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Case Report

A Bilateral Double Sternalis Muscle in a Korean Cadaver

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Abstract : Although the sternalis muscle has been well known to anatomists, it is quite unfamiliar to clinicians. During routine educational dissection, we came across a well-defined bilateral double sternalis muscle innervated by the intercostal nerve, respectively. The right sternalis muscle 1) became tendinous to insert into the sternum and 2) crossed midline and then intermingled with the left pectoralis major muscle, which could be classified into a double with single cross based on Snosek et al.'s criteria. The left sternalis muscle was composed of two bellies, which were combined at the midway, and became tendinous to insert into the contralateral manubrium, which could be classified into a bicipital diverging with double cross based on Snosek et al.'s criteria. The detailed knowledge on the sternalisis is important for clinicians as well as for anatomists, since the clinical importance of the sternalis muscle has been highlighted in recent years.

Keywords : Sternalis muscle, Muscular variation, Pectoral region

Introduction

The sternalis muscle was first reported by Barthelemy Cabrol in 1604 [1], since then it is described as one of variations of pectoral region [2]. Jelev et al. [3] outlined four basic morphological characteristics that must be satisfied for a muscle to be accepted as the sternalis muscle: (1) location between the superficial fascia of the anterior thoracic region and the pectoral fascia; (2) origin from the sternum or infraclavicular region; (3) insertion onto the lower ribs, costal cartilages, aponeurosis of the external abdominal oblique muscle or the sheath of rectus abdominis; (4) innervation by the anterior pectoral and/or intercostal nerves.

A recent review [4] summarized the characteristics of the sternalis muscle: 1) It appeared as the highly variable nature to be cord-like, flat-band, or irregular in shape; 2) A unilateral sternalis muscle is more common (66.86%) than bilateral (33.14%), with preferential occurrence on the right side (63.75%); and 3) The nerve supply to the muscle has been reported to come from the pectoral (51.88%) or intercostal nerves (43.13%), with rare instances of both nerves contributing to the innervation (5%).

Snosek et al. [4] also analyzed prevalence from previous reports on 2,775 cadavers, which showed an overall prevalence of around 7.8% (7.5% in male, 8.6% in female) in the general population. Prevalence does vary by race, the highest rate in the Asian population (11.5%) [3]. The reported prevalence within Korean cadavers ranges from 5% (6/120) [5] to 12.9% (13/101) [6]. Clinical re-

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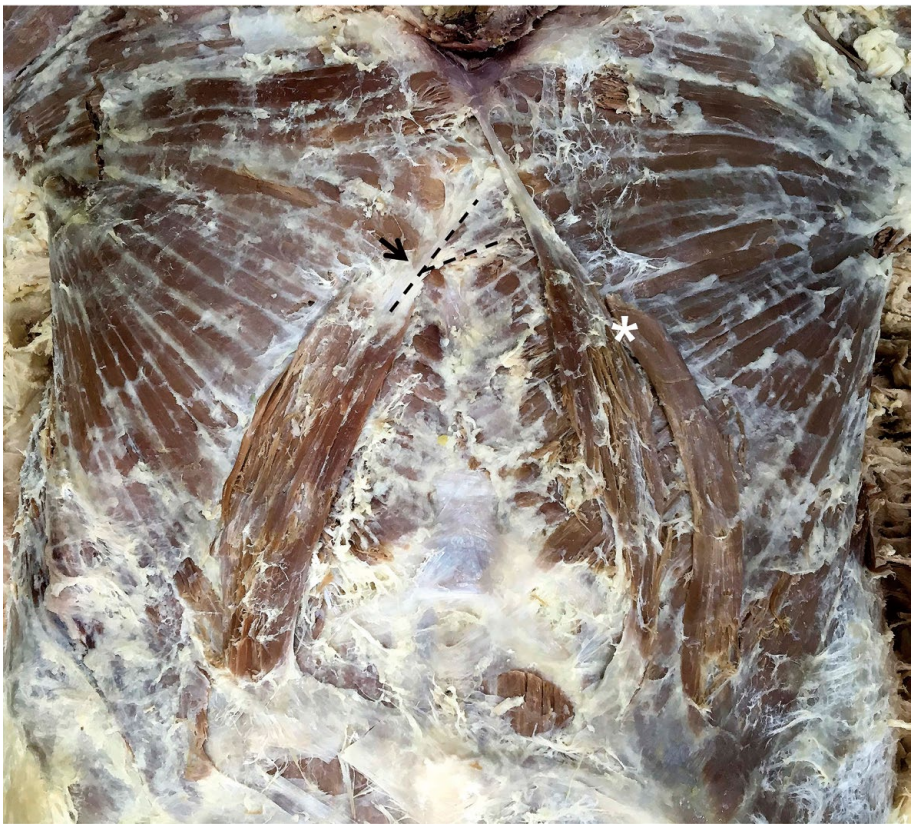

Fig. 1. Photograph of the described bilateral sternalis muscle. The right sternalis muscle 1) became tendinous to insert into the sternum (arrow) and 2) crossed midline and then intermingled with the left pectoralis major muscle (dashed lines). The left sternalis muscle was composed of two bellies, which were combined at the midway (asterisk), and became tendinous to insert into the contralateral manubrium.

ports, whereas, on the sternalis muscle indicate a lower prevalence of 0.6% [4]: 0.02% on mammography, 0.48% during surgery, and 6.4% on multi-detector computed tomography (MDCT). In case of Korean [7], the prevalence was reported 6.2% (86/1,387) using MDCT chest scans.

Though well known to anatomists, most physicians, residents from the disciplines of general surgery, plastic surgery and radiology, and 3rd- and 4th-year medical students are not familiar with this variant [8]. Herein, we describe a rare variation of the bilateral sternalis muscle and reviewed its clinical and embryological aspects.

Case Report

During educational dissection, we found a well-defined bilateral sternalis muscles in a 55-year-old Korean male cadaver, whose cause of death was 'skull fracture by an accidental fall'.

The bilateral sternalis muscle (Fig. 1) were flattened anteroposteriorly and positioned over the pectoralis major, which were innervated by the intercostal nerve, respectively.

The right sternalis muscle was measured to be 14.8 cm in length and 3.2 cm at its broadest part. The inferior fleshy end formed aponeurosis, which merged with the fascia over costal arch. The muscle belly extended upward and medially, and then 1) became tendinous to insert into the sternum at the level of 2nd rib or 2) crossed midline and intermingled with the left pectoralis major muscle, costal part at the 2nd rib level.

The left sternalis muscle was composed of two bellies, medial and lateral. The medial and lateral bellies were measured to be 11.9 cm and 10.6 cm in length and 3.3 cm and 2.4 cm at its broadest part, respectively. The inferior fleshy end merged with the pectoralis major muscle, sternal and abdominal heads at the 6~7th rib level. The lateral belly was combined with the medial belly at the surface of

pectoralis major muscle at the 4th rib level, continued for a short distance along left sternal margin, and then became tendinous to insert into the contralateral manubrium.

Discussion

Herein we clearly showed a bilateral double sternalis muscle, which were supplied from the intercostal nerve. It could be classified into type IIc with the proportion of 3.0% based on Ge et al.'s criteria [9], and further classified into a double with single cross and a bicipital diverging with double cross based on Snosek et al.'s criteria [4]. But previous classifications [3,4,9] did not cover all the morphological findings of the sternalis muscle, including this case, because there have been numerous reports on the sternalis muscle variants.

The 4 common proposed hypotheses on the sternalis suggest it is derived from the panniculus carnosus, the sternocleidomastoid, the pectoralis major or the rectus abdominis, although there has been a debate on embryological explanation of it [4]. This case might support the hypothesis that the sternalis is arisen from the pectoralis major muscle. The sternalis muscle was found to be laid on the same plane and intimately attached to the sternal fibers of the pectoralis major. The hypothesis might be reinforced by the previous reports [10-12], in which the pectoralis major muscle was deficient in its most medial aspect and direct attachment to the sternum and costal cartilages.

Contrary to the report that prevalence of the sternalis muscle varies by race [3], the prevalence is quite similar - 7.8% in the general [4], 8.6% in Korean cadaveric studies [5,6] and 6.2% in Korean radiologic study [7]. Despite its well-documented existence without significant function for anatomists, substantial technological progress in medical imaging and surgical procedures has once again brought the sternalis muscle into relevance: misdiagnosis into neoplasm of the anterior thorax [4,7] to a useful muscular flap in the plastic and reconstructive surgery [3]. Furthermore, the sternalis muscle may cause symptom, long-term painful soft tissue swelling of the parasternal region [13]. A well-developed muscular belly, including this case, could be regarded as a symptomatic sternalis muscle. Hence clinicians as well as anatomists should be aware of this muscular variant.

Conflict of Interest

None declared.

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한국인 시신에서 발견된 두 힘살로 구성된 양쪽 복장근

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간추림 : 복장근은 해부학자에게 매우 익숙한 가슴근육의 변이이다. 최근 영상의학의 발달로 복장근의 발견이 빈번해졌고, 수술에 이용되는 경우도 보고되고 있다. 통상의 해부학 교육과정에서 각각 두 힘살로 구성된 양쪽 복장근이 발견되었다. 오른복장근은 두 힘살로 일어 하나는 힘줄이 되어 같은쪽 복장뼈에, 다른 하나는 반대쪽 큰가슴근의 힘살과 합해졌다. 왼복장근은 두 힘살이 중간에 합해진 후 반대쪽 복장뼈머리에 힘줄이 되어 닿았다. 두 복장근은 모두 갈비사이신경의 지배를 받았다. 복장근은 매우 다양한 형태로 발견되고, 그 분류가 단순하지 않다. 본 증례를 통해 한국인 복장근에 대한 자료 및 임상적 의의를 요약하였다.

찾아보기 낱말 : 복장근, 근육변이, 가슴

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