

# Three unilateral recti sternalis muscles - an unusual variation and its clinical significance

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## SUMMARY

The sternalis muscle is an uncommon anatomical variation. We report a case of three unilateral recti sternalis muscles in a 60 year old male cadaver. All three muscles were slender and had a common origin from the right fourth sterno-chondral junction and partly from the lateral half of sternum. All three muscles continued up to the second costal cartilage, where they became inserted. The 3 muscles were medial, intermediate and lateral in position, and were named ST1, ST2, and ST3 respectively. The nerve supply to all three muscles was from the right third intercostal nerve through its anterior cutaneous branch. The clinical significance of this uncommon variant is discussed.

**Key words:** Rectus sternalis – Unilateral – Intercostal nerve – Mammogram

## INTRODUCTION

The rectus sternalis muscle is an uncommon anatomical variation of the chest wall musculature. As reported by Turner (1867), the earliest description of the sternalis was by Carbolius in 1604, when he described this

muscle in humans. Although the sternalis muscle has no known functional role in humans, its presence has many important surgical implications during breast reconstruction, especially with regard to staged implant reconstruction of the breast (Schulman and Chun, 2005). The sternalis muscle can easily be overlooked during breast surgeries and might often cause diagnostic dilemma on mammography or CT scans (Kaby et al., 2005). Here, we report a case of three recti sternalis muscles in a cadaver that were unilateral in occurrence.

## CASE REPORT

During routine dissections of the thoraco-abdominal musculature of a 60 year old male cadaver in the Department of Anatomy, we encountered three recti sternalis muscles on the right side of the chest wall, covered by superficial fascia and located anterior to the Pectoralis major muscle. There was no corresponding muscle mass seen on the contralateral side. The extent, attachments, dimensions and nerve supply of all three muscles were studied in detail.

All 3 muscles were slender and had a common origin from the right fourth sterno-chon-

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dral junction and partly from the lateral half of sternum. Below the fourth right sternochondral junction, all of them originated as small tendinous slips from the fascia over the rectus abdominis. All three muscles continued up to the second costal cartilage, where they became inserted. The three muscles were medial, intermediate and lateral in position and were named ST1, ST2, and ST3 respectively for descriptive purposes (Fig. 1).

*Medial sternalis muscle: ST1*

The muscle was 5.8 cm long and 0.9 cm broad, and towards its insertion at the level of 2<sup>nd</sup> costal cartilage, it divided in to two tendinous bands, namely medial and lateral (Fig. 2). The medial tendinous band, with a length of 1.5 cm and a breadth of 0.4 cm, inserted at the level of sternal angle and was continuous with the fibres of the pectoralis major of the left side. The lateral tendinous band with a



Fig. 1. Anterior thoracic wall showing all three sternalis muscles. ST1 - Medial Sternalis, ST2 - Intermediate Sternalis, ST3 - Lateral Sternalis, SA - sternal angle.

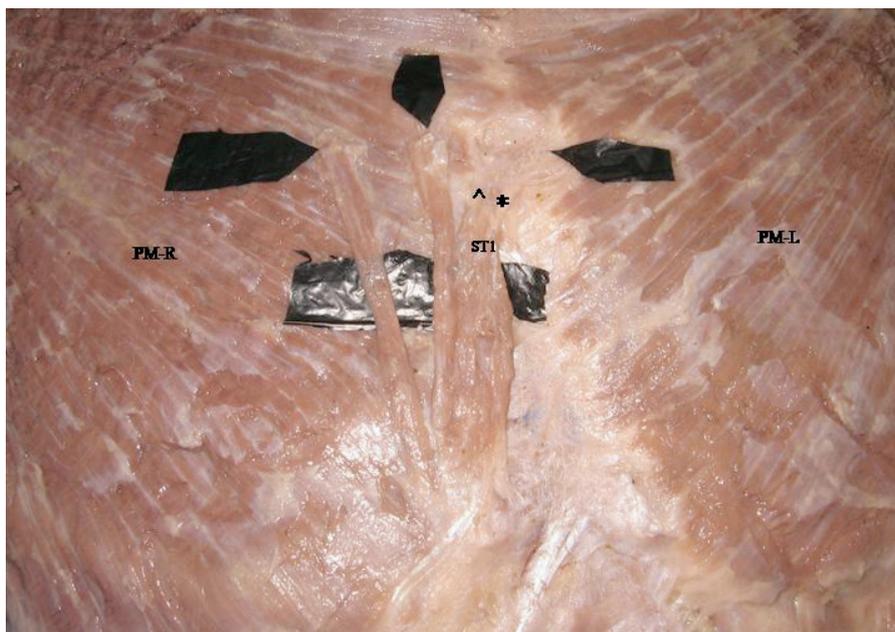


Fig. 2. Insertion of medial sternalis muscle. \* - Medial tendinous band, ^ - Lateral tendinous band, PM-R - Pectoralis major (Right side), PM-L - Pectoralis major (Left side), ST1 - Medial Sternalis.



Fig. 3. Intermediate sternalis muscle. F - Fleshy insertion of intermediate sternalis muscle, ST2 - Intermediate sternalis.

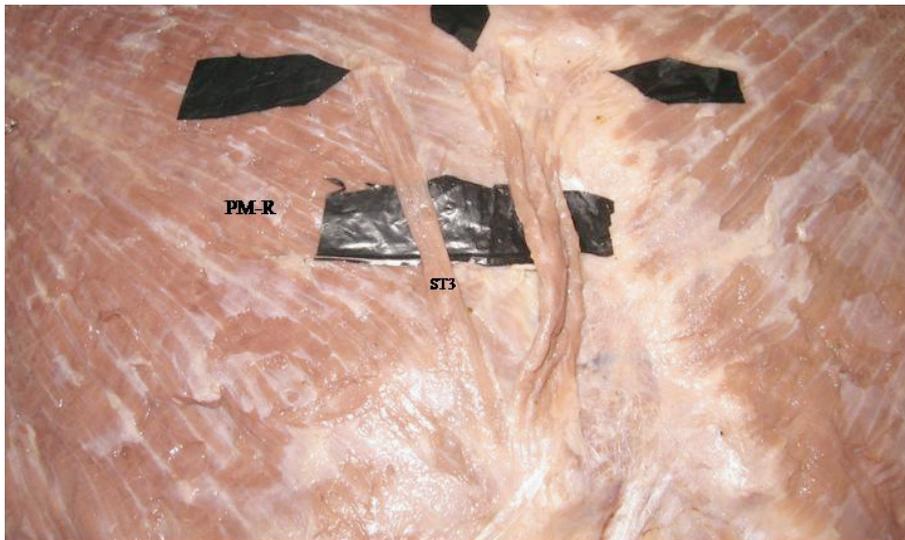


Fig. 4. Lateral sternalis muscle. ST3 - Diverging lateral sternalis muscle, PM-R - Pectoralis major (Right side).



Fig. 5. Nerve supply of sternalis muscle. ③ - Right third intercostal nerve, supplying medial and intermediate sternalis muscles.

length of 1.4 cm and a breadth of 0.2 cm was continuous with the pectoralis major of right side, near its origin from the costal cartilage.

*Intermediate sternalis muscle: ST2*

The muscle was 6 cm long and 0.5 cm broad. It was fleshier towards its insertion and continuous with the fibres of the pectoralis major of the right side (Fig. 3).

*Lateral sternalis muscle: ST3*

The muscle was 6.8 cm long and 0.4 cm broad. The lateral sternalis muscle diverged from the intermediate slip and continued with fibres of the pectoralis major muscle of the right side (Fig. 4).

Above the level of second costal cartilage, all three muscles were not continuous with the tendinous origin of the sternocleidomastoid muscle. The nerve supply to all three muscles was from the right third intercostal nerve through its terminal anterior cutaneous branch (Fig. 5). The pectoralis major muscles on both sides were normal.

## DISCUSSION

The sternalis muscle is a fleshy band of longitudinal fibres of varying length and width. It is superficial to the pectoral fascia and runs parallel to the sternum. It usually arises from the rectus sheath, the aponeurosis of the external oblique muscle, the pectoralis major or the costal cartilages and ends on the upper costal cartilages, the manubrium, or may be joined to the sternal head of the sternocleidomastoid muscle, superficial to the pectoral fascia. In our case, there were three recti muscles on the right side and they were not continuous with the corresponding sternocleidomastoid muscle.

The overall incidence is 2-8% according to Jelev (as quoted by Lee et al., 2006). Lee et al. (2006) reported an incidence of 6.2% in a Korean population. Harish et al. (2003) reported an overall incidence of 0.69% in Indian patients who underwent modified radical mastectomy.

With regard to the homology of the muscle origin, it is considered to be derived from the pectoralis major, rectus abdominis, sternocleidomastoid, and panniculus carnosus, according to O'neil and Folan-Curran (as quoted by Lee et al., 2006). In humans, its functional

significance is considerably diminished and has largely become vestigial, because the arm is free and the head can reach any part of the body surface (Lee et al., 2006).

Sadler (2006) describes it as a part of the ventral longitudinal column of muscle arising at the ventral tips of hypomeres, which in the thoracic region usually disappears but is occasionally represented by this muscle.

Bradley et al. (1996) reported that 6 women out of 32,000 (0.02%), undergoing mammograms had an unusual, irregular structure visible medially on the cranio caudal projection that posed a diagnostic dilemma. This, on cross sectional imaging and during subsequent surgical intervention, was established as the sternalis muscle. Mammograms in these patients showed the appearance of the muscle, ranging from an irregularly rounded density at the sternal edge of the film to a flame-shaped density that was almost completely surrounded by fat. The author thus concludes that the muscle has a variety of appearances that should be familiar to the radiologist to avoid confusion with a malignant lesion.

On Multi Detector Computed Tomography (MDCT), the muscle is seen as an oval structured soft tissue density anterior to the medial border of pectoralis major and had identical Hounsfield units with the adjacent pectoralis major muscle. MDCT clearly defines the longitudinal and parasternal course of the muscle. A knowledge of the appearance of MDCT on the sternalis allows the identification of this muscle and avoids the need for further evaluation and unnecessary biopsies (Nuthakki et al., 2007).

Awareness about this muscle is extremely important, especially in surgical dissections of the chest wall and in breast surgeries and should not be misinterpreted as recurrence at a later date (Harish and Gopinath, 2003).

The purpose of this article is to emphasize that the sternalis is not only a normal and unusual variant of the muscles of the chest wall, but also that it carries an important clinical significance. This case report stresses on the fact that the clinicians and radiologists should be aware of this muscle variant, (*especially three recti muscles as in our case*), which would hopefully prevent them from overlooking or misinterpreting this unusual variant during diagnostic and surgical procedures.

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