

Case Report

STERNALIS - VARIATION OF CLINICAL IMPORTANCE

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ABSTRACT

This case report concerns the presence of an accessory anterior thoracic wall muscle during routine dissection in the Department of Anatomy, Vardhman Mahavir Medical College & Safdarjung Hospital, New Delhi. A 59 year old male cadaver was being dissected, when a unilateral accessory muscle was found parallel and lateral to the right margin of sternum. Accidental encounter with Sternalis, one of the many names used to denote this muscle, made it apparent that such anatomical variations is not uncommon. A descriptive knowledge of such common anatomical variations is both essential and crucial in realizing that not any human body is alike. Besides theoretical interest & academic curiosity, the implications of these variations is indispensable in diagnostic and surgical disciplines.

Keywords: Sternalis, Rectus sternalis, Chest wall, Muscle variation, Human anatomy, Mammography, Rectus sternalis, Anatomical variation, Breast augmentation, Reconstruction, Mammography, Medical education, Sternalis, Chest, Breast, Surgery, Radiography, Mammogram.

INTRODUCTION

Sternalis is a well documented anatomical variation, that presents itself as a parasternal mass between the superficial fascia of the anterior thoracic wall and the pectoral fascia. It is prevalent in 7.8% of the general population with most cases occurring unilaterally on the right side. [1] Its prevalence differs among different geographic populations with a maximum of 11.1% prevalence in the Asian population. [2] Having said that it is present in more than one tenth of our population, along

with its clinical implications, Sternalis muscle stresses the importance of having a knowledge on anatomic variations.

OBSERVATIONS

This case report concerns the presence of a Sternalis muscle in a cadaver, found during routine dissection, in the Department of Anatomy, Vardhman Mahavir Medical College & Safdarjung Hospital, New Delhi. The muscle presented itself as an accessory anterior

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thoracic wall muscle on the right side. The 59 years old male cadaver that was being dissected, had a unilateral accessory muscle parallel and lateral to the right margin of sternum.

After defining the muscle, it is found to have a single belly, superiorly attached to the anterior surface of manubrium sterni. It ran vertically downwards for 15.5cm, covering the medial end of sternal part pectoralis major extending till the seventh coastal cartilage, inserting into the seventh coastal cartilage and external oblique aponeurosis.

The whole length of the muscle was flat with two surfaces and borders, except for the cranial 2.5cms which was cord-like, till it crossed the level of manubriosternal angle to become flat and fleshy. The maximum width of this sternalis specimen was 3.5cm inferiorly, near its insertion. The posterior surface of the muscle was pierced by an intercoastal nerve from the fifth intercoastal space, midway between both the ends of the muscle.

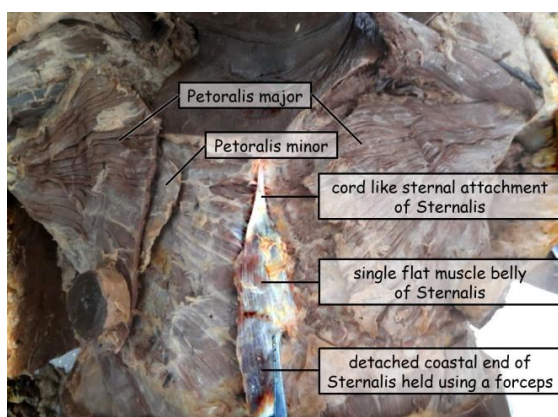


Figure 1: A dissected specimen of anterior thoracic wall with a right sided Sternalis muscle.

DISCUSSION

Dharma et al came across two cases of Sternalis muscle, also addressed as episternalis, presternalis, sternalis brutorum, rectus thoracis, rectus sterni, superficial rectus abdominis and japonicus, in a period of one year. They happened to miss a case of Sternalis in computed tomography, only to find it during mastectomy for breast cancer. But in the second case, they were shrewd to identify the sternalis muscle preoperatively on imaging. [3]

Gross Anatomy

Sternalis can be flat, cord like, flame like or irregularly shaped muscle present in the anterior thoracic wall. It is almost twice as commonly unilateral, and occurs more often on the right side. Its superior attachments can be sternum, inferior border of the cavicle, sternocleidomastoid fascia, pectoralis major and the upper ribs and their costal cartilages. Inferiorly the lower ribs and their costal cartilages, pectoralis major, rectus sheath and

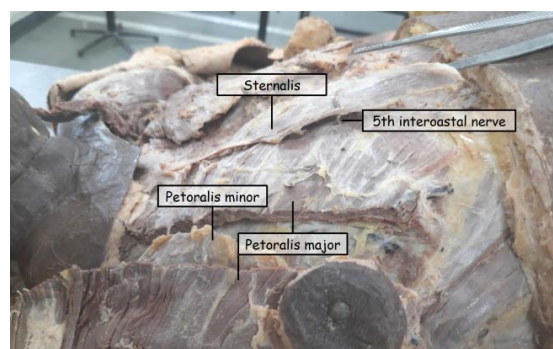


Figure 2: 5th intercoastal nerve piercing the Sternalis muscle, midway between its two attachments.

Sternalis – Variation of Clinical Importance

external abdominal oblique aponeurosis provide attachment.

Its superficial location makes it an ideal candidate for utilization as a muscular flap in plastic reconstruction of the head and neck region. [4]

Nerve supply

Sternalis seems to be innervated by the pectoral (medial or lateral) (51.9%) or intercostal nerves (43.1%). In a few cases (5.0%) both these nerves were found to innervate the muscle. The blood supply is primarily derived from the internal mammary perforators. [1]

Sonne et al, suggested that the medial pectoral nerve must provide the primary nerve supply to Sternalis via small branches that travel in the deep fascia and these branches can be easily mistaken for connective tissue membrane. He also suggested that the intercostal nerves piercing the Sternalis muscle must be providing cutaneous innervation. It is to be remembered that the intercostal nerves have more of GSA fibers while the pectoral nerves have more of GSE. [5]

Classification

Since its description by Cabrolus in 1604, several variations in the muscle have been noted and a classification system was put forward by Jeleu et al. With the identification of more variants of the muscle, elaborate classification systems were put forward by Raikos et al, Ge et al and Snosek et al. But even in after all these years, a new variant has been

identified with three muscle bellies and demands a much detailed classification. [6,7]

Clinical Anatomy

Sternalis muscle may lead to diagnostic dilemma during breast surgery, mammography, computed tomography and magnetic resonance imaging scans where it can mimic tumour. [4]

A cross sectional study by Zina et al, which involved more than 200 doctors majority failed in identifying the Sternalis muscle on a CT and anatomy figure and the most common wrong answer was pectoralis muscle. [8]

During a procedure of mastectomy with free flap reconstruction for breast cancer in a 56 year old female, an aberrant Sternalis muscle was found to be present that was not recognized preoperatively. Though Akyurek et al managed to see through an uneventful procedure, an idea was put forward to use Sternalis as a muscle flap wherever possible. [1]

Naohiro et al goes on to describe a case of breast reconstruction after total mastectomy that presented a challenge with Sternalis muscle. In the case, a loose adipose tissue in connection with Sternalis muscle presented with a caudal lesion of 5cm, making it difficult to use the tissue expander. Eventually Naohiro and team successfully repaired the lesion using an untied suture technique. Besides causing a diagnostic dilemma during examination and investigations, its evident that sternalis has also complicated simple procedures. [9]

Embryology

Snosek et al, in his paper classifying the variants of Sternalis muscle, describes that sternalis is derivation of the pectoralis group of muscles. Interestingly, he affirms this hypothesis by taking into account P.S. Abraham's study of 11 anencephalic fetuses of which six had sternalis muscles. Four among these cases had sternalis muscle closely related to underdeveloped pectoralis major muscle. But it was ambiguous which was the cause and which was the effect, underdeveloped pectoralis muscle or the presence of sternalis muscle. When taking into account the hypothesis that branches of medial pectoral nerve supply the sternalis muscle while the intercoastal nerves simply take a course in close relation to sternalis muscle to end up providing cutaneous innervation, the hypothesis that sternalis muscle develops from the pectoral muscle mass becomes irrefutable. [10]

Phylogeny

When hypothesizing the phylogeny of sternalis muscle, it is important to look at a few similar muscles present in other species. First, there is a rectus abdominis muscle extending from around the cranial end of sternum to pubis, an abdomino-thoracic musculature. Such a rectus abdominis muscle helps in stabilizing the animal when it lands on all four limbs. This can be found in salamanders (urodeles) and langurs (old world monkeys native to the Indian subcontinent). Secondly, there is a rectus thoracis muscle extending from around the sternoclavicular joint to the lower ribs. There it continues with the rectus abdominis muscle

which inturn extends from the lower ribs to pubis. Rectus thoracis muscle helps in inspiration and is present in cows (ruminants), horses (equines) and apes (hominids). Eventually Andrew et al affirms that sternalis is an evolutionary modification of these rectus muscles. [11]

CONCLUSION

If it was not for coming across the most common variant of a typical sternalis muscle during routine dissection, it is possible to have remained unaware of the fact that Sternalis is an anatomical variation of clinical importance with its implications affecting both the diagnostic and surgical departments. Though the phylogenetic and embryological details about sternalis are still being debated, besides its nerve supply, it is evident that, to avoid a diagnostic dilemma, intraoperative complications and to make use of an anatomical variation in various procedures, it is imperative to possess the knowledge on Sternalis.

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Sternalis – Variation of Clinical Importance

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