

Rectus Sternalis: A Case Report

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Abstract

The sternalis is an anatomical variant of anterior chest wall muscle. It occurs either unilateral or bilateral. It lies in the anterior chest wall, superficial to the sternal origins of the pectoralis major muscle. The sternalis usually courses longitudinally adjacent to the sternum and does not cross the midline. In the Department of Anatomy, during routine dissection of thoracoabdominal region of a 49-year-old male, a distinct, separate fusiform muscular mass about 12 cm long was found in the left hemithorax, covered by superficial fascia and located anterior to the pectoralis major muscle. The details are given in this case report. There is a lot of debate on the origin of the muscle. This muscle can be misdiagnosed on routine mammography as a breast mass. It can play an important role in reconstruction flap surgeries. Such anatomical variation should be kept in mind during surgical procedures and diagnosis.

Key words: Dissection, Mammography, Sternum

INTRODUCTION

The sternalis is an anatomical variant of anterior chest wall muscle. It occurs either unilateral or bilateral. It lies in the anterior chest wall, superficial to the sternal origins of the pectoralis major muscle. The sternalis usually courses longitudinally adjacent to the sternum and does not cross the midline. Several variations regarding the superior and inferior attachments have been noted. The superior attachment can include the tendon of the sternocleidomastoid muscle,¹ sternum, clavicle, pectoralis major, platysma and the upper ribs and costal cartilages. The inferior insertions can include the third to eighth costal cartilages, 4th to 8th ribs, the anterior rectus sheath, the pectoralis major fascia, and the subcutaneous adipose tissue overlying the muscle.²

The sternalis muscle is a well-known documented normal anatomic variant seen in humans.^{3,4}

Many more terms have been used in the literature to describe sternalis muscle such as “parasternalis” and “rectus sterni” muscle.^{5,6}

The reported incidence of the sternalis muscle varies across genders, with a higher incidence in females (8.7% compared with 6.4%).⁷ An incidence of 4-8% is reported in Indian subject.⁸

CASE REPORT

During routine dissection in the Department of Anatomy, of the thoracoabdominal region of a 49-year-old male a variation was seen. A distinct, separate fusiform muscular mass about 12 cm long, covered by superficial fascia and located anterior to the pectoralis major muscle on the left side was found. Its origin was inferior to the sternal angle and was at a distance from the clavicle as per Figure 1.

The lateral tendinous portion originated together with fibers of sternochondrocostal portion of the left pectoralis major muscle, whereas the medial portion was firmly attached to the body of sternum. The fibers ran superficial and perpendicular to the fibers of pectoralis major muscle. The tendons and the muscle fibers together form a fusiform muscle 12 cm long, 6 cm wide that inserted into the deep fascia covering the superficial surface of the abdominal portion of the pectoralis major muscle. Small twigs of nerves were seen piercing the muscle, but could not be traced. Since they were one above the other and present parasternally, they are likely to be the continuation of left anterior intercostals nerves.

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DISCUSSION

According to Turner 1867, Bartolemeu Cabrolio 1529-1603, Professor of anatomy in Montpellier, named it for the first time in his book *Anatomes Elenchus Accuratissimus* published in 1604. It was Du Puy, however, in 1726 who was the first author to describe it accurately. The history is compiled in Table 1.⁵

Two radiological reports (Bradley *et al.* 1996,⁹ Murphy and Nokes, 1996) highlighted the diagnostic dilemma posed by a sternalis muscle in the detection of breast cancer. Although sternalis has been well-described in the literature, some confusion persists. For example, it is presented in Gray's Anatomy,¹⁰ as a variation of pectoralis major and is called rectus sternalis, whereas in the embryology text by Larsen (1997)¹¹ it is presented as a derivative of the rectus column and called sternalis.

There is a debate since the 17th century particularly about the homology and innervation of sternalis, and there is an extensive literature. The homology debate from the literature reviewed Table 2 shows that the sternalis has been classified by various authors under four main headings, as being derived:

1. From pectoralis major
2. From rectus abdominis
3. From sternomastoid and
4. From the panniculus carnosus.

An examination of the innervation patterns has narrowed the debate. Sternalis is either pectoralis major derived with an innervation from the thoracic pectoral nerves or

rectus derived with an innervation from the intercostal nerves.

Recently, two articles reported on the sternalis muscle^{12,13} attributed the nerve supply to be anterior cutaneous branch of the intercostals nerve. Morrita (1944)¹⁴ studied 46 sternalis muscle and never observed the innervation coming from intercostals nerve.

Kida *et al.*¹⁵ has observed the nerve supply of sternalis in more than 40 cases over 15 years. In those cases, nerve supply came from pectoral nerves only.

There are many reports on the participation of the intercostals nerves. Shephard 1885; Bardeleben, 1888; Fick, 1891; Christian, 1898; Yap, 1921; Taniguchi and Fochihara, 1932; Slobodin, 1934, 1935; Barlow, 1935; Misra, 1954; Rao and Rao, 1954; Kacker, 1960; Bles, 1968; Kitamura *et al.* 1985; Shen *et al.*, 1992; Jeng and Su, 1998; O'Neill and Folancurran, 1998. However, it's quite challenging to preserve the accurate nerve supply as the nerves get easily damaged during dissection of pectoralis fascia, so a preferred technique would be microdissection.¹⁵

This anomaly is not associated with any symptoms. The presence of sternalis muscles has been associated with other congenital abnormalities of pectoralis major muscle and in 48% of anencephalic neonates.⁷ According to a recent review by Bradley *et al.* 1996⁹ the sternalis muscle is identified in only 4 of 32,000 patients during mammography screening. In these cases, it is usually identified on the cranio-caudal projection as a triangular or flame shaped structure, sometimes with ill-defined margins frequently with fat surrounding it in the medial and deep layers of the breast. Using other imaging techniques, such as computed tomography (CT) or magnetic resonance imaging (MRI), the sternalis muscle is clearly revealed

Table 1: Background history of the sternalis muscle⁵

Year	Author
1604	Cabrolio: Names it for the first time
1726	Du Puy: Describes the muscle's associations
1800	Sommering: Describes the direction of the muscle fibres in relation to the fibres of the pectoralis major muscle
1825	Meckel: Refers to the existence of aponeurotic intersections
1854	Strambio: Confirms the existence of aponeurotic intersections
1888	Bardeleben: The first reference to the muscle's innervation (a study of 8 cases)
1888	Roubinowitch: First observation in living subject
1890	Le Double: Reports 33 cases
1911	Pichler: Publishes the results of his research in 10,500 living subjects
1912	Sclavounos: Describes the muscle's innervation in detail
1912	Eisler: Reviews all published works about the muscle, including his personal contribution
1950	Costa: Studies 74 muscles in 1000 cadavers
2001	Jelev, Georgiev, and Surchev: Provide a compilation of frequencies in population and subpopulation and also introduce a classification scheme based on muscle attachment

According to Turner (1867), Costa (1950), and Jelev *et al.* (2001)



Figure 1: Unilateral sternalis muscle

Table 2: Homology of the sternalis muscle from a review of the literature⁵

Derivation from pectoralis major	Derivation from rectus abdominis	Derivation from sternomastoid	Derivation from panniculus carnosus
Bardeleben, 1876	Early anatomists*	Bourienne, 1773*	Turner, 1867
Abraham, 1883	Bardeleben, 1876	Theile, 1843*	Barlow, 1935
Cunningham, 1884, 1888	Fick, 1917	Henle, 1858*	Shen <i>et al.</i> 1992
Shepherd, 1885	Fukuyama, 1940	Bardeleben, 1876	
Bryce, 1899	Rao & Rao, 1954	Rao & Rao, 1954	
Eisler, 1901	Blees, 1968	Blees, 1968	
Ruge, 1905	Larsen, 1997		
Huntington, 1905			
Fick, 1917			
Yap, 1921			
Fukuyama, 1940			
Dziallis, 1968			
Kida & Kudoh, 1991			

*Turner (1867)

as a longitudinal structure with a parasternal course. When supine the muscle is flattened or band like. When person is prone the muscle is mobile and has a bulging appearance. The classic description on CT or MRI is deep, vertically oriented parasternal tubular structure surrounded by fatty tissue.⁵ The sternalis can present alterations on electrocardiogram⁵ or wrongly interpreted as mass requiring surgical resection.⁹ Pichler (1911) stated “in order to reach reliable evidence I used the following method:

“If you let the subject perform stroking, scratching movements in a horizontal direction at the area of the opposite anterior superior iliac spine with the elbow fixed and flexed in a blunt angle, a sternalis muscle if present, would become prominent.”²⁵

CONCLUSION

Awareness of the muscle and its early identification is imperative in order to proceed in an appropriate plane during surgical dissection. A subcutaneous vertical craniocaudally oriented muscle strip is very confusing if the surgeon is not aware of its identity. A recent case report indicates that, many surgeons are not familiar with this variant.¹⁶ In cases where the muscle is identified and spared, a special note be made so that it is not mistake for a recurrence at a later date. The target depth of radiation of internal mammary nodes varies if the muscle is spared, and the same information should be conveyed to the radiotherapist. Radiologists should be familiar with the image findings of the sternalis muscle to avoid any confusing pathologic lesions and facilitate its clinical use such as flap.¹⁶ The sternalis if present could be used for reconstructive surgical operations on the breast.¹⁷

Despite numerous description of the sternalis muscle in the literature, the muscle though known to anatomists, is relatively unknown by clinicians. Discussion of the muscle is non-existent during medical training or seldom included in standard medical texts.¹⁸

During medical training a mention of this muscle should be done to prevent any misdiagnosis.

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