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Case Report

Muscular variant presenting as an asymmetry on mammogram[☆]

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ARTICLE INFO

Article history:

Received 7 March 2022

Accepted 25 March 2022

Keywords:

Mammogram

Asymmetry

Muscular variant

ABSTRACT

Anatomic variants in chest wall musculature can pose a potential diagnostic dilemma when visible on a mammogram. A few variants have been commonly reported in the literature and can be confidently identified by appearance and location. We present a case of a pectoralis muscle variant, not previously described in radiology literature that presented as a unilateral asymmetry on a screening mammogram. This article reviews common imaging appearances of muscular variants seen mammographically and provides a diagnostic algorithm to avoid unnecessary workup or biopsy.

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Introduction

A few chest wall muscular variants have been described in the literature as being an unusual cause for a mass or asymmetry on mammogram. The sternalis muscle in the inner chest and the axillopectoral muscle or axillary arch are 2 commonly encountered variants that are easily recognized by their shape and location. We present a case of a variant of unknown etiology involving a bifid pectoralis muscle with the clavicular head of the muscle presenting as an asymmetry in the outer breast on screening mammogram.

Case

An asymptomatic 56-year-old woman presented for routine screening mammography. She had no significant past medical

or surgical history, including no personal or family history of breast cancer. A single prior mammogram study from the previous year was available for comparison. In the left breast, on the craniocaudal (CC) projection, there was an equal-density rounded asymmetry in the outer breast at posterior depth (Fig. 1). This asymmetry was not seen on the prior study, likely due to differences in technique. On the mediolateral oblique (MLO) projection (Fig. 2), there was a slight defect in the inferior aspect of the left pectoralis muscle, asymmetric to the right breast. This was similar in appearance to the mammogram from the previous year.

As the location was not typical for established muscle variants, the patient was recalled from screening and underwent diagnostic mammogram to exclude a partially visualized mass (Fig. 3A). Using combination 2-dimensional mammography and digital breast tomosynthesis, exaggerated lateral CC and spot compression CC views demonstrated a persistent asymmetry in the outer left breast, not entirely visualized due to its far posterior location. There was no correlate on the

[☆] Competing interest: None of the authors have any conflicts of interests to disclose.

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<https://doi.org/10.1016/j.radcr.2022.03.095>

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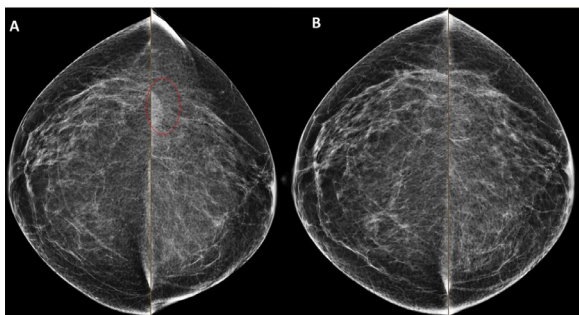


Fig. 1 – Craniocaudal views of the breasts on current (A) and prior (B) screening mammograms. On the current study, there is a partially visualized rounded asymmetry in the outer left breast at posterior depth (red circle). This was not visualized on prior study..

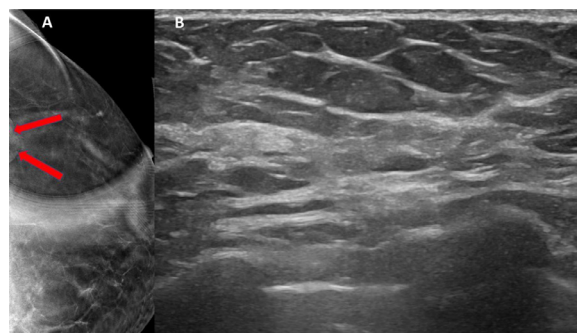


Fig. 3 – Spot compression DBT image (A) reveals persistence of an asymmetry in the outer left breast (red arrows). Representative sonographic image (B) of the outer left breast demonstrates no corresponding abnormality.

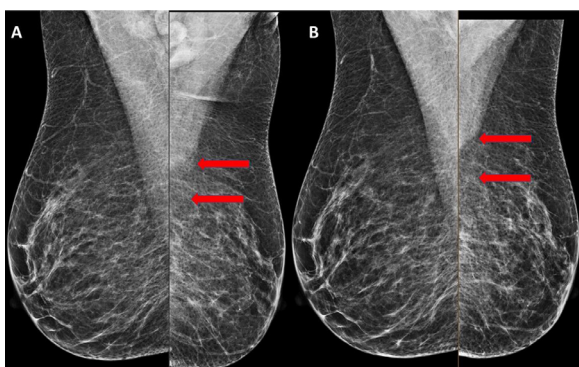


Fig. 2 – Mediolateral oblique views of the breasts on current (A) and prior (B) screening mammograms. On both studies, there is an abrupt decrease in density and convexity of the inferior pectoralis major muscle fibers on the left (red arrows) compared to the right.

true lateral view. Targeted ultrasound was performed (Fig. 3B) which did not reveal a sonographic correlate or suspicious abnormality in the outer left breast.

Since the mammographic finding was new from prior exam, MRI was recommended by the interpreting radiologist for further evaluation. MRI of the breasts with and without contrast (Fig. 4) demonstrated an asymmetric bifurcation of the left pectoralis major muscle, with splitting of the clavicular and sternal fibers in the mid segment of the muscle body. There was no suspicious enhancement in either breast.

Discussion

Extramammary findings, including artifacts and anatomic variations, can sometimes be the cause of diagnostic pitfalls when interpreting mammograms. Radiologists that interpret mammograms are often familiar with the more common variants, allowing them to dismiss these findings as benign and avoid unnecessary workup. The sternalis muscle is perhaps

the most cited muscular cause for a mammographic asymmetry, appearing in the inner breast on the CC mammographic projection. The sternalis muscle is superficial and parallel to the sternum and runs perpendicular to the pectoralis major muscle fibers, creating the characteristic round or triangular shaped mammographic asymmetry seen on the CC view [1]. Occasionally, the sternalis muscle can even appear somewhat spiculated, likely due to traction on Cooper's ligaments [2]. Although the sternalis muscle is uncommon in the general population, the characteristic shape and location of this asymmetry is often sufficient to confidently explain the finding and omit further workup. The axillopectoral muscle is an accessory muscle in the axilla that slips between the latissimus dorsi and pectoralis major muscle fibers [3]. This creates a bandlike ovoid asymmetry seen on the MLO projection overlying the pectoralis major muscle in the axilla. This variant can also be unilateral or bilateral and occurs in approximately 7% of the population [3]. Given its appearance and location; it too is confidently identified as muscular in origin without need for further workup.

In addition to the aforementioned common accessory muscle variants, there are many variations that can be present within the pectoralis major muscle itself, as highlighted by this case presentation. The most common variant of pectoralis anatomy is a cleft between the sternal and clavicular heads of the muscle, which can be partial or complete [4]. The presence of such a cleft in the pectoralis major fibers has been described in the surgical literature, as it can affect surgical planning. However, to our knowledge, it has not been described in radiology literature as a cause for a mammographic abnormality. In the case of our patient, the cleft in the fibers was enough to allow the more lateral clavicular fibers to form a rounded lateral asymmetry on CC mammogram, analogous to the appearance of other accessory muscles such as the sternalis muscle in the medial breast. On MRI, the more inferior muscle fibers were asymmetrically diminished/atrophied on the left, explaining the appearance of diminished muscle caliber and density on the MLO projection.

While our patient's anatomic variation of the pectoralis muscle is rare and mammographically unique from previously described variants, it is a good case to illustrate the

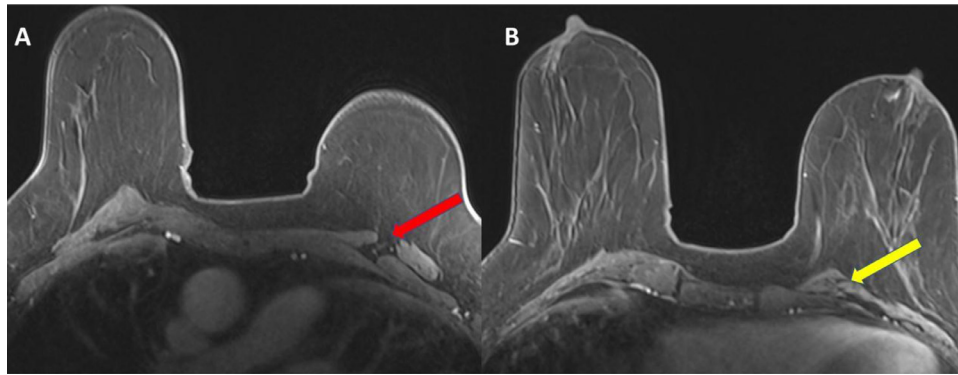


Fig. 4 – Axial T1-weighted fat-suppressed MR images following administration of gadolinium at the level of the upper to mid chest (A) and lower chest (B). More superiorly, there is a large cleft between the medial and lateral fibers of the left pectoralis muscle (red arrow). The fibers fuse more inferiorly but are diminutive in caliber relative to the right side (yellow arrow).

diagnostic dilemma that may arise when interpreting mammograms. If a mammographic asymmetry does not clearly match a classic description and location of muscular variation, such as the sternalis muscle in the deep inner breast on the CC projection and cannot be confirmed as muscular tissue on screening mammography, additional imaging is recommended to exclude a suspicious breast finding. Diagnostic mammography is the first-line approach in evaluating one-view mammographic asymmetries. Digital breast tomosynthesis has been shown to improve the sensitivity and specificity of mammography in this setting and provides better localization for one-view findings. If the asymmetry persists on spot compression views, targeted ultrasound is the next step in diagnostic evaluation [5]. In the setting of equivocal findings on mammography and ultrasound, MRI can be used to evaluate equivocal or inconclusive mammographic or sonographic findings [5]. In our case, in which the finding was not seen on prior mammogram and the location did not allow for confident classification as a muscular variant, MRI proved beneficial in establishing the diagnosis. MRI should be used sparingly in the workup of equivocal or inconclusive findings on diagnostic mammography or ultrasound [6].

Conclusion

Chest wall muscular variants are a relatively uncommon cause of mammographic asymmetry. For variants such as the sternalis muscle and axillary arch, findings are often dismissed as benign given their classic location and appearance. As demonstrated in this case, the possibility of a pectoralis muscle cleft should be considered for an asymmetry seen in the posterior lateral breast on the CC mammogram with corresponding pectoralis changes on the MLO mammogram. Occasionally, a muscular variant cannot be definitively character-

ized on initial mammographic imaging, and evaluation with diagnostic mammogram and ultrasound is appropriate. MRI can be performed in the case of inconclusive or equivocal findings.

Patient informed consent

The patient provided written consent to use mammogram, ultrasound, and MR images in this case report. She was informed that no patient identifiers would be used when publishing the case.

REFERENCES

- [1] Raikos A, Paraskevas GK, Tzika M, et al. Sternalis muscle: an underestimated anterior chest wall anatomical variant. *J Cardiothorac Surg* 2011;6:73.
- [2] Cawson J, Papadopoulos T. Variants of sternal insertion of the pectoral muscle on mammography: a pictorial review. *Clin Radiol* 2002;57:442–8.
- [3] Ko K, Han B, Shin J. The axillopectoral muscle seen on mammography. *Clin Radiol* 2006;61:625–9.
- [4] Haładaj R, Wysiadecki G, Clarke E, Polguy M, Topol M. Anatomical variations of the pectoralis major muscle: notes on their impact on pectoral nerve innervation patterns and discussion on their clinical relevance. *Biomed Res Int* 2019;2019:6212039.
- [5] Chesebro A, Winkler N, Birdwell R, Giess C. Developing asymmetries at mammography: a multimodality approach to assessment and management. *RadioGraphics* 2016;36(2):322–34.
- [6] Giess C, Chikarmane S, Sippo D, Birdwell R. Breast MR imaging for equivocal mammographic findings: help or hindrance? *RadioGraphics* 2016;36(4):943–56.