

## Rectus Sternalis Muscle - A Rare Variant

Dr. Surendra Chaudhary<sup>1</sup>, Dr. Uma B. Gopal<sup>2</sup>, Dr. Muteeba Naz<sup>1</sup>,  
Dr. Jeevan Kumar Giri<sup>1</sup>, Dr. Simi C. P.<sup>1</sup>, Dr. Daiarisa Rymbai<sup>1</sup>

<sup>1</sup>PG Scholars, <sup>2</sup>Professor

Department of Rachana Sharir, Sri Dharmasthala Manjunatheshwara  
College of Ayurveda and Hospital, Hassan, Karnataka, India

### ABSTRACT

Rectus sternalis muscle is a rare morphological variation of the musculature of the anterior abdominal wall. A unilateral right sided Rectus sternalis muscle was found during routine dissection of a 55 years old female cadaver with hefty built at Department of Rachana Sharir, Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan, Karnataka. The muscle was present in right hemithorax, superficial to right pectoralis major muscle. The cranial parts of the muscle were attached into manubrium sterni and sternocleidomastoid muscles while the caudal part was attached into 5th and 6th costal cartilages just lateral to the right sternal margin. The knowledge of this uncommon variation will help the radiologists, physicians and surgeons in interventions and diagnostic procedures as the muscle may be confused for an abnormal lesion or mass. The muscle may be useful in plastic surgery for reconstruction purpose. This anomalous muscle in chest region will raise awareness about its possible presence in the body and its clinical importance.

**KEYWORDS:** *rectus sternalis, sternocleidomastoid, manubrium sterni, costal cartilage*

### INTRODUCTION

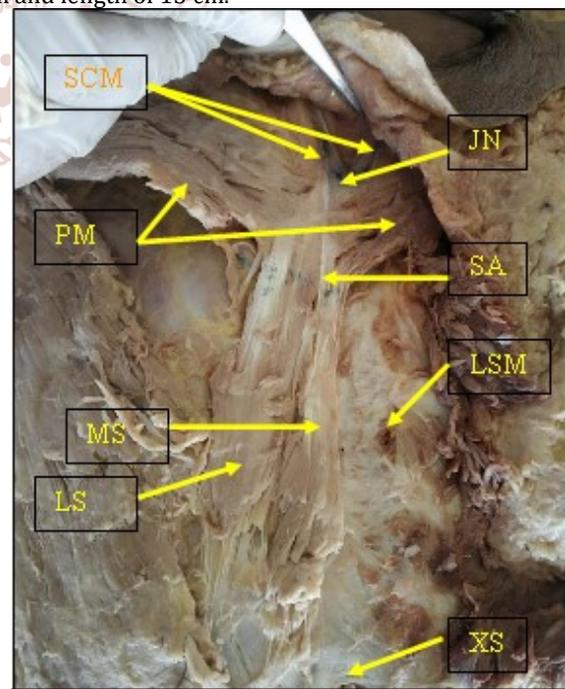
Rectus sternalis muscle is one of uncommon muscular variation in anterior chest wall, usually appears in the form of superficial vertical strip which is sternal or parasternal in position. This muscle was first demonstrated by Carbollius in 1604 and first formal description was given by Dupuy in 1726<sup>1</sup>. Different names have been indicated to this muscle such as Sternalis, Rectus thoracis, Presternalis, Muscularis sternalis, Parasternalis, Episternalis etc<sup>2</sup>. The muscle usually arises from lower costal cartilages and rectus sheath to blend with SCM muscle or to attach to the upper sternum or costal cartilages<sup>3</sup>

It generally lies parallel to the sternum covering the medial border of pectoralis major, extending from manubrium to the costal region inferiorly<sup>3</sup>. It is noted that incidence of rectus sternalis muscle varies with sex, race and ethnicity. It occurs 4.4 % in Europeans, 8.4 % in Africans, 11.5 % in Asians, 4.8 % in Indians, 4.8 % in Japanese and more usual in females (8.7%) than in males (6.4 %). The attachment sites, function, embryology, and the nerve innervations of the rectus sternalis are still controversial<sup>4,5</sup>.

### Case Report

During the routine dissection of pectoral region, in a 50 years old female cadaver, at department of Rachana Sharir, Sri Dharmasthala Manjunatheshwara College of ayurveda and Hospital, Hassan, Karnataka, there was an abnormal strap of rectus sternalis muscle covering the sternal origin of fibres of right pectoralis major muscle. The muscle and surrounding area were traced out carefully and photograph was taken. The lower part of the muscle was attached into 5th and 6th costal cartilages just lateral to the right sternal margin. It was observed that the lower attachment of the muscle was interdigitating with aponeurosis of external oblique muscle of anterior abdominal wall. The muscle was extending upwards and medially by two slips and attached into the upper surface of manubrium sterni. Some tendinous fibres of lateral slip were blended with right

sternocleidomastoid (SCM) while that of medial slip were blended with left SCM muscle. It was also observed that sternal origin of right pectoralis major muscle was present deep to rectus sternalis and some fibres were originated from the upper part of the lateral tendinous slip. There was partial deficiency of sternocostal fibres of right pectoralis major muscle. Some of fibres of manubrial portion of left pectoralis major were originated from medial slip of the rectus sternalis. There was no such sternal muscle on left side of sternum. The muscle belly had a maximal width of 3 cm and length of 13 cm.



**Figure: Right rectus Sternalis Muscle.**  
JN -jugular notch, SA -sternal angle, LSM -left sternal margin, XS - xiphisternum, LS -lateral slip, MS -medial slip, PM -pectoralis major muscles, SCM -sternocleidomastoid muscles

## Discussion

Rectus sternalis muscle appears as a band of fleshy fibres of varying length and width located close and generally parallel to the sternum. There are conflicts of opinions regarding the attachments, embryological origin, function and nerve innervations. It has been reported that the muscle remains attached cranially to pectoral fascia, upper costal cartilages, sternal body, manubrium and sternal heads of SCM muscle and caudally to the lower costal cartilages, external oblique, rectus abdominis muscle or its sheath<sup>5,6</sup>. Hao et al. reported the rectus sternalis muscle originating from clavicular head of SCM muscle<sup>7</sup> while JeleV et al. described originating from sternum or interclavicular region and inserting into rectus sheath, lower costal cartilages or ribs<sup>8</sup>. In Gray's Anatomy, it is described that the muscle ascends from lower costal cartilages and rectus sheath to blend with SCM muscle or to attach to the upper sternum or costal cartilages<sup>3</sup>. In present case, the muscle was present unilaterally on the right side, caudally attached to right 5th, 6th costal cartilages and aponeurosis of external oblique muscle. The muscle was superficial to pectoralis major, extending vertically upwards and slightly medially by two slips. Both lateral and medial slips of the muscle were cranially attached to anterior surface of manubrium and also blended with ipsilateral sternal heads of SCM muscle. The origin and insertion sites cannot be ruled out in the cadaver but in living body, it can be identified on the basis of direction of contraction of muscle fibres. The contraction of muscle fibres occurs from insertion sites towards the less movable or immovable origin sites.

The size of rectus sternalis may vary from a few short fibers to a well-formed muscle, with average length  $4.8 \pm 1.97$  cm, width  $15.1 \pm 6.84$  mm thickness  $3 \pm 0.91$  mm. It may occur unilaterally (4.5 %) or bilaterally less than (1.7 %) <sup>5</sup>. In present case, there was unilateral presence of rectus sternalis muscle on the left side of sternum. The length of the muscle was 13 cm and its widest part was 3 cm at the level of right fourth costal cartilage.

There are many theories which explain the embryological origin and nerve innervations of rectus sternalis. It might be originated from the hypoaxial masses for the SCM muscle, ventral muscular wall of the thoracoabdominal cavity or even the remnants of the panniculus carnosus muscle sheet<sup>5</sup> or ventrolateral part of diaphragm<sup>9</sup>.

Nerve innervations of rectus sternalis in majority is contributed from intercostal nerves<sup>10,11,12</sup> while Kida et al. reported that it is usually supplied by pectoral nerves<sup>1</sup>. O'Neil and Folan Curran reported that 55 % of the muscles were innervated by branches of the internal and external thoracic nerves, 43 % by branches of the intercostal nerves and 2 % by both from internal and thoracic nerves. However very fine nerves may be easily damaged or removed during dissection as these are very much confused with connective tissues<sup>9</sup>. Kida & Kudo reported the partial absence of the sternocostal portion of the ipsilateral pectoralis major muscle and suggested the possibilities of both by same origin<sup>13</sup>. In the present case, the muscle was supplied by intercostal nerves.

Many authors have debated about function of rectus sternalis. Turner viewed that it might be a vestigial remnant of a muscle that was lost during evolution and is expressed in some individuals<sup>14</sup>. It may have the role in shoulder joint

movement or have accessory role in chest wall elevation<sup>5</sup>. In present case, some tendinous fibres were blended with SCM tendons, so it might have accessory role in movement of head also.

There are insufficient references about rectus sternalis in standard medical text books, so it may lead to diagnostic dilemma and complications during interventions in anterior thoracic region. The muscle is usually asymptomatic, however, it may alter the electrocardiogram readings or confuse a routine mammography. During mammography, this muscle may be visible as an irregular structure and may lead to misdiagnosis of a wide range of benign and malignant lesions of chest wall and breast. It may cause asymmetry of chest or breast or the deviation of the ipsilateral nipple areola complex<sup>15</sup>. Rectus sternalis can be used as a muscle flap in anterior chest wall, head, neck and breast reconstruction due to its insignificant function<sup>5</sup>. Gruber L et al. reported a female patient with right sided unilateral rectus sternalis muscle associated with pain upon pressure and respiratory excursion of the thorax. There was significant hypoplasia of the pectoral muscle of ipsilateral side<sup>16</sup>.

## Conclusion

The rectus sternalis muscle is a rare muscular variant of anterior chest wall, with uncertain origin, function, location. Anatomists, radiologists, physicians, surgeons, should be familiar to this muscle to avoid misdiagnosis, surgical malpractice or make proper use in plastic surgery.

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