

Sternalis Muscle: a Case Report and Literature Review.

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Sternalis muscle is an anatomical variation of the anterior thoracic wall. Its incidence in white population is 4-7%. During a routine dissection of male cadaver, a long flat muscular structure was observed, crossing the anterior thoracic wall, which was composed of two bellies and intermediate tendon. It was located underneath the superficial thoracic fascia and superficially to pectoralis major. Superior belly was oriented parallel and merges with the fibers and fascia of right pectoralis major. Thin long intermediate tendon crossed the sternum. The inferior portion of the muscle was wider and longer than the upper one. Its fibers were oriented perpendicularly to the fibers of left pectoralis major and caudally fused with the anterior layer of the rectus abdominis sheath. The two bellies had different nerve supply by the pectoral nerve (superior belly) and anterior branches of the intercostal nerves (inferior belly). The knowledge of sternalis muscle is important for radiologists and surgeons.

Key words: sternalis muscle, pectoralis major muscle, rectus abdominis muscle, variation

Introduction

Sternalis muscle is an uncommon anatomical variant located on the human anterior thoracic wall, superficial to pectoralis major muscle [1]. This long and flat muscle usually extends from the inferior costal cartilages and rectus sheath to the upper part of the sternum or superiorly located costal cartilages or fuses with the fibers of sternal head of sternocleidomastoid muscle [21]. Sternalis muscle was reported for the first time by Cabrollo (1604) in his book “Anatomes Elenchus Accuratissimus” and also described by Du Puy (1726) [12]. There are a lot of synonyms for this variable muscle: episternalis, presternalis, sternalis brutorum, rectus thoracis, rectus sterni, superficial rectus abdominis and they have also been used in the literature [4, 6, 11, 12, 14]. Nevertheless this muscle is often unknown even in clinical practice [2, 20].

The collected data shows that sternalis is a rare anatomical variation with different incidence in different populations. Its incidence in white population is 4-7%, in black population is 8,4% and in Asian population – 11% [17]. The first study and evaluation of the incidence of sternalis in Bulgaria and the first report on the frequency of the

muscle in Eastern Europe is performed by Jelev et al. [9]. They suggested a definition of sternalis muscle and also based on an extensive review of the literature they offer first classification of this rare variation [9].

The aim of this case report is to disseminate the awareness of this rare finding among clinicians, anatomists and medical students, as well as to expand data on the prevalence and morphology of sternalis in the Bulgarian population.

Materials and Methods

We present a case of a 90-year old male cadaver of Caucasian descent from the dissection hall of the department of Anatomy and Cell Biology, Medical University-Varna, Bulgaria. Routine dissection of the pectoral region was performed, according to the Vankov's standard dissection guideline. After removing the skin and superficial fascia of the dissected region, any muscular variation of the anterior chest-wall was carefully observed and followed for its details like origin, insertion and morphological features and photographs were taken. The length and breadth of the variable muscle were measured using a ruler. Cadaver material was obtained according to Regulation №2 from 18.05.2012 of the Bulgarian Ministry of Health.

Results

During routine dissection of the cadaver, a long muscular strip was observed under superficial fascia, over the anterior surface of the thoracic wall. It was a flat, double bellied muscle, oriented obliquely and located superficially to the pectoralis major on the right and left sides. Superior belly (1) was oriented parallel and merges with the fibers and fascia of right pectoralis major. It originated 4 cm laterally to the midline, at the level of second sternocostal junction and was about 1 cm wide. Thin flat 4 cm long tendon (2) crossed the sternum. The inferior portion of the muscle (3) was wider (about 2,5 cm) and longer (about 6,5 cm) than the superior one. Its fibers were perpendicularly oriented to the fibers of left pectoralis major and caudally fused with the anterior layer of the rectus abdominis sheath, medially to the attachment place of the left serratus anterior. The two bellies had different nerve supply by the pectoral nerve (superior belly) and anterior branches of the intercostal nerves (inferior belly) (**Fig. 1**).



Fig. 1. Anterior surface of thorax: 1-superior belly of m. sternalis, 2-tendon of m. sternalis, 3-inferior belly of m. sternalis.

Discussion

Although sternalis has been described for the first time in 17th century, it is still a mystery. There are a lot of theories for origination of this muscle. Some authors described it from sternocleidomastoid, rectus abdominis [4], pectoralis major [13], obliquus externus abdominis [18]. There are a number of theories about its phylogenetic origin. Although it has been described always superficially, some authors discuss it as a part of longitudinal ventral paramedian muscle sheet which disappears, leaving the hyoid muscles in the anterior cervical region and rectus abdominis of the anterior abdominal wall [16]. Sternalis is considered to be a remnant of panniculus carnosus, which is a thin sheet of skeletal muscles, located subcutaneously in lower mammals and acting to move the overlying skin [3]. Turner has described it as an atavistic form of *m. pectoralis cutaneous* of lower animal [19]. According to Ruge it is presented as rudimentary cuticular muscle in some mammals, which could be found as a subcutaneous muscular fibers of the anterior thoracic wall in humans [15]. Clemente considered it as misplaced portion of pectoralis major [7].

In our case report, the superior belly of sternalis was located in the left pectoral region, just superiorly to superficial pectoral fascia. It originated from aponeurosis of pectoralis major and the fibers direction was same as that of the pectoral muscles. Therefore we would exclude that it was a part of the ventral longitudinal column of muscles, and rather agree with authors who accept it as a part of atavistic thoracic subcutaneous muscle or a misplaced portion of pectoral muscles [7, 15, 19]. Inferior part of sternalis, in our opinion, probably has another origin. We can accept this because the muscle fibers run parallel to those forming *m. rectus abdominis* and are perpendicular to the fibers of the thoracic muscles on the right. For this part of the variant muscle we rather agree with Sadler [16] that it is a part of the ventral longitudinal column of muscles or as a part of panniculus carnosus in lower mammals [3].

Reported incidence of sternalis in the literature is between 4% and 11% in different populations. The variation is mostly one-sided, varying in shape and size. In Bulgaria the reported incidence is 2.9% [9]. Incidence of sternalis has been reported as 4.5% unilaterally and less than 1.7% bilaterally [22]. Unilateral sternalis is twice as common as bilateral one [2, 3]. Five cases of this rare variation have been reported in Bulgarian studies: three of them are unilateral and two of them are with bilateral localization [8, 9]. The sternalis muscle presented in our case can be classified as “crossed sternalis” [10].

Researchers are uncertain regarding innervations of sternalis. In 55% of the cases the innervation is by branches of pectoral nerves, in 43% by branches of intercostal nerves and 2% by both intercostal and pectoral nerves [3, 5]. Because the nerve supply corresponds to the myotomes of origin, we can make this assumption for the two-bellied sternalis in our case – each belly has a different embryonic origin. We can accept that there are two different muscles, which are located bilaterally and fused by intermediate tendon over body of the sternum.

Conclusions

The knowledge about the variations of sternalis helps in better interpretation of great number of mammography done every year. The presence of it may mimic focal densities in the medial breast on mammography, leading to suspicion of a neoplasm. It is necessary to document this unusual anatomical variants with the use of various diagnostic and therapeutic tools like mammography, CT or MRI as its presence may affect area of surgical excision and radiation dose in breast cancer. It also could be used in breast reconstruction or in the plastic and reconstructive surgery of the head and neck region. This shows the importance of this structure in everyday clinical practice.

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