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The sternalis muscle in cadavers: anatomical facts and clinical significance

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Abstract

The sternalis is an anomalous muscle located in the anterior wall of thorax and several past reports have described its presence with clinical implications. The sternalis muscle may be incidentally detected during routine cadaveric dissections and autopsies. We observed the presence of anomalous sternalis muscle on both sides of the anterior chest wall in 25 cadavers (n = 50), over a span of three years. Out of a 50 cases, we observed a single case of sternalis on the right side of the 55-year-old male cadaver (2%). The sternalis was found to be absent in the rest 49 cases (98%). The sternalis muscle displayed an oblique course in the anterior wall of the thorax. The muscle originated near the seventh costal cartilage extending obliquely upwards to insert into the second costal cartilage close to the sternum. The originating portion of the muscle was located at a distance of 3.5 cm lateral to the mid-sternal plane. The vertical length and the maximum width of the anomalous sternalis muscle measured 9 cm and 1.9 cm, respectively. The fibers of the muscle vertically ascended upwards. No other associated anomalies were observed in the same cadaver. The presence of sternalis muscle is considered to be a rare variation with no earlier studies being performed in the Malaysian population. The anomalous sternalis muscle may be important for reconstructive surgeons performing mastectomy and radiologists interpreting mammograms. Thus, the sternalis muscle may be academically, anthropologically and surgically important. ***Clin Ter 2009; 160(2):129-131***

Key words: *anatomy, anomalous, muscle, rectus, sternalis, thorax*

Introduction

A rare variation in the vicinity of the anterior chest wall is the presence of sternalis muscle. Over the past years, several anatomists have used various terms like "pectoris rectus" or " episternalis" or "parasternal" or "presternalis" to define anomalous sternalis muscle and a detailed description of at least seventeen different nomenclature in a tabular form, defines the importance of such a muscle (1). As per earlier research reports, this anomalous muscle is located in the anterior wall of the thorax in the parasternal region (1).

One of the earlier researchers quoted the fact that this muscle was first named by Cabrolio in 1604 and thereby, its features were described in detail by Dupuy in 1926 (1, 2). The sternalis muscle may be related to ethnic population. This anomalous muscle may be present in 2.9-6.4% in white races while its incidence in blacks have been reported to be around 11% (3). The muscle has also been reported to be present in 1% of the Chinese population, 3.3% Filipinos, 13.1% Japanese and 4-8% of the Indian population (3, 4). However, there is paucity of literature on the Malay population inhabiting the region of the Malaysian subcontinent.

Few of the standard anatomy textbooks do mention about the existence of such anomalies (5) but the main source of information are the research reports. Interestingly, the anomalous muscle has been reported to be more prevalent in the Asian community with its incidence reaching up to 11.5% (6). Perhaps, this was the reason for the curiosity behind our work i.e. to observe the incidence and features of sternalis in the Malaysian subcontinent region and discuss its clinical implications.

Material and Methods

We performed the study on both sides of 25 adult cadavers (n = 50), the age of which varied between 20 to 60 years (average 40 years). The anterior abdominal wall and the anterior wall of the thorax were carefully dissected to observed the presence of any anomalous muscle. Morphometric measurements were taken and the specimen was photographed (Fig.1). A line diagram of the anomalous sternalis was also drawn (Fig. 2).

Results

The rectus sternalis muscle was observed on the right side of the thorax of a 55-year-old male cadaver (2%). The anomalous muscle was thin and flat, located below the skin, above the pectoralis major muscle, lying adjacent to the right

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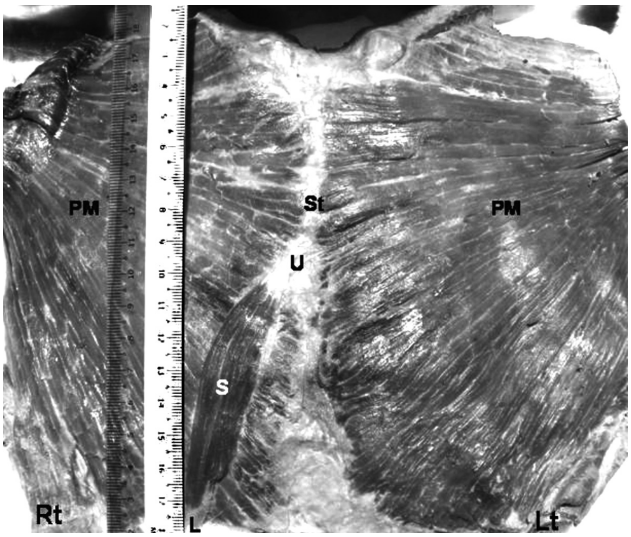

Fig.1. Dissected specimen of anterior thoracic wall showing:
St: Sternum; **S**: Sternalis muscle; **U**: Upper end of sternalis; **L**: Lower end of sternalis; **PM**: Pectoralis Major muscle; **Rt**: Right side; **Lt**: Left side.

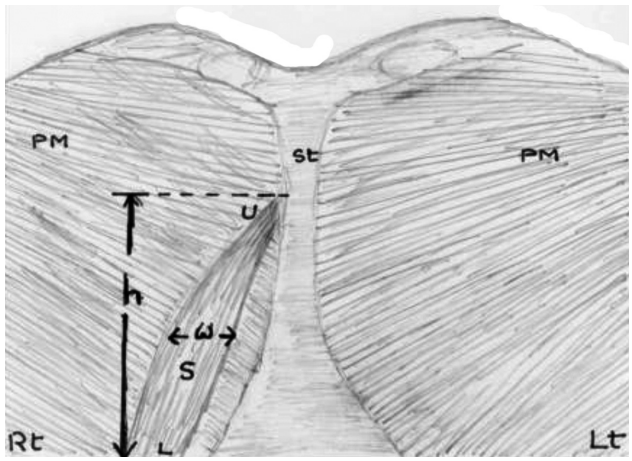

Fig. 2. Sketch diagram to show the anomalous sternalis muscle
St: Sternum; **S**: Sternalis muscle; **U**: Upper end of sternalis; **L**: Lower end of sternalis; **PM**: Pectoralis Major muscle; **Rt**: Right side; **Lt**: Left side
Note that the maximum vertical length and width of the sternalis muscle is marked as 'h' and 'w' respectively.

parasternal border ('S' in Fig.1). The muscle measured 9 cm in length and 1.9 cm at its maximum width. The superior part of the muscle was attached to the right side of the sternum at the level of the third costal cartilage. Inferiorly, the muscle was attached to the aponeurosis of the right external oblique, located at a distance of 3.5 cm from the parasternal border at the level of the seventh costal cartilage. On careful observation, the upper end of the muscle was found to be spindle shaped while the lower end was broader. No other associated abnormalities were detected on the left side of the same cadaver. Both sides of 24 cadavers and the left side of the anomalous single cadaver (98%) did not show any presence of sternalis muscle.

Discussion

Sternalis is an anomalous muscle which may be incidentally detected during routine cadaveric dissections and autopsies. Often, the anomalous muscle is detected incidentally during mammography procedure (7). An earlier researcher had described this anomalous muscle as a misplaced pectoralis major muscle (5). As per embryologists' description, it is considered to be a derivative of myotomic hypomeres that develops into the muscles of the ventral and lateral wall of thorax and abdomen, such as external oblique, internal oblique, transverses abdominis and rectus abdominis (8). The sternalis muscle may be derived from primitive ventral longitudinal muscle sheet from which the pectoralis, sternocleidomastoid, and rectus abdominis develop (9). Thus, the sternalis muscle may be linked developmentally to the pectoralis major and it may be considered as a continuation of rectus abdominis muscle. In the present case, we did not find any associated abnormality in the pectoralis major muscle so that it is development might have been linked accordingly.

The presence of the sternalis muscle has been considered to be a mystery (10). Interestingly, it was observed in 48% of anencephalic fetuses examined by a researcher (11). Perhaps, this finding encourages researchers to think more in detail about the existence of such an anomalous muscle in early ages. Researchers have thought the anomalous sternalis muscle to be nothing more than a misplaced developed muscle tissue, which could have originated from different sources in the anterior wall of thorax and abdomen (10).

A thorough search of literature depicts that the sternalis muscle may be accompanied by abnormality of the pectoralis major or any other associated anomaly of the anterior chest wall (8, 12). Interestingly, an earlier study had reported the presence of a supernumerary rib on the right side of the cadaver associated with anomalous sternalis muscle (12). However, in the present study, no other associated skeletal anomalies were observed.

The fact that both sternalis muscle and pectoralis major muscle are derived from the same source explains the reason why the anomalous sternalis muscle may be supplied by the pectoral nerves. An earlier researcher observed 40 cases over a span of 50 years and reported the fact that sternalis muscle is innervated by pectoral nerves (2). Researchers have described the sternalis muscle to be innervated by the pectoral or the intercostal nerves (4, 13). Some researchers described the innervation of the sternalis muscle by intercostal nerves (14). In the present case, we did not observe the pectoral nerves to innervate the anomalous sternalis muscle, rather it was innervated by the intercostal nerves.

During routine mammography, the presence of anomalous sternalis muscle may result in erroneous interpretation of CT scan. The sternalis muscle may mimic a malignant breasts mass (7). Recent research reports have described the presence of the anomalous sternalis muscle to be a hurdle in submuscular pocket dissection during breast augmentation surgeries (15). Splitting of the pectoralis muscle during any surgery would also become difficult in case of presence of any anomalous sternalis muscle. It has been considered that surgery for any tumor located in the upper and lower qua-

drant of the breast, the removal of this muscle would help in complete dissection of breast tissue and pectoral fascia (16). For surgeons operating on the anterior thoracic and abdominal wall, it is essential that they are familiar with the presence of such anomalous muscle.

We as anatomists feel that a vertical, oblique muscle extending from 7th to 3rd to the costal cartilages as observed in the present case, would have influenced the movements of the costal cartilage and sternum on the right side during any process of respiration. We also opine that a compression of the sternal origin of pectoralis major fibres as seen in the present case might have influenced its role as a medial rotator and adductor. Admittedly, no clinical history of the patient was available to corroborate such facts.

In conclusions, to date, there is paucity of information on the presence of sternalis in the Malaysian subcontinent. Our study although confined to a limited sample size because of the constraints in having cadavers, still showed that sternalis muscle may be a rare entity. Prior, anatomical knowledge on the presence of sternalis muscle might be important for academic, anthropological, clinical and radiological purpose.

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