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## **An unusual variation of Pectoralis minor muscle and its clinical significance**

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### **Abstract**

The anatomical knowledge of variations of origin and insertion of Pectoralis minor muscle is of great significance to minimise complications during surgical procedures. An unusual variation of Pectoralis minor muscle was encountered in an adult male cadaver on right side, during routine dissection. Higher origin of Pectoralis minor was noticed (from 2<sup>nd</sup> to 5<sup>th</sup> ribs). It can lead to restriction of movements of shoulder joint, especially during abduction and lateral rotation. It can also give rise to neurological and vascular symptoms in arm. The Pectoralis minor was found to be inserted mainly on the Coracoid process and few fibres were found blending with Coracobrachialis and short head of Biceps brachii. Precise knowledge of the anatomy of Pectoralis minor muscle and its possible anatomical variations is important for Orthopaedicians to understand restricted movements of shoulder joint and their management. Variations of Pectoralis minor muscle are also of prominent interest to Plastic surgeons, owing to its use as a free flap. All Surgeons advancing to the surgical exposure of chest wall, as well as Radiologists should be aware of such variations with respect to the precise anatomy of shoulder girdle region.

**Keywords:** pectoralis minor, coracoid process, coracobrachialis, shoulder, ribs.

### **1. Introduction**

Variations of Pectoralis minor (Pm) are not very common. Pectoralis minor (Pm) is a thin, triangular muscle lying deep to Pectoralis major (PM). It is enclosed by a fascial envelop continuous with the Claviopectoral fascia, (the envelop splitting at one border of the muscle and uniting at the other border) [1]. Pectoralis minor arises from upper border and outer surface of third to fifth ribs, near to costochondral junction, and from fascia overlying adjoining External intercostal muscles. Its fibres ascend laterally under cover of Pectoralis major (PM), converging in a flat tendon which is attached to the medial border and upper surface of the Coracoid process of Scapula [2]. Pm is innervated by branches of medial and lateral pectoral nerves (C5, 6, 7, 8 and T1).

Pm is helpful in drawing the Scapula forwards around the chest wall, it rotates the scapula, depressing the point of shoulder [2]. It also participates in elevation of 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> ribs during forced inspiration. The muscle is an important landmark; it crosses two important structures- Axillary artery and the Brachial plexus. It is used to describe Axillary artery into three parts (proximal, posterior and distal to the muscle). Our aim is to report variations in attachment of Pm, which will help Clinicians and Surgeons in making diagnosis related to compression of Axillary artery and Brachial plexus. It is important to be familiar with anatomical variations of Pectoralis minor and to identify them, in order to achieve appropriate dissection planes during chest wall surgery [3]. Knowledge of such variations is also important to Radiologists for accurate studies of anterior chest wall images.

During routine educational dissection procedure, an unusual variation in the attachment of Pectoralis minor was observed in an adult male cadaver on right side. External appearance of the anterior chest wall did not indicate any obvious abnormality. The region was carefully dissected, clavicular parts of Deltoid and Pectoralis major were removed from their origins, and Pectoralis minor (Pm) was exposed. Pectoralis minor was found to be arising from 2<sup>nd</sup> to 5<sup>th</sup> ribs and their costochondral junctions (figure-1). The fibres were

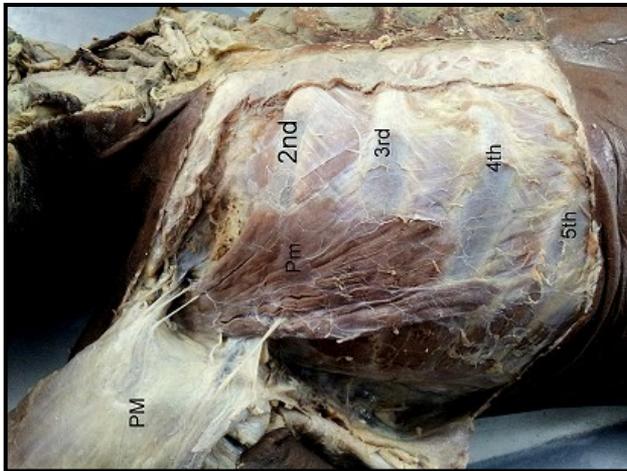
### **2. Case Report**

During routine educational dissection procedure, an unusual variation in the attachment of Pectoralis minor was observed in an adult male cadaver on right side. External appearance of the anterior chest wall did not indicate any obvious abnormality. The region was carefully dissected, clavicular parts of Deltoid and Pectoralis major were removed from their origins, and Pectoralis minor (Pm) was exposed. Pectoralis minor was found to be arising from 2<sup>nd</sup> to 5<sup>th</sup> ribs and their costochondral junctions (figure-1). The fibres were

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converging to a flat tendon, inserting into the Coracoid process and blending with Coracobrachialis and short head of Biceps brachii. This case report showed anomalous attachments of Pectoralis minor.

**Figure 1: Dissected Pectoral region showing variation in the attachment of pectoralis minor- from 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> ribs (PM, pectoralis major; Pm, pectoralis minor).**



### 3. Discussion

Pectoral muscles develop from the pectoral pre-muscle mass [1]. This pectoral pre-muscle mass lies in the lower cervical region on the medial side of arm bud. It is continuous with the arm pre-muscle sheath, and lies almost entirely anterior to the 1<sup>st</sup> rib. In a CRL: 11 mm (crown rump length) embryo it reaches to the level of 3<sup>rd</sup> rib. Two muscles remain as a single columnar mass attached to Humerus, Coracoid process of Scapula, and Clavicular precursors. As the mass differentiates, it flattens out and extends caudoventrally to distal ends of upper ribs. The caudal end of muscle extends till the anterior end of the 5<sup>th</sup> rib and the muscle begins to assume its adult form, with fibres arising from front of upper five ribs, sternal angle and Clavicle. At this stage, the proximal portion of the muscle has split into major and minor portions, one attached to Humerus and other to the Coracoid process. Both muscles remain fused near their costal attachments. In a CRL: 16 mm embryo two muscles are quite distinct, the Pectoralis minor muscle has now its distinct attachment to 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> ribs. This embryological origin may persist later in adulthood [4].

Sinha *et al* [1] found pectoralis minor arising from 2<sup>nd</sup>- 4<sup>th</sup> ribs and their costochondral junctions bilaterally. In our case Pm was found to be arising from 2<sup>nd</sup> to 5<sup>th</sup> ribs and their costochondral junctions on right side. Higher origin of Pectoralis minor may give rise to neurological and vascular complications in arm due to pressure over neurovascular structures during abduction and lateral rotation of shoulder.

Homsy *et al* [5] demonstrated an abnormal insertion of Pectoralis minor during ultrasound examinations of shoulder; an abnormal insertion was demonstrated in 9.57% of examined shoulders. Tubbs *et al* [6] reported an unusual bony attachment of Pectoralis minor in an adult cadaver, left Pectoralis minor had no attachment to the Coracoid process of Scapula, but attached directly to fibrous capsule of the glenohumeral joint.

Gregory *et al* [7] described a case of shoulder stiffness, in which an ectopic insertion of Pectoralis minor over Supraspinatus tendon was found. Complete restoration of external rotation movement was obtained after release of Pectoralis minor from the Supraspinatus. Uzel *et al* [8] described an abnormal insertion of Pectoralis minor on Coracohumeral ligament, Supraspinatus tendon and capsule of Glenohumeral joint. Lee *et al* [9] reported ectopic insertion of Pectoralis minor in 13.4% cases as assessed by MRI.

Zvijac *et al* [10] reported 2 cases of isolated Pectoralis minor tear in professional foot ball players. Unusual attachment of Pectoralis minor may predispose to muscle tear. Gordon *et al* [11] reported a case of Pseudo-angina pectoralis caused by Pectoralis minor trigger points.

### 4. Conclusion

Knowledge of the Anatomy of the pectoralis minor and possible variations of attachments is of great help to Clinicians, Radiologists and Surgeons, in order to understand and manage various problems associated with them. All Surgeons advancing to the surgical exposure of chest wall, as well as Radiologists should be aware of such variations with respect to the precise anatomy of pectoral and shoulder region.

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