

## *Sternalis muscle*: an anatomic variation of the anterior chest wall

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### Abstract

The *sternalis muscle*'s presence is an uncommon anatomic variation of the anterior chest wall's musculature. It is insufficiently mentioned by the most of anatomical textbooks, although it has been well described by the literature. The study of this anatomic variation is extremely relevant, principally for the interpretation of image's exams that approach this region. For this study's achievement, 102 cadavers were dissected (97 of the male sex and 5 of the female sex). The study of the *sternalis muscle* avoids the expenses with exams and the indication of aggressive treatments in a wrong way.

**Keywords:** *sternalis muscle*, chest wall, anatomic variation, chest musculature, mammography.

### 1 Introduction

The *sternalis muscle*'s presence is an uncommon anatomic variation of the anterior chest wall's musculature that is extremely relevant, principally for the interpretation of image's exams that approach this region.

The occurrence of the *sternalis muscle*, in the most cases, is unilateral and, when it is present, the muscle has its origin on the superior part of the sternal and its insertion is localized on the superior part of the *rectus abdominis muscle*. The *sternalis muscle*'s innervation comes from perforating branches of the intercostals nerves and its vascularization comes from perforating branches of the anterior intercostals arteries.

The first report on the literature about the *sternalis muscle* was done by Cabrollius (1604), but its formal description was done only in 1776 by Dupuy (ZAHAR, DARWISH, ABDALLA et al., 2009). Its incidence seems to be directly linked to sex and ethnic groups. The *sternalis muscle*'s presence is more common between women and white-skinned people (KABAY, AKDOGAN, OZDEMIR et al., 2005). Its ethnic distribution can also be considerate because it seems to be bigger between Japanese, Chinese, Philippine and Indian people (KABAY, AKDOGAN, OZDEMIR et al., 2005).

### 2 Material and methods

For this study's achievement, 102 cadavers were dissected (97 of the male sex and 5 of the female sex).

These dissections were performed between the years of 1992 and 2010, following the techniques described by L. Testut et al. A bibliographic review about the subject was performed too, based on books, scientific articles and other publications about the issue.

### 3 Results

In our dissections, we've found the presence of the *sternalis muscle* on two of the 102 cadavers. In our findings, the muscle was presented only unilaterally, like a long muscle in a ribbon form. One of them was originated in the lateral left face of *sternal manubrium* and its insertion was localized in the superior part of the anterior lamina of the *rectus abdominis muscle*'s scabbard (Figure 1). Its length was 18 cm, with a breadth of 0,8 cm (Figure 2). The other muscle found in our dissections was originated on the lateral face of the sternal body and its insertion was localized on the base of the xifoide sternal process. It contrast with the information found in our literature review, that shows its insertion like the first muscle, on the anterior lamina of the *rectus abdominis muscle*'s scabbard, like an aponeurosis (Figure 2). Its length was 11,8 cm, with a breadth of 1,8 cm. The biggest dimensions that have been already found were: a length of 14,4 cm and a breadth of 2,6 cm. The smallest

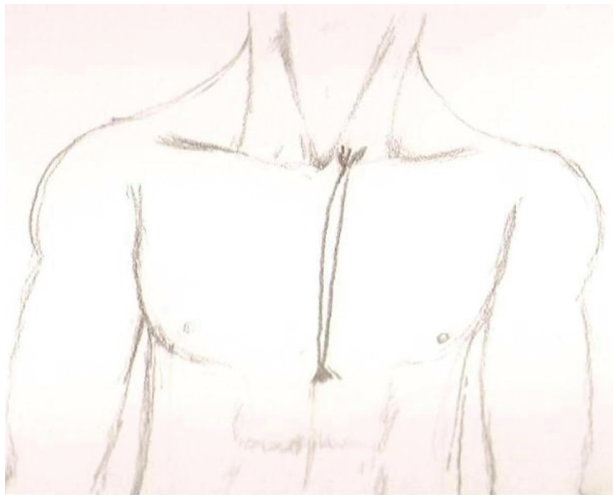
dimensions that have been already found were: a length of 2 cm and a breadth of 0, 25 cm.

#### 4 Discussion

The *sternalis muscle* was mentioned for the first time by Cabrolus in the year of 1604, and it was formally described by Dupuy in 1776, when he found a case of the bilateral muscle's presence (ZAHER, DARWISH, ABDALLA et al., 2009). Some authors believe that the *sternalis muscle* must have been originated of one of these four muscles: a) *pectoralis major*; b) *rectus abdominis*; c) *sternocleidomastoideus*; d) *panniculus carnosus* (SAEED,

MURSHID, RUFAl et al., 2002) that represents the subcutaneous muscle of the thorax and abdomen, whose action would be to wrinkle the trunk's skin, like the platysma does in the cervical region (ZAHER, DARWISH, ABDALLA et al., 2009). Some papers still affirm that the *sternalis muscle* is a phylogenetic residue inherited from primates.

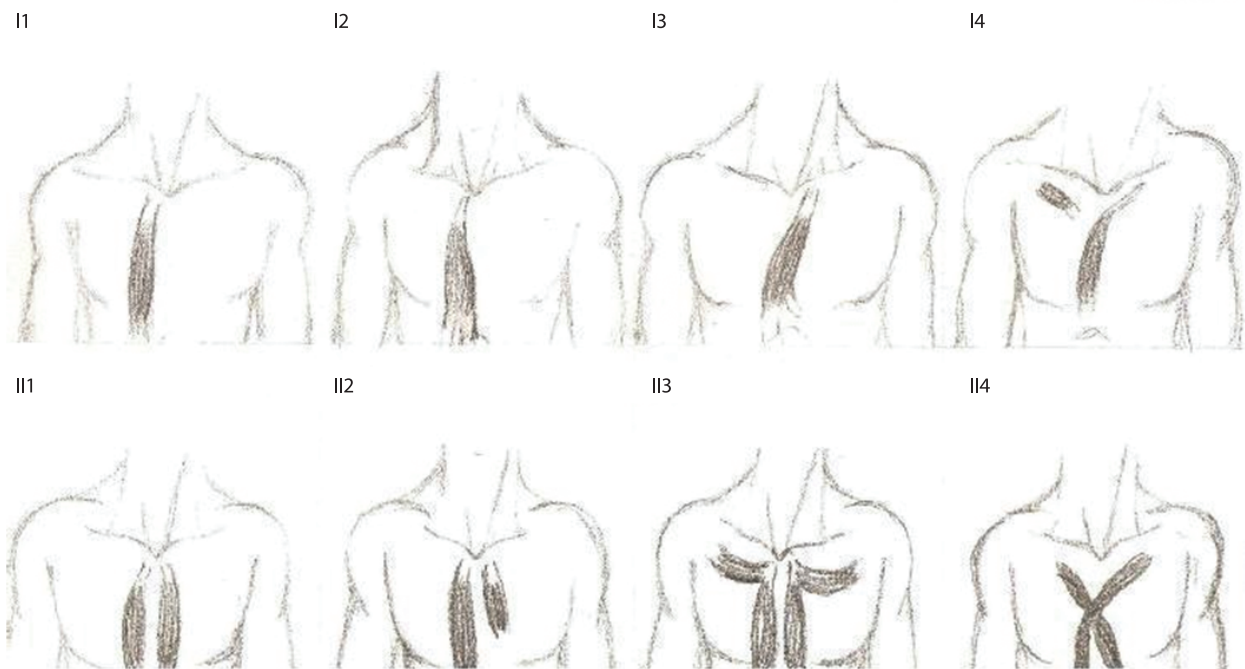
The literature shows the *sternalis muscle* present between 3% and 6% of the dissections (JETTI, PAMIDI, VOLLALA et al., 2009) and its smaller between European (4,4%) and bigger between African (8,4%) and Asiatic people (11,5%). Between white-skinned people, a presence of 3% a 7% can be found and the muscle is present in 8,4% of the



**Figure 1.** Schematic design that represents the first *sternalis muscle* found in our dissections.



**Figure 2.** Origin and insertion of the second *sternalis muscle* found in our dissections.



**Figure 3.** Different aspects of the *sternalis muscle* described by the literature (JELEV, GEORGIEV and SURCHEV, 2001).

dark-skinned people. In our dissections, the *sternalis muscle* was just observed in two of the 102 cadavers (an incidence of 1,96%). In both cases, the muscle was unilaterally present.

The unilateral presence of the *sternalis muscle* is two times more common in comparison with its bilateral presence and its presentation can occur in a lot of different ways (Figure 3). The *sternalis muscle* can represent a *pectoralis major muscle* that was not totally developed, representing a residue in cases of *pectoralis major muscle's* agenesis (KULKARNI and KULKARNI, 2010). The literature describes the absence of the *sternalis* part of the pectoral major muscle when the *sternalis muscle* is present.

The *sternalis muscle* is present, in most cases, on the anterior chest wall, beside the sternal. It's been originated in the superior part of the *sternal manubrium* and its insertion is localized in the anterior lamina of the *rectus abdominis muscle's* scabbard or in the *obliquous externus muscle*, in the costal cartilages and in the anterior faces of the ribs (SAEED, MURSHID, RUFAl et al., 2002).

Intercostals nerves and the anterior thoracic cutaneous nerves provide the *sternalis muscle's* innervation. Therefore, studies never found intercostals innervation (KULKARNI and KULKARNI, 2010). According to Jelev, Georgiev and Surchev (2001), the vascularization is performed by perforating branches of the thoracic internal artery, but any vascular or nervous sheaf could be observed in our dissections. The *sternalis muscle's* principal action is to furrow the skin of the anterior chest wall (KULKARNI and KULKARNI, 2010). In a paper published by Bradley, Hoover Junior and Hulka et al. (1996), the *sternalis muscle* was diagnosed like a mammary tumor in the ultrasonography. In other papers authors found that, in 3200 mammographies, 4 diagnosed the muscle like a mammary tumor (SAEED, MURSHID, RUFAl et al., 2002). Its identification can be done by ultrasonography, tomography or magnetic resonance (SAEED, MURSHID, RUFAl et al., 2002).

## 5 Conclusion

The *sternalis muscle* is not well-studied by the medicine yet because it's a rare muscle that's not very important. However, when it is present, it can implicate in doubts

and wrong diagnoses. Its presence can be confirmed when the physic exam of the patient and the mammography in the lateral-oblique can't find any abnormality and the crania-caudal mammography shows a lengthened presternal structure with a length of 1 a 2 cm.

This anatomic variant is not described sufficiently by the gynecology, mastology, plastic surgery and radiology, burdening the health system with expensive exams. The study and publicizing of the *sternalis muscle* avoids the expenses with exams and the indication of aggressive treatments in a wrong way.

## References

- BRADLEY, FM., HOOVER JUNIOR, HC., HULKA, CA., WHITMAN, GJ., McCARTHY, KA., HALL, DA., MOORE, R. and KOPANS, DB. *The Sternalis Muscle: an unusual normal finding seen on mammography. AJR*, 1996, vol. 166, n. 1, p. 33-6.
- JELEV, L., GEORGIEV, L. and SURCHEV, L. The sternalis muscle in the Bulgarian population: classification of sternales. *Journal of Anatomy*, 2001, vol. 199, p. 359-363. <http://dx.doi.org/10.1046/j.1469-7580.2001.19930359.x>
- JETTI, R., PAMIDI, N., VOLLALA, VR., VASAVI, R. and NERELLA, VM. Right sternalis muscle. *International Journal of Anatomical Variants*, 2009, vol. 2, p. 41-42.
- KABAY, B., AKDOGAN, I., OZDEMIR, B. and ADIGUZEL, E. The left sternalis muscle variation detected during mastectomy. *Folia Morphologica*, 2005, vol. 64, n. 4, p. 338-340.
- KULKARNI, DU. and KULKARNI, UK. Unilateral Rectus Sternalis Muscle: a case report. *Al Ameen Journal of Medical Sciences*, 2010, vol. 3, n. 2, p. 169-171.
- SAEED, M., MURSHID, KR; RUFAl, AA., ELSAYED, SE. and SADIQ, MS. An anatomic variant of chest wall musculature. *Saudi Med Journal*, 2002, vol. 23, n. 10.
- ZAHAR, WA., DARWISH, HH., ABDALLA, AME., VOHRA, MS. and KHAN, MM. Sternalis: a clinically important variation. *Pakistan Journal of Medical Sciences*, 2009, vol. 25, n. 2.

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