

## Uncommon Variation in Musculature of the Chest wall

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### Abstract

Occasionally a vertical strip of muscle is seen at the lateral border of sternum, which is named as 'Rectus sternalis (sternalis) muscle'. This muscle is considered as part of the vertical strip of muscles (strap muscles present from chin to pubis). A rare case of unilateral right sided sternalis muscle was found during routine dissection of human male cadaver at Kamineni Institute of Medical Sciences, Narketpally. The early detection of this variant muscle is necessary for assessing in radiological examination. Here by we report a case of right unilateral rectus sternalis muscle. Knowledge of variations occurring in the muscular system is of great importance to the surgeons and professionals who works with imaging.

An unusual variation in chest wall rectus sternalis, it can be confused for a mass on mammography, but confusion revolved by computerised tomography/magnetic resonance imaging. It has unclear embryonic origin, perhaps a remnant of the panniculus carnosus. It is an unusual muscle found occasionally in the anterior part of the thorax.

This variation was found in a male cadaver during routine dissection, it belongs to a muscle of pectoral group. It was found in 8% of population. This muscle is called as rectus sternalis, rectus means straight; it lies parallel to the lateral border of sternum on right side, absent in left side. It is an accessory muscle of the chest wall; it is useful for reconstruction of the neck, chest, abdomen, and perhaps even other places. At last, sternalis may be nothing more than misplaced developed muscle tissue, arising from variable sources in a localised region at the anterior thorax, and serving no apparent function but to be fuddle diagnosticians. Therefore, familiarity of the sternalis only broadens the surgeon's knowledge of variations of chest wall anatomy but also provides reconstructive operations (when present) for wounds in the chest wall as well as adjacent regions. It may be bilateral (or) unilateral. It is a rare variation.

**Keywords:** Chest wall; Pectoralis major; Sternum; Rectus sternalis

### Introduction

The muscular part of the chest wall is derived from myotome. In the abdominal region, the muscles arrange into three layers. The outer layer, Muscle external, internal oblique and transverse, is the same layer as the Muscle Pectoral major on the thoracic region. At the linea semilunaris, three oblique muscle layers are fused to the rectus sheath. The sheath covers the longitudinal fiber of Rectus abdominis. This muscle originates from body and crest of the hipbone. Its fiber runs vertically and inserts at the anterior surface of the xiphoid process and 7<sup>th</sup>-5<sup>th</sup> costal cartilage. Similarly in cervical region, the longitudinal muscles are found by Sternothyrioid Sternohyoid, Sternocleidomastoid, thyrohyoid, Geniohyoid, and omohyoid. In human, the longitudinal muscle of thoracic region is absent. Occasionally in some case, the longitudinal muscle of thorax has been found and called as rectus sternalis [1].

Superficial to the pectoralis major, some muscle fibres may pass vertically from the lower costal cartilages and rectus sheath to blend above with the sternocleidomastoid, (or) to be attached to the upper sternum (or) costal cartilages. These fibers may constitute the sternalis muscle (or) the rectus sternalis [2].

Rudiments of various muscles have been observed in many parts of human body and not a few muscles which are regularly present in some of the lower animals can be sometimes detected in man, in a greatly reduced condition. Uncommon variation is "Rectus sternalis muscle" [3].

Sternalis muscle was first mentioned by Cabrollius in 1604, but the formal description of this muscle was given by Dupuy in 1726. Various names have been coined for this muscle like sternalis muscle, Muscularis sternalis, episternalis, presternalis, sternalis brutorum, rectus thoracis, rectus sternalis, thoracis, etc. [4].

The abdominal slip from aponeurosis of the external oblique is sometimes absent. The number of costal attachments and extent to which the clavicular and costal parts are separated, right and left muscles may decussate across the sternum. A superficial variant slip (or) slips may arise from the lower costal cartilages and rectus sheath to blend with sternocleidomastoid muscle (or) to attach to the sternum (or) costal cartilages. This is sternalis. This may be partially (or) completely absent [5].

The muscle cells are organised in two parts: a small dorsal portion, the epimere which is formed by the dorsomedial cells of the somite, and a large ventral part, the hypomere, which is formed by the ventrolateral cells of the somite. The ventral tip of the hypomeres may fuse to form sternalis in thoracic region [6].

### Case Report

During routine dissection of the thoraco-abdominal region of a 60-year-old male cadaver in kamineni institute of medical sciences, we observed a distinct muscular mass about 12.5 cm long and 2.5 cm breadth in the right hemithorax, covered by superficial fascia and located superficial to the pectoralis major muscle. Its cranial part

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blends with clavicular fibers of left pectoralis major muscle close to second costo-chondral junction. Its caudal end blends with fascia of rectus abdominis, 4 cm lateral to midsternal line at the level of 7<sup>th</sup> to 8<sup>th</sup> costal cartilages, this was innervated by anterior cutaneous branches of second inter costal nerve (Figures 1 and 2).

## Discussion

Incidence of this muscle varies with sex, race and ethnicity. In Europeans it was 4.4%, in Africans 8.4%, Asian 11.5%, Indians 4.8%, Japanese 31.1%, Chinese 1%. Average range of incidence is 3-6%. It may be unilateral or bilateral [7]. Turner described it as a form of atavism, corresponding to the *pectoralis cutaneous* of lower animals.

It is more usual in females (8.7%) than males (6.4%). Folan-Curran reviewed the literature and found that 55% of the sternalis muscles were innervated by branches of the internal and external thoracic nerves, 43% by branches of the inter-costal nerves and 2% both from the inter costal and thoracic nerves.

## Origin and Insertion

Jelev et al. [8] described this muscle originates from sternum or intraclavicular region and gets inserted into rectus sheath, costal cartilage, or lower ribs.

In Gray's Anatomy this muscle is described as ascending from lower costal cartilages and rectus sheath to blend with sternocleidomastoid muscle or attached to the upper sternum or costal cartilages [8].

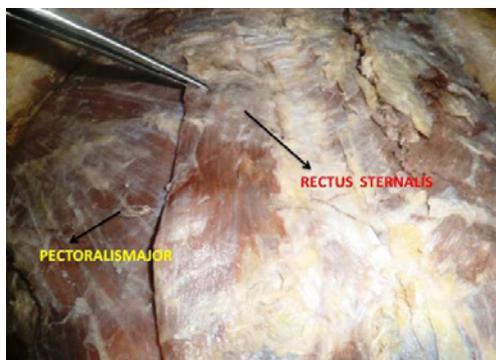


Figure 1: Photograph showing rectus sternalis lies parallel to lateral border of sternum on right side, left side not found.



Figure 2: Photograph showing sternalis merges with clavicular fibers of pectoralis major at second inter costal space.

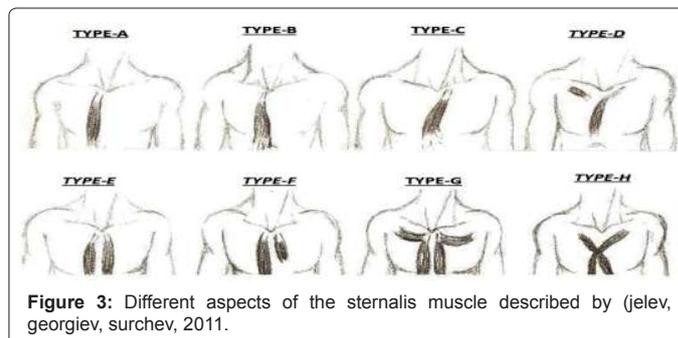


Figure 3: Different aspects of the sternalis muscle described by (jelev, georgiev, surchev, 2011).

According to Sadler [9] Development: (1) Rectus sternalis may be derived from primitive ventral, longitudinal muscle sheet which also gives rise to rectus abdominis, sternocleidomastoid muscles. This is supported by the findings that sternalis muscle fibres are many times continuous with either sternocleidomastoid or rectus abdominis or both (Sadlar); (2) Sternalis muscle is accompanied by partial deficiency of pectoral major muscle. Rectus sternalis represents the remains of 'panniculus carnosus' which is supported by its position superficial to pectoral fascia and nerve supply by anterior cutaneous branches of intercostal nerves [8].

According to athanasios raikos, unilateral sternalis muscle has been reported to be present in 4.5% of subjects, while the bilateral manifestations are found in less than 1.7%. There are many theories to explain the embryological origin of sternalis muscle.

According to Jelev et al. [8] (Figure 3) Classification of rectus sternalis:

**Type-A:** The rectus sternalis muscle lies on right side, at lateral border of sternum, left side is absent.

**Type-B:** This muscle lies on body of the sternum, on right side its lower fibers present on the xiphoid process, left side is absent.

**Type-C:** Sternalis muscle lies on left side along with body of the sternum; it runs downwards towards the midline, right side absent.

**Type-E:** Sternalis lies on either side of body of the sternum.

**Type-F:** Right sternalis muscle is longer than the left sternalis; it lies towards the median plane.

**Type-G:** Bilateral sternalis situated on the body of the sternum. Right and left sides of sternalis merge with on either side of pectoralis major.

**Type-H:** Right and left sternalis cross with each other, Right sternalis merges with left pectoralis major, left sternalis merges with right pectoralis major. In this literature Type-A, B, C and D Rectus sternalis is unilateral, Type-E, F, G and H Rectus sternalis is bilateral and Type-D, G and H Groups of rectus sternalis merges with pectoralis major.

In our study Type-A rectus sternalis is right unilateral, this is similar to our study [10]. It is postulated that it is a derivative of the hypaxial myotomes/dermomyotomes from which ventral and lateral body wall muscles of thorax and abdomen are developed. Moreover, it is claimed to originate from the adjacent muscles such as sternocleidomastoid, rectus abdominis, and panniculus carnosus muscle, abdominal external oblique muscle or from the ventrolateral part of the diaphragm [7].

## Conclusion

1. It can be used as a flap in reconstruction surgery of head and neck, chest wall and breast.
2. It is important for physicians, especially to recognise and familiar with sternalis to avoid confusion with malignant lesion.
3. Radiologist must be aware of possibility of encountering the sternalis during thoracic imaging (CT, mammography, MRI) because of the risk for its misdiagnosis as a tumour further risk for surgical implications such as damage to this muscle during breast surgeries must be considered.
4. Functional significance of rectus sternalis is elevation of the lower chest region during inspiration (based on attachment sites) and proprioception for movements of thoracic wall.
5. Presence of sternalis muscle and its variable presentations may require adaptations and adjustments during radiation therapy for breast surgery.

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