the left axilla with associated internal calcifications (Figure 2A and 2B). Color-flow Doppler ultrasound revealed no significant

Figure 2. Ultrasonography of the Left Axilla of a 45-Year-Old Woman.

A Sagittal view (irregular serpiginous mass with circumscribed margins)

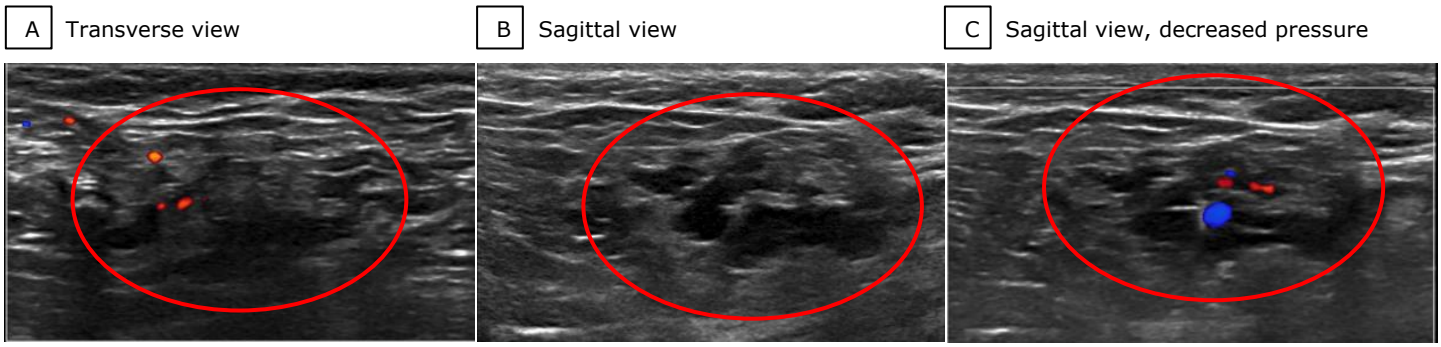


B Sagittal view (internal echogenic foci)



Diagnostic ultrasound of the left axilla shows an anechoic, irregular, serpiginous mass with circumscribed margins, which measures 22 mm (red circles). Associated internal echogenic foci were also seen (B, red circle), suggestive of the coarse calcifications and phleboliths seen on correlative mammogram. The difference in the observed size of the mass between images from figure 1 and figure 2 may be the result of differences in imaging modality, measurement plane, and lesion compressibility with probe pressure.

Figure 3. Color-Flow Doppler Ultrasound Images of the Left Axilla of a 45-Year-Old Woman.



(A, B) Ultrasound images of the left axillary mass with color flow Doppler initially did not demonstrate significant internal vascularity (A, B red circles). (C) Repeat imaging with decreased pressure on the ultrasound probe demonstrated some pulsatile internal vascularity (C, red circle).

internal vascularity (Figure 3A and 3B). However, upon repeat imaging with decreased pressure on the ultrasound probe, the mass demonstrated internal pulsatile vascularity (Figure 3C). The finding was additionally evaluated with spectral Doppler ultrasonography, which demonstrated monophasic waveform suggestive of venous flow (Figure 4). These ultrasound findings corresponded to the mammographic finding and to the area of palpable concern. There was no significant axillary lymphadenopathy evident on ultrasound. The constellation of these imaging findings was suggestive of a VM, with the internal calcifications corresponding to phleboliths. As such, biopsy was not recommended. Magnetic resonance angiography and venography (MRA/MRV) of the upper extremity were suggested for further confirmation of the diagnosis; however, the patient did not undergo this imaging.

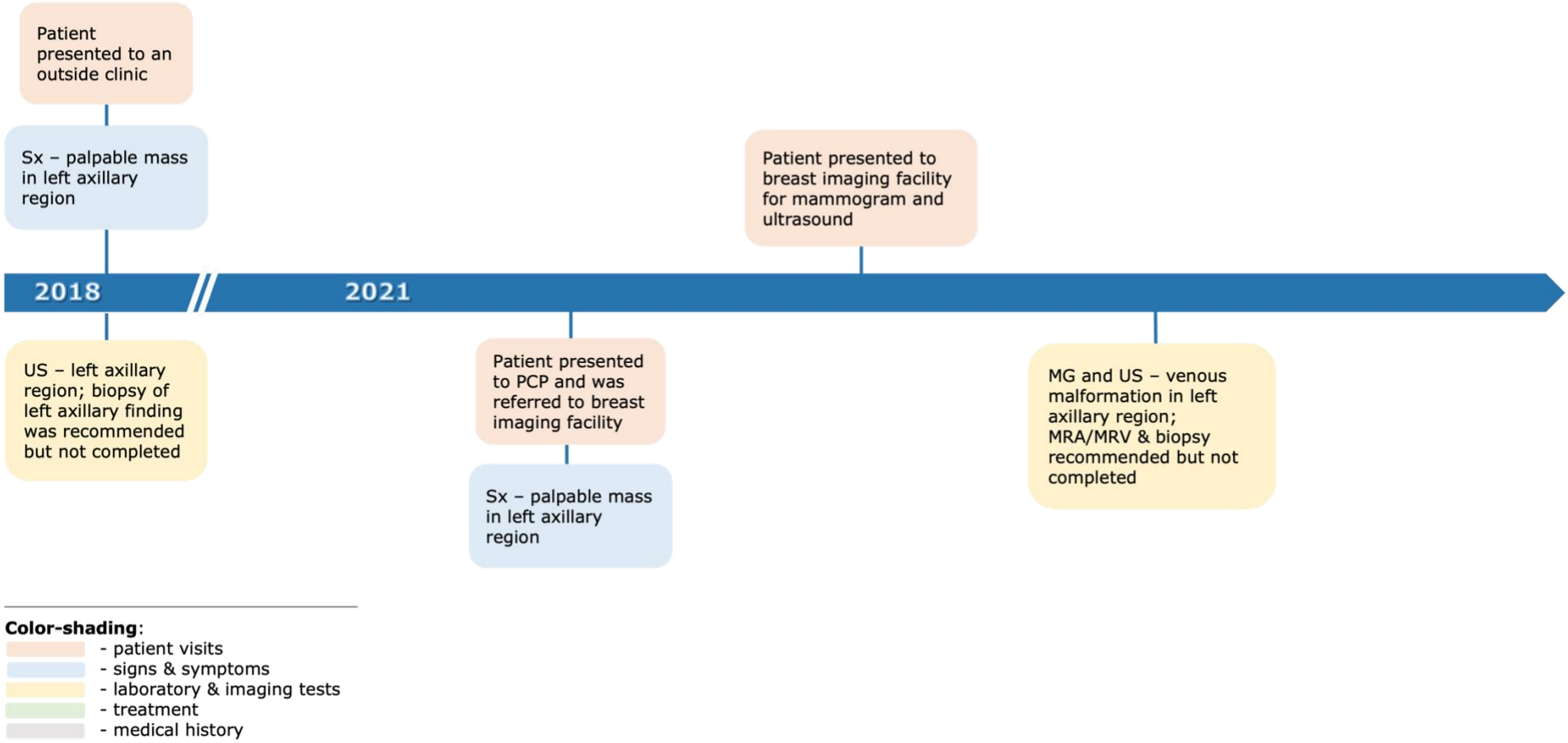
Following this diagnostic work up, the mammogram and ultrasound images performed three years prior at an outside institution became available for review (Figure 1C). The findings in the left axilla seen on our diagnostic exam appeared grossly stable compared to the prior outside imaging. No significant internal vascularity was noted at the time, likely due to the compressibility of the VM.

Discussion

VMs are a rare non-neoplastic vascular disorder characterized by multiple dilated veins which can occur in various locations, such as the skin, muscles, or internal organs. Although a rare and often undetected occurrence within the breast parenchyma, VMs can present within the breast as painless, palpable lumps.[3] If thrombosis or hemorrhage occurs within the lesion, discomfort has been noted as a primary complaint, possibly due to compression of the surrounding breast tissue.[3] To our knowledge, only 7 cases of vascular malformations seen on mammography have been reported: 5 cases of VMs, 1 case of cavernous hemangioma, and 1 case of venous angioma.[5–9] Among the 5 reported cases of VMs, 2 cases were identified within the pectoralis muscle, 1 was identified in the retropectoral space, and 2 were identified within the breast parenchyma. To our knowledge, this is the first published report of an axillary VM identified initially on breast imaging. Although there is a possibility that this finding could have occurred within accessory breast tissue in the axilla, given that ultrasound suggests the possibility of the presence of fibroglandular tissue, there is no clear mammographic evidence for accessory breast tissue.

Given the rarity of presentation of axillary VMs on breast imaging, this entity is not typically considered in the differential diagnosis of axillary masses. When a non-lymph node lesion is identified in the axilla, vascular lesions and nerve sheath tumors should be considered, especially since the superficial axillary artery and vein may be involved. Partially or completely anechoic lesions in this area should prompt the breast imager to perform Doppler ultrasound imaging and investigate any patient history of

Case report timeline



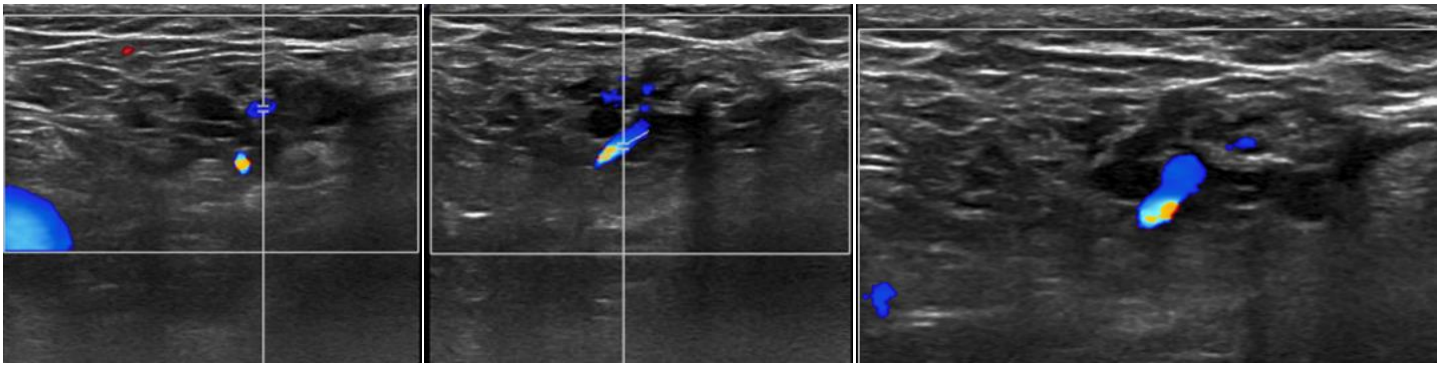
Abbreviations: MG, mammography; MRA, magnetic resonance angiography; MRV, magnetic resonance venography; PCP, primary care physician; Sx, symptoms; US, ultrasonography

Figure 4. Spectral Doppler Ultrasonography of the Left Axilla of a 45 Year-Old Woman.

A Longitudinal spectral Doppler ultrasonogram

B Focused color Doppler ultrasonogram

C Color and spectral Doppler ultrasonogram



Spectral Doppler ultrasound of the left axillary mass demonstrates monophasic waveforms, suggesting venous flow.

interventional or surgical procedures, which would raise the possibility of an iatrogenic arteriovenous malformation.[10] If the lesion appears solid, nerve sheath tumors should be considered. Conversely, if the lesion is not solid or mass-like, the possibility of vascular malformations and hematomas should be considered. Absence of a history of interventional or surgical procedures may further support the diagnosis of a vascular malformation.[10]

Additionally, imaging characteristics such as a serpiginous mass with hypoechoic spaces and hyperechoic septa, low-velocity flow within the lesion, calcifications, and compressibility can help differentiate a VM from other types of vascular anomalies.[11] The diagnosis of a VM can sometimes be made based on clinical history and examination alone, but confirmation can be obtained with imaging, typically through ultrasound and Doppler examination.[12] While not always necessary, magnetic resonance imaging (MRI), particularly magnetic resonance angiography (MRA) or venography (MRV), may be advantageous in confirming VMs in some cases.[13] In our case, MRA/MRV was recommended, but the patient did not undergo the exam. Biopsies are rarely utilized to confirm VMs due to the risk of significant bleeding or hemorrhage. If a VM is diagnosed and the patient experiences symptoms such as discomfort or pain, referral to vascular surgery should be considered.[10] These instances highlight the importance of considering a VM in the diagnosis of masses detected on breast imaging and the need for a comprehensive diagnostic approach.

Conclusion

VMs are the most common type of vascular malformations, but it is rare for their initial detection to occur during breast imaging. Although a few reported cases of VMs in the breast and chest wall have been symptomatic, most VMs remain clinically occult, suggesting that their true prevalence in the breast and axilla may be underreported.[5–9] Due to the rarity of detecting axillary VMs initially through breast imaging, this condition is not typically included in the differential diagnosis of lesions in the breast and axilla. However, it is crucial for radiologists to recognize the distinguishing characteristics of VMs to ensure accurate diagnosis and appropriate clinical management.

Author Contributions

Conceptualization, C.Y., M.T., and I.S.T.; Acquisition, analysis, and interpretation of data M.T. and I.S.T.; Writing – original draft preparation, C.Y.; Review and revisions, C.Y., M.T., and I.S.T.; Supervision, M.T. and I.S.T. All authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Disclosures

None to report.

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