

Morphology of unilateral Rectus sternalis: A Cadaveric study

T. Sumalatha*, I. Gowri and Tanuja

Department of Anatomy, Osmania Medical College, Hyderabad, India

*Correspondence Info:

Dr. T. Sumalatha,
Assistant Professor,
Department of Anatomy,
Osmania Medical College, Hyderabad, India
E-mail: sivasuma_2@yahoo.co.in

Abstract

The rectus sternalis is a rare anatomic variant muscle in the anterior chest wall. Knowledge of variations in the anterior chest wall musculature is important for operating surgeons as well as radiologists. Its overall incidence is 3-5% worldwide. The present study was conducted on 30 cadavers in the department of anatomy, Osmania Medical College to evaluate the incidence of rectus sternalis. We observed presence of unilateral rectus sternalis in adult male cadaver. The incidence of this variant muscle on the basis of our study is 3.3%.

Keywords: Rectus sternalis muscle, unilateral, super numerary muscle, rare chest wall muscle, Indian population.

1. Introduction

The rectus sternalis muscle is a rare anatomic variant which was reported by Carbolio in 1604 [1]. The rectus sternalis muscle was formally described by Dupuy (1726) and detailed description was given by Turner (1867) [2]. The sternalis may be unilateral or bilateral. Its origin may be from sterno-cleido mastoid, rectus abdominis [3], pectoralis major [4], external oblique muscle [5] unilateral rectus sternalis was observed in 4.5% and bilateral presence has been reported to be 1.7%. It is less common among men (6.4%) than women (8.7%) [6]. The incidence is 11.5% in Asian population and 4-8% in Indian population [7].

The appearance of this muscle is in the form of superficial vertical strip which can be sternal or parasternal in position with several variations in its superior and inferior attachments. Its superior attachment may be from sterno cleido mastoid, pectoralis major, sternum, clavicle, upper ribs or costal cartilages. Its inferior attachments include 3-8th costal cartilages, 4-8 ribs, anterior rectus sheath, pectoralis major fascia, sub-cutaneous adipose tissue overlying the muscle [3].

This rare muscle variant is known by various names viz. musculosternalis, episternalis, presternalis, Sternalisbuttorum, rectus thoracis, japonicas, thoracicus etc. It was termed Abdomino-Guttural by Dugas, Abdomino-Cutaneous by Klein. Cutaneous pectoris by Zenker and Sternalis Brutorium by Kuhff [7].

Its incidence seems to be directly linked to sex and ethnic groups. The incidence of rectus sternalis is maximum at 23.5%, reported in Chinese population and minimum at 1%

in Taiwanese population, the overall incidence worldwide being 3-5%. Rectus sternalis is either pectoralis major derived with innervations from thoracic pectoral nerves or rectus derived with innervations from intercostal nerves [8]. According to Kida *et al*, rectus sternalis is supplied by pectoral nerves [9].

1.1 Aim of the study

To determine the incidence of rectus sternalis, exact location, extension and morphological features of the muscle. This data would help the clinicians during various surgical and diagnostic procedures.

2. Materials and methods

30 cadavers fixed in formalin for dissection, were studied over 3 years in the department of anatomy at Osmania medical college, Hyderabad. Routine dissection of pectoral region was performed, rectus sternalis, a rare variant muscle was observed in only one male cadaver. It appeared as a vertical strip of muscle in the anterior chest wall musculature. It was unilateral, present on the right side. It was superficial to pectoralis major muscle and is followed for its origin, insertion, nerve supply and morphological features.

3. Observation and Results

In the present study, in the right pectoral region of an adult male cadaver, unilateral rectus sternalis was observed. The fibres had distal attachment to aponeurosis of external oblique muscle. The muscle belly was running vertically over

the pectoralis major muscle and blending with pectoral fascia proximally. It is 2.5cm in width and 11.5cm in length. The muscle is pierced by two anterior cutaneous branches of 3rd and 4th intercostal nerves. The blood supply is derived from perforating branches of internal thoracic arteries.

Figure 1: unilateral rectus sternalis



4. Discussion

Rectus sternalis is a supernumerary muscle of the pectoral region. The rectus sternalis is a part of a ventral longitudinal column of the muscle arising at the ventral tips of the hypomeres [10]. According to Barlow 1935 it represents a remnant of panniculus carnosus [11]. Turner stated that, it is present in man as a result of atavism of the fascicles of the pectoralis Cutaneous muscle of lower animals [2]. In Grays anatomy, this muscle is described as a superficial vertical slip or slips which ascend from lower costal cartilages and the rectus sheath to blend with sternocleidomastoid muscle or to attach to upper costal cartilages [12]. According to Bharathi et al, the proximal attachment is to anterior surface of sternum and distal attachment to anterior lamina of rectus sheath [8]. In the present study, this muscle had distal attachment to aponeurosis of external oblique and running vertically superficial to the pectoralis major muscle and blending with pectoral fascia proximally.

According to Bradley *et al*, rectus sternalis muscle was identified in only 4 /32,000 patients during mammography screening [13]. According to Barlow, the incidence is 11% in Asians, 6% in Afro-Americans, 2% in Europeans [14], and 4-8% in Indian population [15]. Bharathi *et al* found the incidence of sternalis muscle to be 2.5% among 40 cadavers studied in south Indian population [8]. Bilateral muscles have also been reported to be seen in 1.7% of cases while unilateral rectus sternalis is reported to be 4.5% of cases. SariKcioglu L *et al* found 3 muscles in a single cadaver, one on right and 2 on left side [16] In the present study, incidence of rectus sternalis is 1/30 cadavers, incidence is 3.3%.

Hung LY *et al* found that rectus sternalis is supplied by pectoral nerves in 55%, intercostal nerves in 43% and a combination of the two in 2% of cases [17]. Morrira studied 46 sternalis muscles without any nerve supply from intercostal nerves [18]. Last RJ stated that sternalis muscle is

innervated segmentally by intercostal nerves which are correlating with the present study [19].

The clinical significance of this muscle is that it may be mistaken as tumour on mammogram and causes difficulty in interpretation by radiologists this can be overcome by performing additional tests like CT and MRI [20]. During mastectomy, this muscle may be found in subcutaneous plane; hence it is important for surgeons to be aware of this rare location and presentation of this muscle and should not be mistaken for recurrence of malignancy at later stage. The rectus sternalis can also be used as a muscle flap in anterior chest wall, head and neck, and in breast reconstructions. In radiation therapy, the depth at which internal mammary nodes are irradiated may also vary in the presence of this muscle [21-23].

5. Conclusion

The anatomical knowledge of rectus sternalis is essential even though the incidence is around 3% among south Indian population. The lack of awareness of this variation can cause confusion among radiologists during mammography interpretation and iatrogenic injury during mastectomy surgery.

The morphological features of rectus sternalis should therefore be included in standard medical literature to allow the clinicians provide safe treatments thereby avoiding errors due to lack of awareness of rectus sternalis muscle even though it is a rare variant.

References

- [1] Cabrol B. (1604) *Alphabeton anatomikon hoc est anatomes elenchus accuratissimus, omnes humani corporis partes, ea qua solent secari methodo, delineans. Accessere osteologia, obseruationesque medicis iuxta ac chirurgis peritiles.* Jacob Jouet, Geneva.
- [2] Turner W.M. On the musculus sternalis. *J. Anat. Physiol.* 1867; 1:246-253.
- [3] Blees G. A peculiar type of sternalis muscle. *Acta Morphol. Neerl. Scand.* 1968; 7: 69-72.
- [4] Novakov S.S., Yotova N.I., Petleshkova T.D., Muletarov S.M. Sternalis muscle - A riddle that still awaits an answer. *Folia Med. (Plovdiv)* 2008; 50: 63-66.
- [5] Testut L. *Les Anomalies musculaires chez l'homme, expliquées par l'anatomie comparée.* Masson, Paris 1884.
- [6] Jetti R, Pamidi N, Vollala VR, Vasavi R, Nerella VM. Right Sternalis muscle. *International Journal of Anatomical variations* 2009; 2:41-42.
- [7] Kulkarni DU, Kulkarni UK. Unilateral Rectus Sternalis muscle- A case report. *Al-Ameen J Med Sci.* 2010; 3(2):169-171.
- [8] Bharathi D, Sarala HS, Padmalatha N, Balakrishna. Morphology of Rectus Sternalis: A Cadaveric Study. *International Journal of Life Sciences Research.* 2014; 2(4):65-67.

- [9] Kida M.Y., Kudoh H. Innervation of the sternalis muscle accompanied by congenital partial absence of the pectoralis major muscle, *Okajimas Folia Anat. Jpn.* 1991; 67: 449-455.
- [10] Clemente C.D. Clement, C.D. Muscle and fascia; In Gray's Anatomy - 36th Edition, Lea and Febiger. Philadelphia. 1985.
- [11] Barlow R.N. The sternalis muscle in American whites and Negroes. *Anat. Rec.* 1935; 64: 413-426.
- [12] Gray's Anatomy. 30th ed, Lea and Febiger, Philadelphia. P. 520.
- [13] Bradley F.M., Hoover H.C., Hulka C.A., Whitman G.J., McCarthy K.A., Hall D.A., Moore R., Kopans D.B. The sternalis muscle: an unusual normal finding seen on mammography. *AJR Am. J. Roentgenol.* 1996; 166: 33-36.
- [14] Sadler TW. Langman's Medical embryology." 12th ed., Williams & Wilkins: Baltimore, 1995: 147.
- [15] Shah A.C. The sternalis muscle. *Indian J. Med. Sci.* 1968; 22: 46-47.
- [16] Sarıkcıoğlu, Levent, et al. "Three sternalis muscles associated with abnormal attachments of the pectoralis major muscle." *Anatomy* 2008; 2 (1).
- [17] Hung LY, Lucaciu OC & Wong JJ. Back to the debate: Sternalis muscle. *International Journal of Morphology.* 2012; 30(1): 330-336.
- [18] Morita M. Observations of the musculus sternalis and musculi pectorales in mammals and a morphological interpretation of the essence of the musculus sternalis, *Acta Anat. Jpn.* 1944; 22: 357-366.
- [19] Last RJ: Last's Anatomy-Regional and Applied," 5th ed., Churchill Livingstone: Edinburgh, 1972: 82.
- [20] Harish K, Gopinath KS. Sternalis muscle: Importance in surgery of the breast. *Surgical and Radiological Anatomy.* 2003; 25(3-4): 311-314.
- [21] Athanasios R, George KP, Maria T, Pedro F, Stefanos T, Panagiota K et al. Sternalis muscle: an underestimated anterior chest wall anatomical variant. *Journal of Cardiothoracic Surgery.* 2003; 6(1): 73.
- [22] Britton CA. Subpectoral mass mimicking a malignant breast mass on mammography. *Am Jour of Roent* 1992; 159: 221.
- [23] Khan UD. Use of the rectus sternalis in augmentation mammoplasty: case report and literature search. *Aesthetic Plast Surg* 2008; 32:21-24.