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Original Research Article

An Observational Assessment of the Profile of Sternalis Muscle in Cadavers: A Morphometric Study

Chandra Kiran[1], Praveen Kumar[2], Rajendra Prasad[3]

[1]Tutor, Department of Anatomy, Anugrah Narayan Magadh Medical College, Gaya, Bihar, India

[2]Tutor, Department of Anatomy, Anugrah Narayan Magadh Medical College, Gaya, Bihar, India

[3]HOD, Department of Anatomy, Anugrah Narayan Magadh Medical College, Gaya, Bihar, India

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Corresponding Author: Dr. Praveen Kumar
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Abstract

Aim: The aim of the present study was to assess the profile of sternalis muscle in cadavers.

Methods: The present study was conducted in the Department of Anatomy, ANMMC, Gaya Bihar for two years and 70 adult cadavers (55 males and 15 females) embalmed in 10% formalin were dissected in the dissection hall.

Results: Muscle was bifurcating into medial and lateral tendinous laminae after 8 cm from the distal fleshy end. The length of medial lamina was 4.5 cm which was attached to sternal angle whereas the lateral lamina was 3 cm long while was reaching to the medial end of second intercostal space merging with the deep fascia covering pectoralis major muscle. Medial border of the muscle with its medial lamina was making an angle of 350 with the midline. On left side: Distal end was fleshy while its fibres at proximal ends were tendinous. Its length was 12 cm from the fifth rib to the sternal angle. Medial border of the muscle near the sternal angle was making angle of 300 with the midline passing through centre of sternum.

Conclusion: The early detection is essential in regular mammogram screening to differentiate it from the malignant lesions. This muscle is a matter of interest for anatomists, radiologists and surgeons for doing surgeries on anterior chest wall.

Keywords: Mammography, lamina, Pectoralis major muscle, Sternalis muscle, Sternocleidomastoid muscle, Sternum

Introduction

The sternalis muscle is an anatomical variant of the anterior thoracic region musculature well documented and familiar to anatomists but quite unknown among clinicians and radiologists. [1] It lies superficially and perpendicular to the pectoralis major muscle and parallel to the sternum. Many more terms have been used in the literature to describe sternalis muscle such as "parasternalis" and "rectus sterni" muscle. [2,3] The muscle usually arises from the upper sternum and the infraclavicular region and can display variable insertion points such as the pectoral fascia, lower ribs, costal cartilages, rectus abdominis muscle sheath or the abdominal external oblique muscle aponeurosis. [4,5] However, there is a great variation in height (4.8±1.97 cm), width (15.1±6.84 mm), and thickness (3±0.91 mm). [6]

The sternalis muscle is a rare (strap-like) anterior chest wall muscle variant with fibers near-parallel to the sternum and perpendicular to the pectoris major. Though inadequately described in standard anatomical texts, this muscle is familiar to trained anatomists. [7] However, it is relatively unknown to radiologists, surgeons, and other clinicians until recently. [8] Its rarity (roughly 5%-10% of the population) [9], variable morphology [10] and poorly understood embryology [7] render the muscle rather perplexing to anatomists, radiologists, and surgeons alike.

The appearance of this muscle is in the form of superficial vertical strip, which is sternal or parasternal in position. CT and MR imaging are diagnostic when they show the longitudinal extent of the muscle, which lies anterior to the medial margin of the pectoralis major muscle. If clinicians are not aware of its occasional presence, this muscle can be confused with an abnormal mass. In radiotherapy and surgery, lack of knowledge on Rectus Sternalis can cause negative changes in prognosis of patient. Sufficient knowledge on this muscle may help in making a better diagnosis and it can decrease complications. Cadaveric studies have shown the equal presence of this muscle in approximately 5-8% of both males and females. Variations in its

incidence have been reported in different ethnic groups. Rectus Sternalis is twice as often unilateral as it is bilateral. [11] Many authors assumed the Sternalis muscle to be derived from neighbouring muscles, such as pectoralis major [12], rectus abdominis, sternocleidomastoid, panniculus carnosus and external oblique. [13]

The aim of the present study was to assess the profile of sternalis muscle in cadavers.

Materials and Methods

The present study was conducted in the Department of Anatomy, ANMMC, Gaya , Bihar , India, for two years and 70 adult cadavers (55 males and 15 females) embalmed in 10% formalin were dissected in the dissection hall.

After the removal of subcutaneous tissue, the region was cleaned with the help of blunt forceps. The region was looked for presence of sternalis muscle or any other additional muscle. The region was further dissected to find out the nerve supply of muscle and whether muscle fibres were merging with any other muscle. Length of the muscle was measured with the help of vernier caliper (minimum count 01 mm). The angle of sternalis with midline was measured with Goniometer (minimum count 1°).

Results

Table 1: Morphometric profile of sternalis muscle

Features	Right side	Left side
Extent	Fifth rib to sternal angle	Fifth rib to sternal angle
Distal end	Fleshy and 3 cm wide	Fleshy and 3 cm wide
Proximal end	Tendinous with two laminae	Tendinous with single lamina
Angle of muscle with vertical plane	35°	32°
Length of muscle	8 cm from lower end till bifurcation of tendons. Lateral lamina- 3 cm Medial lamina- 4.5 cm	12 cm

Muscle was bifurcating into medial and lateral tendinous laminae after 8 cm from the distal fleshy end. The length of medial lamina was 4.5 cm which was attached to sternal angle whereas the lateral lamina was 3 cm long while was reaching to the medial end of second intercostal space merging with the deep fascia covering pectoralis major muscle. Medial border of the muscle with its medial lamina was making an angle of 350 with the midline. On left side: Distal end was fleshy while its fibres at proximal ends were tendinous. Its length was 12 cm from the fifth rib to the sternal angle. Medial border of the muscle near the sternal angle was making angle of 300 with the midline passing through centre of sternum.

Discussion

Sternalis muscle on the anterior chest wall is occasionally detected in humans. Its appearance is in the form of superficial strip of muscle, which is sternal or parasternal in position. [14] It is also known as episternalis, pre-sternalis, rectus thoracic or rectus sterni. [15] According to Turner, it was first identified by cabrolius in 1604 as a longitudinal band like muscle but its proper description was first made by Du Puy in 1726. [16] Variation in its incidence has been reported in different ethnic groups. Incidence of this muscle varies as low as 1% in Taiwenese to 11% in Asian population. [17] It is found slightly more in females than males. [18]

Devepomentally, Sternalis is a part of a ventral, longitudinal column of muscles which arise at the ventral tips of hypomere. This muscle is represented by the rectus abdominis muscle in the abdominal region and by infrahyoid muscle in the cervical region. In the thoracic region, this layer usually disappears but occasionally remains as sternalis muscle.[13] It could be the separated fibres of pectoralis major muscle, as indicated by its nerve supply from twigs of pectoral nerves. Depending on its development it may get its nerve supply from lateral or medial pectoral nerves. During the dissection, attempts were made to find out the innervation of this muscle. It was found that it was not supplied by nerve supplying pectoralis major and pectoralis minor muscles. An assumption was made that it would have been supplied by anterior cutaneous branch of the neighboring intercostal nerves. It has been suggested that the sternalis could be an upward prolongation of the rectus abdominis or a downward extension of the sternocleidomastoid. [16,19] In this case, the sternalis muscle appeared to be continuation of the rectus abdominis muscle. Muscle was bifurcating into medial and lateral tendinous laminae after 8 cm from the distal fleshy end. The length of medial lamina was 4.5 cm which was attached to sternal angle whereas the lateral lamina was 3 cm long while was reaching to the medial end of second intercostal space merging with the deep fascia covering pectoralis major muscle. Medial border of the muscle with its medial lamina was making an

angle of 350 with the midline. On left side: Distal end was fleshy while its fibres at proximal ends were tendinous. Its length was 12 cm from the fifth rib to the sternal angle. Medial border of the muscle near the sternal angle was making angle of 300 with the midline passing through centre of sternum.

Occurrence of Rectus Sternalis is rare but it is not the rarest and it has racial and regional variations. Sarikcioglu L et al [20] reported its incidence to be 4-7% in white population, 8.4% in black population, 11% in Asian population, 1% in Taiwanese population and 9.3% in Turkish population. In Indian population, its incidence is 5-8% equal in both genders. Mehta V et al [21] discussed a more common unilateral occurrence of this muscle and lack of acquaintance of the clinicians with this muscle variant. An incidence of 4–8% has been found earlier in Indian subjects. [22,23] Reported size of Rectus Sternalis was different in different cases. In cases with a partial or complete congenital absence of Pectoralis Major muscle, a significant size of Rectus Sternalis has been observed. Muscles were wider at their caudal ends in case reports of Mehta V et al [21] (2.2 cm) and Kulkarni DU et al [24] (5.2 cm), these findings are similar to present finding. In present study, upper end of muscle was in the form of 2-3 slips and it was tendinous, while the lower end was wider (4.2 cm) and fleshy.

Conclusion

The early detection is essential in regular mammogram screening to differentiate it from the malignant lesions. This muscle is a matter of interest for anatomists, radiologists and surgeons for doing surgeries on anterior chest wall.

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