IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

UNILATERAL RIGHT-SIDED STERNALIS MUSCLE: A RARE ANATOMICAL VARIATION OBSERVED DURING CADAVERIC DISSECTION

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ABSTRACT

BACKGROUND

The sternalis muscle is a rare anatomical variant of the anterior chest wall located superficial to the pectoralis major muscle. The incidence of the sternalis muscle varies among different populations, and it may occur unilaterally or bilaterally. Although usually asymptomatic, its presence is of clinical significance because it may be mistaken for a pathological mass during radiological examinations and may be encountered during thoracic and breast surgeries.

MATERIALS AND METHODS

During routine cadaveric dissection conducted as a part of a dissertation study in the Department of Rachana Shareera, Government Ayurveda Medical College Bengaluru, the anterior thoracic wall of a 72-year-old male cadaver was carefully examined. Anatomical variations encountered during dissection were documented and photographed.

RESULTS

A unilateral sternalis muscle was identified on the right side of the anterior chest wall. The muscle was located parallel to the sternum and superficial to the pectoralis major muscle. Its morphology, attachments, and anatomical relations were observed and recorded.

CONCLUSION

The present finding highlights the importance of recognizing the sternalis muscle as a rare anatomical variation. Knowledge of its occurrence is valuable for anatomists, radiologists, and surgeons to avoid diagnostic errors and facilitate appropriate surgical planning.

KEY WORDS; Sternalis muscle, Anatomical variations, Cadaveric study, Clinical anatomy.

INTRODUCTION

The human body exhibits numerous anatomical variations that arise during development and contribute to individual differences in morphology. Although most anatomical structures follow a typical pattern, variations in muscles, vessels, nerves, and other tissues are not uncommon. Knowledge of these variations is essential for anatomists, clinicians, radiologists, and surgeons, as they may influence diagnostic procedures and surgical interventions. Cadaveric dissection remains the gold standard for the study of human anatomy and continues to play a vital role in identifying and documenting such variations. The discovery and reporting of rare anatomical findings through dissection contribute to a better understanding of human morphology and provide valuable information for clinical practice.

Sternalis is an anatomical variation well known to anatomists but relatively unknown to clinicians and surgeons. The muscle appears as a parasternal mass deep to the superficial fascia of the anterior thoracic wall and superficial to the pectoral fascia overlying pectoralis major. It may be a cord-like, flat band or irregular and flame-like in shape, is almost twice as commonly unilateral, and occurs more often on the right side[1].

Various Attachments:

Superiorly: Sternum, inferior border of the clavicle, sternocleidomastoid fascia, pectoralis major, and the upper ribs and their costal cartilages.

Inferiorly: Lower ribs and their costal cartilages, pectoralis major, the rectus sheath and the external abdominal oblique aponeurosis.

Clinical significance

- Its superficial location makes it an ideal candidate for utilization as a muscular flap in plastic reconstruction of the head and neck region.
- The relationship of sternalis to pectoralis major may cause a diagnostic dilemma during breast surgery, mammography, computed tomography and magnetic resonance imaging scans because its appearance mimics tumour pathology of the region[2].

Development

The aetiology is unknown[3]. There are many theories to explain the embryological origin of sternalis muscle. It is postulated that it is a derivative of the hypaxial myotomes/dermomyotomes from which the ventral and lateral body wall muscles of thorax and abdomen are developed. Moreover, it is claimed to originate from the adjacent muscles or their blastema, such as sternocleidomastoid, rectus abdominis, and panniculus carnosus muscle sheet, abdominal external oblique muscle or from the ventrolateral part of the diaphragm. Other authors support that the muscle develops either from the rectus abdominis sheath

or from pectoralis major due to a defect in the muscle patterning. Particularly, in the latter case, the defective precursor migration of the prepectoral mass which gives rise to the pectoralis major and minor muscles may also contribute to the sternalis muscle development, while mechanical disturbances may lead to atypical clockwise rotation of the muscle fibers[4].

MATERIALS AND METHODS

During the routine anterior thoracic wall cadaveric dissection conducted as a part of a dissertation study in the department of Rachana Shareera, Government Ayurveda Medical College, Bengaluru, a rare anatomical variant Sternalis muscle was identified. During dissection, the muscle was carefully exposed and cleaned. Detailed observations regarding its attachments, morphology and anatomical relations were documented, and photographs were taken for academic and clinical reference.

OBSERVATION

On examination, a unilateral sternalis muscle was observed on the right side of the anterior chest wall. The muscle was situated superficial to the pectoralis major muscle and ran vertically parallel to the sternum.

Superiorly: Originated by a tendon from the manubrium sterni and the sternal head of the sternocleidomastoid muscle.

Inferiorly: Inserted into the aponeurosis of the external oblique muscle, with a few fibers attaching to the adjacent costal cartilages.

Morphologically, the muscle appeared as a flat, elongated, strap like muscular slip extending vertically in the parasternal region. No corresponding sternalis muscle was present on the left side.

a) **Pectoralis major**
b) **Sternalis muscle**
c) **Sternum**

Unilateral right sided Sternalis

Reflected sternalis muscle

RESULT

The present study demonstrated the presence of a unilateral right sided sternalis muscle. The muscle exhibited distinct anatomical attachments and was confined to the right side of the anterior thoracic wall.

DISCUSSION

The pectoral region forms the anterior wall of the thorax and contains the pectoralis major, pectoralis minor, subclavius, and serratus anterior muscles. Variations in the musculature of this region are relatively common and may involve the presence of accessory muscles, abnormal attachments, or alterations in muscle morphology. Among these variations, the sternalis muscle is a rare anatomical variant situated superficial to the pectoralis major and parallel to the sternum. Although its occurrence has been documented in different populations, it remains an uncommon finding during routine cadaveric dissection. The present case demonstrates a unilateral right-sided sternalis muscle, contributing to the existing literature on variations of the anterior chest wall musculature.

The embryological origin of the sternalis muscle remains unknown. Several theories have been proposed regarding its development. Some authors suggest that it represents a remnant of the panniculus carnosus, a subcutaneous muscular layer that is well developed in lower mammals but largely regressed in humans. Others consider it to arise from aberrant migration or incomplete differentiation of the ventral muscle primordia during embryogenesis. The muscle has also been described as a derivative of adjacent muscles such as the pectoralis major, sternocleidomastoid, or rectus abdominis. Variations in its attachments and morphology support the view that the sternalis muscle may result from disturbances in the normal pattern of muscle development during the formation of the anterior thoracic wall.

The sternalis muscle exhibits considerable variation in its occurrence, morphology, and attachments. It may present unilaterally or bilaterally and may vary from a thin muscular slip to a well-developed muscle. Several classification systems have been proposed based on its laterality, number of muscle bellies, and attachments. Jelev et al. classified the sternalis muscle into unilateral (Type I) and bilateral (Type II) forms, with further subdivisions according to the pattern of muscle arrangement and continuity with adjacent muscles[5]. The present case represents a unilateral sternalis muscle and can be classified as Type I. Based on its superior tendinous attachment to the sternal head of the sternocleidomastoid muscle, it most closely corresponds to Type I4, in which the muscle belly passes into another well-defined muscle. Such classifications are useful in understanding the wide spectrum of anatomical presentations of the sternalis muscle and facilitate comparison among reported cases.

The innervation of the sternalis muscle remains variable and has been a subject of considerable discussion in the literature. Previous studies have reported that the muscle may receive its nerve supply from the external or internal thoracic nerves, the anterior cutaneous branches of the intercostal nerves, or occasionally from both. O Neil and Folan-Curran reported that approximately 55% of sternalis muscles are innervated from the external or internal thoracic nerves, whereas about 43% receive innervation from the intercostal nerves, while the remaining cases were supplied by both nerves[6]. In the present case, the nerve supply to the sternalis muscle could not be identified. The fine neural branches supplying this

occasional muscle are difficult to preserve during routine cadaveric dissection, especially while reflecting the pectoral fascia.

Recognition of the sternalis muscle is important in clinical practice. During mammographic examinations, it may appear as an abnormal soft tissue density and can be mistaken for a breast mass or other pathological lesion, potentially leading to diagnostic confusion. Surgeons performing procedures involving the breast, anterior chest wall, or reconstructive surgery should be aware of its presence to avoid inadvertent injury and misinterpretation during operative interventions. Furthermore, the muscle may serve as a useful source of local tissue in reconstructive procedures. Therefore, knowledge of this rare anatomical variant is valuable for anatomists, radiologists, and clinicians.

CONCLUSION

The present case highlights the occurrence of a rare unilateral right-sided sternalis muscle in the anterior chest wall. Awareness of this anatomical variation is important for anatomists, radiologists, and surgeons, as its presence may lead to diagnostic confusion during imaging studies and may influence surgical procedures involving the chest wall and breast. Documentation of such variations through cadaveric dissection contributes to a better understanding of human anatomy and underscores the importance of recognizing anatomical diversity in clinical practice.

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