

Mammographic features of the sternalis muscle

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PURPOSE

To evaluate the mammographic findings of the sternalis muscle and discuss appropriate diagnostic approaches.

MATERIALS AND METHODS

Ten years of records from our mammography unit were retrospectively examined for the presence of the sternalis muscle. This variant was seen in 10 women out of the 52,930 examined, and the mammograms of these patients were re-evaluated. The size, shape and contours of the muscle were reviewed on the craniocaudal (CC) and mediolateral oblique (MLO) views. Yearly mammograms were assessed to evaluate follow-up changes. Extra examinations were reviewed, including ultrasound (US), computed tomography (CT) and magnetic resonance imaging (MRI).

RESULTS

The prevalence of the sternalis muscle was 0.018%. Its contours were well-defined, irregular or spiculated, and the diameter ranged from 3–4 mm to 15 mm. The shape of the muscle varied from slightly bulging to round or triangular. The muscle was detected on MLO projections in three patients as an inferior soft tissue density at the posterior edge of the breast, continuous with the pectoralis muscle. Distinct pulling of the breast led to variations in the appearance of the muscle on yearly mammograms. US examinations were normal in all patients. CT and MRI showed the muscle clearly.

CONCLUSION

The appearance of the sternalis muscle may vary on CC views. It may also be detected on MLO projections. The ability to visualize the muscle depends on proper positioning. Knowledge of its detectability on mammograms will prevent the misdiagnosis of a mass and prevent further unnecessary investigations.

Key words: • breast • mammography • differential diagnosis

Screening for cancer using mammography requires high-quality images. An improved technique with a systematic approach to patient positioning enables visualization of the deep parts of the breast. The sternalis muscle is occasionally observed in mammograms as a variant of the deep normal structures and may mimic a mass (1).

The sternalis muscle is an uncommon anatomic variant of the chest wall musculature. It is located subcutaneously over the pectoralis muscle and has a parallel course to the sternum. It runs from the infraclavicular area to the caudal aspect of the breast. This inconsistent muscle has varying shapes, contours and sizes and may mimic a mass lesion on the craniocaudal (CC) mammogram. Familiarity with its mammographic appearance is essential for avoiding confusion with a malignant lesion (2).

In this study, we describe imaging findings of the sternalis muscle on the mammograms of ten patients. We discuss more accurate interpretations of this asymmetric mass-like density and the appropriate diagnostic approach.

Materials and methods

Ten years of records from our mammography unit were retrospectively reviewed to determine the prevalence of the sternalis muscle on mammographic examinations. The sternalis muscle was reported in 10 of the 52,930 women examined. The medical records of the 10 women were collected, and the mammograms were re-evaluated. A physical examination was performed in all 10 patients.

The mammographic examinations were performed using a Senographe 600 T Senix HF (General Electric CGR SA, Issy Les Moulineaux, France) and a Mammomat 3000 (Siemens, Solna, Sweden). One of the ten patients was seen 8 years prior, and magnetic resonance imaging (MRI) was recommended after mammographic and ultrasonographic examination. Another patient underwent a computed tomography (CT) scan. All patients were evaluated with ultrasonography (US) to either detect or evaluate masses. Breast US was performed using a 7.5 MHz transducer (SAL 70, Toshiba Cooperation, Tokyo, Japan) or a broad-band 5–11 MHz transducer (HDI 1000, ATL Ultrasound, Bothell, Washington, USA). Nine patients were followed up after more than 2 years (5–8 years). One patient died was lost to follow-up.

Results

The patients were 44–53 years old (mean, 48.7 years). In all patients, CC mammograms demonstrated an asymmetric opacity in the medial posterior part of the breast. The mammographic appearance of the sternalis muscle was not the same in all patients. Its diameter ranged from 3–4 mm to 15 mm. The edges of the muscle were well defined in

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four patients, irregular in five patients and spiculated in one patient. The shape varied from slightly bulging to round or triangular (Figs. 1 and 2). The sternalis muscle was always seen in the right breast. The muscle was detected on the mediolateral oblique (MLO) projections in three patients. It was seen as an inferior soft tissue density at the posterior edge of the breast, continuous with the pectoralis muscle (Fig. 3). A 12-mm round opacity in the medial posterior edge of the breast on the CC view was identified in one patient, and an MRI was performed. The MRI did not detect a mass lesion, but a small piece of tissue lying over and isointense with the pectoralis muscle was identified. The patient was diagnosed with the sternalis muscle, and the diagnosis was confirmed with follow-up mammograms. In another patient, CT showed a thin muscle that was localized anterior to the medial side of the pectoralis muscle and lying longitudinally, parallel to the sternum.

US examination did not detect a mass lesion in the medial part of the breast in any of the patients. Mass lesions were not found in 9 out of 10 patients during follow-up. In the follow-up examinations, the sternalis muscle was not demonstrated or the size of the muscle was different, depending on the position of the breast.

Discussion

The sternalis muscle is a supernumerary muscle located in the anterior thoracic region, running parallel to the sternum. Muscle fibers arise from the sheath of the rectus abdominis muscle or adjacent structures and terminate upon the pectoralis fascia, upper sternum, costal cartilages, the sternum, or the medial heads of the sternocleidomastoid muscle (3, 4). The sternalis muscle can be a few short fibers or a well-formed muscle, and it may be unilateral or bilateral (3, 5). This variant was seen unilaterally and in the right breast in our cases. When deep parts of the breast are visualized and high-quality images are obtained, the sternalis muscle may be seen in CC projections. It was first shown on mammography by Bradley et al., who described it in six women (2). Four of those women were seen during the screening and diagnostic mammographic imaging of 32,000 women (0.01%). The detection

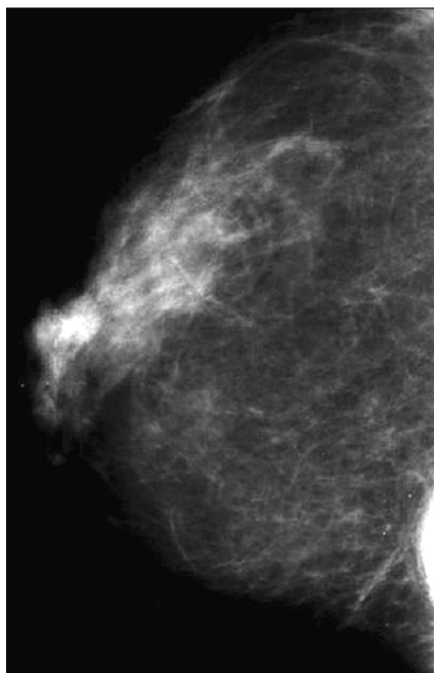


Figure 1. Craniocaudal mammogram of the right breast of a 51-year-old woman with a well-defined flattened ovoid opacity located medially.

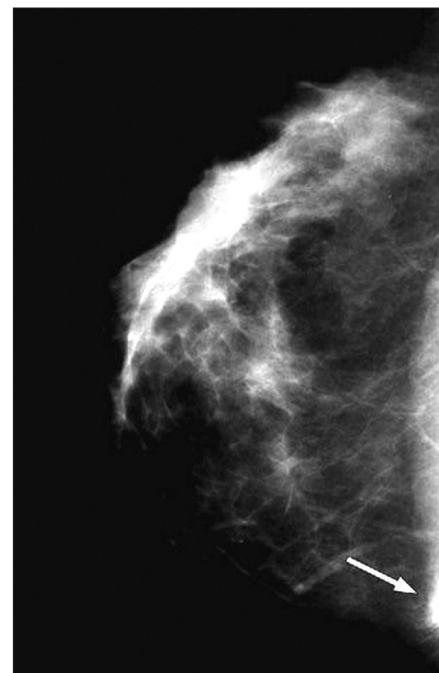


Figure 2. On the right craniocaudal mammogram of a 45-year-old woman, a spicular mass is seen near the medial edge of the pectoralis muscle (arrow).

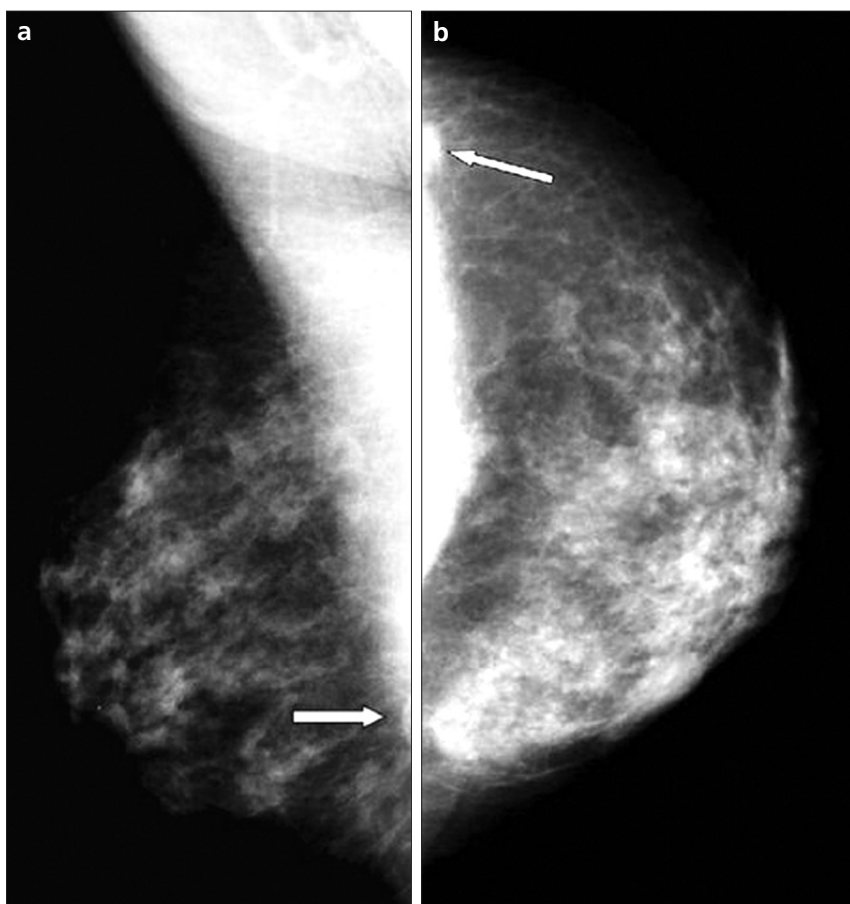


Figure 3. a, b. Mediolateral oblique (a) and craniocaudal (b) mammograms of a 44-year-old woman. A longitudinally running opacity in the breast near the chest wall in the caudal portion of the pectoralis muscle (a, arrow) is seen. A small opacity (b, arrow) with irregular contours is seen near the pectoralis muscle.

rate of this variant was similar to our study (0.018%). Different anatomical studies have reported the prevalence of the sternalis muscle to be 1.9–23.5% (6). Its incidence was described as 6.2% in a study that examined multidetector CT scans of the chest in 1,387 adult patients (7).

The sternalis muscle is usually seen as a small, asymmetric opacity at the medial posterior edge of the breast on mammogram CC views and can simulate breast pathology (1, 8). The muscle is isodense with fibroglandular densities and can be seen with varying diameters, shapes and contours on mammograms (9). The obtuse angle at the chest wall is typical of a muscular structure, and it is usually surrounded by fat (10). Significantly, it could not be detected in all follow-up images, and may appear larger or smaller on follow-up mammograms due to the distinct pulling of the breast during positioning. Although the appearance of the muscle on CC views has been described in the literature and textbooks, we observed a longitudinally running opacity on MLO views in the breast near the chest wall in three patients.

When a density suggesting the sternalis muscle is seen on a mammogram, it should be investigated with US like all other asymmetric opacities and mass-like densities with irregular or spiculated margins. The diagnosis of a mass can be eliminated with US and

physical examination. The sternalis muscle can be easily shown using CT or MRI. CT shows a band-like structure that lies anterior to the medial part of the pectoralis major muscle and is isodense with other anterior thoracic muscles; it may be flat or have an oblique appearance (7). A thin layer of fat tissue is usually seen between the sternalis and the pectoralis muscles (11). Similar findings can be shown with MRI (9). In our study, one patient was evaluated with CT and another was evaluated with MRI.

We believe that the interpretation of the sternalis muscle according to the BI-RADS category should be reconsidered. In nine cases, the sternalis muscle was thought to be a mass in the first screening due to its density and overall appearance. However, a corresponding palpable asymmetry was not identified, and US was normal in all patients. Undesirable results were not encountered during the follow up. We suggest that the sternalis muscle should be classified as BI-RADS category II and investigation beyond mammography and US is not indicated when an opacity resembling the sternalis muscle is seen. However, CT or MRI may be performed when there is any doubt.

In conclusion, the sternalis muscle is a very rare chest wall muscle variant. Although it may mimic a mass lesion in a CC projection, understanding how to identify the muscle may lead to a fi-

nal diagnosis and prevent further unnecessary investigation.

References

1. Cawson JN, Papadopoulos T. Variants of sternal insertions of the pectoral muscle on mammography: a pictorial review. *Clin Radiol* 2002; 57:442–448.
2. Bradley FM, Hoover HC, Hulka CA, et al. The sternalis muscle: an unusual normal finding seen on mammography. *AJR Am J Roentgenol* 1996; 166:33–36.
3. Scott Conner CEH, Al-Jurf AS. The sternalis muscle. *Clin Anat* 2002; 15:67–69.
4. Arraez-Aybar LA, Sobrado-Perez J, Merida-Velasco JR. Left musculus sternalis. *Clin Anat* 2003; 16:350–354.
5. Das S, Paul S, Mandal AK. Anomalous musculoskeletal morphology of anterior chest wall: a case report. *Arch Med Sci* 2006; 2:289–291.
6. Jeleu L, Georgiev G, Surchev L. The sternalis muscle in the Bulgarian population: classification of sternales. *J Anat* 2001; 199:359–363.
7. Young Lee B, Young Byun J, Hee Kim H, et al. The sternalis muscles: incidence and imaging findings on MDCT. *J Thorac Imaging* 2006; 21:179–183.
8. Stines J, Tristant H. The normal breast and its variations in mammography. *Eur J Radiol* 2005; 54:26–36.
9. Goktan C, Orguc S, Serter S, Ovali GY. Musculus sternalis: a normal but rare mammographic finding and magnetic resonance imaging demonstration. *Breast J* 2006; 12:488–489.
10. DeParades ES. Atlas of mammography. 3rd ed. Philadelphia: Lippincott, Williams & Wilkins, 2007; 8.
11. Ramirez-Escobar MA, Salmeron IR. Case of the month: What is this breast mass? *Br J Radiol* 1998; 71:573–574.