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 infracavicular 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 seen in 10 of 52,930 women 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
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
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 final diagnosis and prevent further unnecessary investigation.

References