

An unusual sternalis with variation of the contralateral sternocleidomastoid muscle: A Case Report

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Abstract

Purpose

To report a previously undocumented variant of sternalis.

Methods

An unusual muscle was observed during routine dissection.

Results

The sternalis muscle located in the right thoracic region originated from the superior portion of the rectus abdominis sheath and 5-6th costal cartilages, crossed the midline and attached at the sternum. The muscle fibers then ascended with the left sternocleidomastoid muscle as an additional fasciculus, of which the superior ends were finally terminated at the left mastoid process. The sternalis muscle of the thoracic region was innervated by the anterior cutaneous branches of right intercostal nerve, while the additional fasciculus ascended with the left sternocleidomastoid muscle was innervated by the branches of left accessory nerve.

Conclusions

This study presents a unilateral sternalis muscle with the contralateral sternocleidomastoid variation. It will enhance the exhaustive classification of sternalis, and provide significant information to radiologists, angiologists and surgeons for better interpretation of images and safer interventions.

Introduction

Sternalis muscle was first described in 1604, with the advent of medical imaging and thoracic surgery, the clinical importance of this muscle has been re-emphasized. The sternalis is an accessory muscle which locates in anterior thoracic region and originates from adjacent structures [5]. It has a prevalence of 8% in human population [1]. Awareness of sternalis and its variations has major implications in breast and thoracic surgery [10]. Despite the appropriately summarized sternalis classifications and comprehensive studies [10], confusions still persist with regards to its morphology and homology. Here, we report a previously undocumented variant of well-developed sternalis muscle with variation of the sternocleidomastoid muscle. In addition to being informative for clinical practice, our case will guide in better understanding of phylogeny of the unusual, often unnoticed or unknown muscle.

Materials And Methods

The cadaver was a 93-year-old Chinese male. The cause of death was coronary heart disease. Routine dissection of the chest was made by medical students at Sun Yat-Sen University. The morphology the anatomic variant were captured with a digital camera.

Results

A parasternal mass deep to the superficial fascia of the anterior thoracic wall and superficial to the pectoral fascia overlying the pectoralis major muscle was observed in the right hemi-thorax. The sternalis muscle located in the thoracic region was 128.47 mm long, 26.3mm wide, 0.6 mm thick. It originated from the superior portion of the rectus abdominis sheath on the right side opposite the 5th and 6th costal cartilages, 22.4 mm from the midsternal line (Fig. 1). Fibers of the sternalis continued upwards, crossed the sternum from right to left over the sternal angle, and became a thin delicate intermediate tendon attached at the left sternum margin in the thorax.

On further dissection, it was observed that the muscle fibers ascended with the left sternocleidomastoid muscle as an additional fasciculus, of which the superior ends were finally terminated at the left mastoid process. The fasciculus, which was 189.7mm long, 11.4 mm wide and 4.6 mm thick, ran along with from the medial and lateral sternal head (SH), and formed the middle SH of the sternocleidomastoid muscle.

The sternalis muscle of the thoracic region was innervated by the anterior cutaneous branches of right intercostal nerve that penetrated the muscle near its medial margin on its deep surface (Fig. 2a). The fasciculus ascended with the left sternocleidomastoid muscle was innervated by the branches of left accessory nerve entering the left sternocleidomastoid muscle (Fig. 2b).

Discussion

It is generally recognized that the prevalence of sternalis varies greatly in different races and populations [3, 5, 10]. The sternalis muscle is more often unilateral than bilateral, and it is more frequently on the right side than left side [1, 4, 10]. According to Snosek et al [10], sternalis muscle was classified into simple type, mixed type and other based on each hemithorax separately. Our case reported here fits into "other" category, which is absent from previous classifications.

It has been shown that the innervation of sternalis muscle is most likely to be external or internal thoracic nerves or the intercostal nerves with blood supplies from internal thoracic artery [9, 10]. In our case, the sternalis muscle located in the right thoracic region was innervated by the anterior cutaneous branches of the right intercostal nerve, while the fasciculus ascended with the left sternocleidomastoid muscle was innervated by the branches of left accessory nerve entering the left sternocleidomastoid muscle. The blood supply for thoracic part of sternalis came from internal thoracic artery (figure not shown).

Previously, it has been reported that sternalis may have a function of skin tension or chest wall movement in respiration [3, 8]. The sternalis with variation of sternocleidomastoid muscle found in our case may have extra function similar to sternocleidomastoid. Normally, the sternocleidomastoid muscle

ascends obliquely across the side of the neck and attaches inferiorly consists of two heads, one from the sternum and one from the clavicle. In our case, SCMs have four heads of origin (three from the sternum and one from the clavicle). It is shown that the sternocleidomastoid muscle can have multiple attachments, and its variations become functionally, clinically, or surgically important only when the lower attachment or upper attachment shows variations [6]. During the dissection, the variation of cephalic vein and brachial plexus has also been found (figure not shown). Whether the variation of sternalis can be accompanied by other adjacent variations or is just partial of a larger group of variations is unknown. Microdissection technology is recommended for meticulous dissection and further exploration [8].

Because of the incomplete description of the sternalis in most anatomy textbooks, the absence of sternalis training or the deficiencies of sternalis detection technologies, many physicians, surgeons and radiologists have insufficient understanding or even no idea about the sternalis [1, 2, 3, 7, 10]. The existing of sternalis can affect clinical diagnosis (eg. abnormal ECG and misdiagnosis of imaging), clinical treatments (eg. radiation and surgery) [8, 9, 10]. In addition, for reconstruction surgery of the head, neck, anterior chest wall and breast, sternalis can also be used as muscle flap [4, 5, 7].

Declarations

Author contributions

X. Wang, H. Zou, J. Chen, H. Zhang, Y. Fu, Y. Wang, Z. Chen, R. Zhang, L. Zhang, K. Guo: dissection, data collection, data analysis, manuscript writing. D. Xu, J. Duan: data collection, manuscript writing.

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Conflict of interest

The authors declare that they have no conflict of interest.

Ethical approval

The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Zhongshan School of Medicine, Sun Yat-Sen University.

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Figures

Figure 1

a Anterior view of the thoracic wall showing the unilateral sternalis muscle (*SM*) with variation of the contralateral sternocleidomastoid muscle (*SCM*). **b** The pattern graph for the sternalis with variation of the sternocleidomastoid muscle. *IT* intermediate tendon, *RPM* right pectoralis major, *LPM* left pectoralis major, *RSCM* right sternocleidomastoid muscle, *SH1* medial SH, *SH2* middle SH, *SH3* lateral SH, *CH* clavicle head

Figure 2

a Anterior cutaneous branches of right intercostal nerve (*ICN*) penetrating the sternalis muscle (*SM*) near its medial margin on its deep surface are seen. **b** The fasciculus ascended with the left sternocleidomastoid muscle was innervated by the branches of left accessory nerve (*l*) entering the left sternocleidomastoid muscle. *RPM* right pectoralis major, *LPM* left pectoralis major, *SH1* medial SH, *SH2* middle SH, *SH3* lateral SH, *CH* clavicle head