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STERNALIS AN ANATOMICAL VARIANT – A CASE REPORT

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ABSTRACT

The Sternalis muscle is an anatomical variant that lies superficial to Pectoralis major muscle and sternum. It has been recognised as a variant of Pectoralis major or Sternocleidomastoid usually (1). The worldwide prevalence has been stated as 6% (2). The present case discusses the anatomical and embryological relevance. Bilateral Sternalis muscle was found in a 60year old male during the routine cadaveric dissection for undergraduate students. The muscle flap if present, is clinically used for breast reconstruction surgery.

Key words: Accessory muscle, Pectoral region, Thorax

INTRODUCTION

During the routine cadaveric dissection for the undergraduate students, the bilateral accessory muscle was found superficially in 60-year-old male cadaver (Fig.1). The muscle was thin with a length of approximately 19.4cm (Rt) and 20.1cm (Lt) and its fibres parallel to Sternum and perpendicular to Pectoralis major muscle fibres (Fig.2). The muscle mass between 2nd intercostal space and 5th rib on the right side has been chipped off during the dissection unknowingly (Fig.3). This muscle has its caudal attachments with the aponeurosis of External oblique muscle on both sides; having a length of 3.1cm (Rt) and 2.4cm (Lt) and merges at the level of 5th rib (Fig.4).

FIG.1-The muscle variant

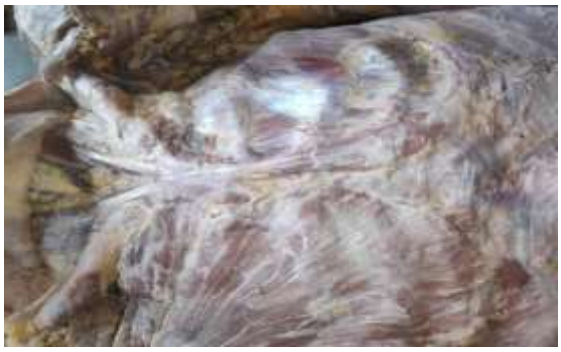

FIG.2- Muscle fibres parallel to Sternum

It runs upwards as the belly, superficial to Sternum, Pectoralis major, and Sternocleidomastoid (SCM) with an intervening fascia separating the muscles (Fig.5). The muscle belly was found to be widest near the 4th rib (Width 2.1cm on the Left side). The tendon from the muscle can be appreciated at the level of the second rib. The muscle continues and is in close apposition at the level of the first intercostal space. At the level of the Jugular notch, it diverges to either side of the median plane of the neck. The maximum distance between the tendons was 2.2cm as measured at a distance of 3cm above the Jugular notch. The tendons are found in proximity to the sternal and clavicular fibres of the Sternocleidomastoid (SCM). The tendons merge with the respective fibres of Sternocleidomastoid (SCM) at a distance of 2.1cm (Rt) and 2.4cm (Lt) from the right and left sternal ends of the Clavicle respectively (Fig.6).

DISCUSSION

Sternalis is a muscle with varied locations, origins, insertion, and nerve supply. According to Jelev (2001), the nomenclature of the muscle is entitled only if the following criteria are fulfilled (3). Location- between superficial and deep fascia of the pectoral region, Origin- from Sternum, Insertion – lower ribs, costal cartilages, Rectus abdominis sheath or aponeurosis of External oblique muscle. Nerve supply- Pectoral nerve or Intercostal nerves or both (4). One of the main criteria to label it as Sternalis is its origin from Sternum with the rest of the criteria being supportive (5,6). As the present muscle found in the pectoral region fulfills the above criteria, it is confirmed as Sternalis. It has been reported that the muscle is derived from neighbouring muscles like Sternocleidomastoid (SCM), Pectoralis major, Rectus abdominis. The present muscle fibres could be a variant of Pectoralis major as can be interpreted from its attachments along the sternum and External oblique aponeurosis (7). A microdissection technique has been recommended (Kida M Y et al, 2000) to preserve accurate innervations to the muscle as the nerve supplying the muscle may be easily damaged during dissection (3). Though literature cites the above-listed nerves as innervations to the muscle, the present study could not identify the said innervations.

Action- The function of the Sternalis muscle is still vague and has been opined that it may be involved in shoulder joint movement or may have an accessory role in lower chest wall elevation (Young Lee Bee) (3). The present muscle fibres as discussed above could be a variant of Pectoralis major and so the possibility of a similar action of that of the Sternocostal part of Pectoralis major in the extension of the flexed arm against resistance may be considered (8). Also, the present muscle Sternalis is in close proximity with fibres of Sternocleidomastoid (SCM), the action of the latter may be assisted by this accessory muscle especially in the function of elevation of manubrium sternii thus assisting in forced inspiration (9,7).

FIG.3- Right side chipped off

FIG.4- Caudal attachments.

The muscle is commonly reported to be present unilaterally but if it occurs bilaterally, it is usually asymmetric with the right side better developed than the left one (10). The size of the muscle is also recorded as usually large in males (11). It is also reported to be more common in females (8.7%) than males (6.4%). The present muscle was found in male and was bilateral but its variation in size could not be calculated as the right side had been cut off (Fig.3). The embryological origin of the Sternalis muscle has been stated as abaxial precursor. The ventrolateral (VLL) and dorso medial (DML) edges of prospective dermomyotome give rise to the progenitors for muscle tissue. A myotome is formed from the cells of both regions. There is also migration of few cells from VLL into the lateral plate mesoderm (parietal layer) across the lateral somatic frontier. This frontier separates the primaxial and Abaxial domain in the embryo which is the two mesodermal domains. The latter domain consists of a parietal layer of lateral plate mesoderm in combination with somite-derived cells that migrate across the frontier into this region (12). Some authors have opined that the muscle develops from Pectoralis major due to defects in muscle patterning especially the defective precursor migration of prepectoral mass that is essential for Pectoral muscle formation. This also may contribute to Sternalis muscle formation (3).

FIG.5-Fascia separating muscles

FIG.6- Merges with SCM fibres.

The length of the present muscle obtained was 19.4cm (Rt) and 20.1cm (Lt). The muscle belly width at the widest part was 2.1cm (Lt). Length of caudal attachments with the aponeurosis of External oblique muscle from both sides was 3.1cm (Rt) and 2.4cm (Lt) (Fig.4). The maximum distance between the tendons was 2.2cm noted 3cm above the Jugular notch. The tendons merge with the respective fibres of Sternocleidomastoid (SCM) at a distance of 2.1cm (Rt) and 2.4cm (Lt) from right and left sternal ends of the Clavicle respectively (Fig.6). A similar study conducted by Zaher W A et al (2009) has recorded that the muscle extends 17 cm cranio-caudally from manubrio-sternum, 0.5cm below the Jugular notch to 6th costal cartilage. At the 4th intercostal space, it was recorded widest (3.1 cm wide) and 1.5mm thick (13). There are reports of variations in measurement parameters. Raikos et al (2011) reported the muscle with a height of 4.8±1.97cm, width of 15.1±6.84 mm, and thickness of 3±0.91 mm (3). The vertical length

and maximum width of the Sternalis muscle measured 9cm and 1.9cm respectively (N A Rahman et al,2009) (14). The dimensions 1.7cm wide x 2.4cm length x 0.6cm antero-posteriorly was obtained from the radiographs of a case report by Soujanya Nuthakki et al(2007) (15). Because of its varied locations and parameters, it can be misdiagnosed as a tumor or other pathological lesions. Also, the presence of the muscle has been stated to cause breast or chest asymmetry which may also lead to confusion during mammography (11). Variations in ECG have also been reported in individuals with Sternalis muscle.

CONCLUSION

The muscle located in the anterior chest wall found by serendipity during the routine dissection follows the criteria of Sternalis and can be considered as a variant of Pectoralis major. Sternalis is well known among anatomists, but it is quite unfamiliar among radiologists or clinicians. The dilemma may lead to difficulties in diagnosis or surgical interventions and hence there is a need to report the incidence of this supernumerary muscle. The knowledge of this muscle is an advantage to the surgeons performing reconstruction surgeries, especially of the thorax.

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