

CASE REPORT

Rectus thoracis bifurcalis: a new variant in the anterior chest wall musculature

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Abstract

A cadaveric study was undertaken to report the incidence of sternalis muscle in cadavers of Asian origin. A total of 88 cadavers were studied over a period of six years and the sternalis was reported only in a single case and that too unilaterally. The accessory muscle was discovered in the right pectoral region in a 40-year-old male cadaver. The muscle emanated from the external oblique aponeurosis of abdomen confirming its origin from the ventral longitudinal sheet of muscle. The muscle was fleshy throughout its extent except at the ends where they were aponeurotic. At the sternal angle, the muscle displayed “Y” shaped configuration and merged with the respective sternocleidomastoid muscle. The innervation was derived from the third intercostals nerve. We intend to highlight a few points through this study. Firstly, we found a paucity of studies undertaken to describe the incidence of sternalis muscle. Further, the studies present in anatomical archives are mainly case reports. Secondly, this muscle presents itself in varying configurations on radiological studies. The radiologist should acquaint himself with all these presentations, so that he can make accurate diagnosis of a breast mass. Thirdly, this muscle having more morphological relevance may be conveniently utilized for flap procedures of post mastectomy breast reconstruction. Lastly, the presence of this muscle may alter the depth at which the internal mammary lymph nodes are irradiated in case of carcinoma breast. Additionally, it should not be erroneously diagnosed as a mass which recurred on follow up of breast cancer patients. The present investigation endeavors to discuss the anatomical, embryological and clinical relevance of a rare accessory muscle of the anterior chest wall.

Keywords: rectus thoracis, sternalis, accessory, muscle, chest.

☐ Introduction

The sternalis muscle is an accessory muscle of the anterior thoracic wall, present superficial to the sternocostal fascicles of pectoralis major muscle. It presents a parallel to slightly oblique orientation with respect to the sternal margin. The muscle has being described in both sexes with equal incidence. However, it has a variable frequency in different ethnic groups [1]. The derivation of this rare muscle may be from either of the following muscles: pectoralis major, rectus abdominis, and sternocleidomastoid and panniculus carnosus. The innervation is derived from the pectoral or less frequently the intercostal nerves. Although an uncommonly described muscular variation, it merits a special mention in anatomical archives owing to its propensity to simulate a soft tissue mass on radiological evaluation of the pectoral regions [2]. Therefore, unnecessary cancer workup and biopsy may be carried out to rule out carcinoma breast especially in female patients. Earlier elucidated only by anatomists in case reports, this accessory muscle is now being described by clinicians because of its importance in reconstructive surgeries. This article illustrates the morphological and clinical relevance of this extraordinary muscle of the anterior chest wall.

☐ Material, Methods and Results

The upper extremity is usually the first lesson to be taught to the medical undergraduates. A detailed cada-

veric study of the pectoral region was carried out for these students to explain the topography between the musculature and the neurovascular structures and also to familiarize them with the fascial planes of this region. The sternal region of an adult male cadaver of Indian origin revealed an unusual supernumerary muscle during the dissection class. The superficial fascia was meticulously cleared to visualize traces of the muscle, keeping in mind that the muscle could range from a few muscle fibers to a well-established band. We encountered a rare disposition of a supernumerary muscle in the subcutaneous plane of the right thoracic wall of a 52-year male cadaver. This muscle was strap like and extended from the sternal end of right sixth rib to the suprasternal notch (Figure 1).

The inferior attachment of the muscle was to the external oblique aponeurosis. At its origin, the medial margin of the muscle followed the right lateral border of the sternum and the muscle gradually inclined upwards and medially becoming fleshy as it passed towards the jugular notch. The superior attachment was to the manubrium sterni in the vicinity of the jugular notch. The muscle was wider at its inferior attachment and was visualized to taper narrowly towards the manubrium sternum. The width of the muscle at its origin was 2.2 cm, which was reduced to 1 cm at the sternal angle. The length of the muscle measured 16.5 cm and the maximum width at the level of the nipple was 4.3 cm. At the sternal angle, the muscle belly became aponeuro-

tic and seen to bifurcate into two diverging bands that blended with the respective sternocleidomastoid muscle. The length of the right and left aponeurotic bands measured 0.6 and 0.8 cm respectively. The innervation to this accessory thoracic muscle was derived from the third intercostal nerve, which entered the muscle close to its lateral border (Figure 2).

The remaining musculature exhibited normal morphology with no departure from the usual disposition.

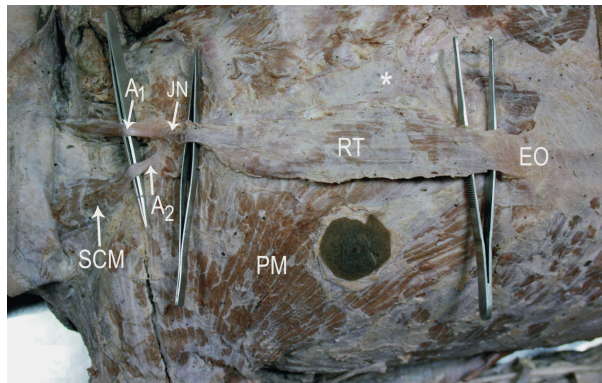


Figure 1 – Photograph of right sternal region displaying the following: RT – rectus thoracis muscle, PM – pectoralis major muscle, EO – external oblique muscle, SCM – sternocleidomastoid muscle, JN – jugular notch, A₁ – first aponeurotic band, A₂ – second aponeurotic band.

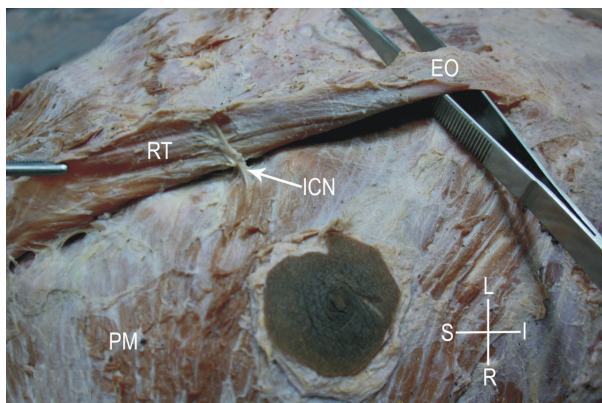


Figure 2 – Photograph displaying the nerve supply to the muscle: RT – rectus thoracis muscle, PM – pectoralis major muscle, EO – external oblique muscle, ICN – intercostal nerve.

Discussion

The sternalis muscle was first coined by Carbriotus in 1604 and subsequently by Du Puy in 1726. The first report describing it in alive subject was by Roubinowitch in 1888 [3].

Although described as a cranial extension of rectus abdominus, it deserves special mention in anatomical records and this is the reason for numerous accounts of its presence in cadaveric and clinical subjects. Anatomical literature is studded with various synonyms for this muscle – parasternal, rectus sternalis, praesternalis. We suggest a new nomenclature “rectus thoracis”, owing to its unique orientation in the anterior thoracic wall and its continuity with the ventral longitudinal sheet of trunk muscle. The bifurcation of the muscle into two diver-

ging aponeurotic bands at the level of sternal angle reasonably justifies the title “rectus thoracis bifurcalis” for the muscle. A sole description of “rectus thoracis” in the archives was made by Christian HA (1898), which supported our nomenclature [4]. Although this muscular anomaly was described as early as the 17th century, its source still remains an mystery. Numerous case reports in the past elucidating this muscle differ in their opinion regarding the embryogenesis of the same. Developmentally, sternalis represents a remnant of a thoracic rectus muscle being derived from the same ventral longitudinal sheet. The nerve supply from the intercostals nerve provides evidence for the above derivation [5].

This accessory muscle is known to be a derivative of myotonic hypomeres, which form muscles of the ventral and lateral body walls in the thorax and abdomen. These include the intercostals, oblique and the rectus abdominus muscles.

However, some authors in the past have regarded it as derivative of panniculus carnosus [6].

Certain criteria must be subserved to categorize a muscle as sternalis:

1. Location between superficial fascia of anterior thoracic wall and pectoral fascia.
2. Origin from sternum.
3. Insertion into the lower ribs, costal cartilages, rectus abdominus sheath or aponeurosis of external oblique.
4. Innervation by intercostals or pectoral nerves [7].

The supernumerary muscle found in the present case lacked any attachment to the sternum or the ribs, but displayed continuity with the aponeurosis of external oblique. However, its position in the subcutaneous plane and innervation by intercostals nerves supports its categorization into sternalis muscle.

A classification of sternalis was performed based on its unilaterality or bilaterality. The present muscle conformed to type I4, that is unilateral muscle belly passing into sternocleidomastoid [8].

According to a previous case study, the occurrence of sternalis is regarded as a demonstration of atavism of pectoral musculature in lower mammals. The morphological relevance of any muscle reflects upon its innervation, as the nerve supplies that muscle which it is destined to deliver and this is obviously determined at the beginning of development. Hence, the corresponding embryonic segment may be ascertained [1].

An extensive review of literature on the nerve supply of sternalis muscle, revealed innervation by thoracic nerves in 55% of cases and by intercostal nerves in 43% of the cases [9]. Our study revealed an innervation derived from intercostal nerve, confirming its embryological origin from the rectus abdominus.

Bailey PM (1998) reported an incidence of 2% in European, 6% in African and 11% in Asian descendants [10]. The paucity of literature in clinical reports is inconsistent with cadaveric findings. The clarification for the above is 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 [11, 12]. The present study however reports a lower incidence of 2%

in the cadavers of Indian origin. Additionally, a greater preponderance in females of 8.7% as compared to 6.4% in males has been described [13].

Despite its diverse origin or incidence, it has hardly any biomechanical advantage or functional bearing, unless it assumes an enormous size replacing the congenitally absent pectoralis major [14]. Although the sternalis in our case was of considerable magnitude, no attendant abnormality of pectoralis major muscle was recorded. As anatomists, we are compelled to delegate this muscle as “functionally inactive” and having only morphological, developmental and atavistic significance. Contrarily, the clinicians and radiologists differ in their opinion. Diagnostic confusions may result while interpreting the mammography reports a sternalis may project as an irregular medial density mimicking a tumor [15]. In fact, in one unusual clinical encounter, open biopsy had to be undertaken to substantiate the diagnosis. If this muscle is left unresected in operations for carcinoma breast, then it may be confused for a recurrence at a later date. Confirmatory verification may be obtained thereafter by MRI and CT scans. Furthermore, this muscle may be effectively utilized for reconstructive surgeries of the breast or of the head and neck region [10, 16]. Another pertinent altercation arising from this muscle is the depth at which the internal mammary lymph nodes are irradiated in case of carcinoma of breast especially those lesions infiltrating the medial quadrants [6].

It is true that the solitary existence of this accessory muscle may not present with clinical repercussions. Yet a notification of its association with several clinical conditions such as anencephaly in 48% and anomalies of adrenal gland is unavoidable and hence warrant documentation [6].

The recognition of this muscle per-operatively may be cumbersome as its size varies from a few muscle fibers to an aponeurotic band. Therefore, we surmise that acquaintance of reconstructive surgeons with this muscle is crucial especially if it is well developed as they can devise a plan to utilize this muscle as a flap. In fact, conjoint sternalis-pectoralis major muscle flap during tissue expander reconstruction of breast was offered by reconstructive surgeons [3].

Construction of suitably sized sub muscular pocket may be confounding in the presence of this anomalous muscle variant, as it will not accommodate the base diameter of the tissue expander amply. In the event of such an opportunity, this muscle may serve as critical interface between breast prostheses and mastectomy skin flap.

Conclusions

Sternalis presents as a vertical strap like subcutaneous muscle, which may create bewildering situations for radiologists or surgeons who are oblivious of this variation. We as anatomists, wish to emphasize that this muscle be amply described in anatomical literature in order to create and reinforce much needed awareness about such anomalies among clinicians. Hopefully, knowledge of precise anatomical details of such morphological variants would contribute a great deal in carrying out successful reconstructive procedures.

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