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"Costodeltoideus": A Rare Anomaly of the Deltoid Muscle

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ABSTRACT

During routine dissection for medical students at the Department of Anatomy, Usmanu Danfodiyo University, Sokoto, Nigeria, an adult male cadaver was found with an unusual, unilateral, long cylindrical muscle mass, within a separate fascial sheet, at the back of the left shoulder, extending from the axillary border of the scapular to the shaft of the humerus. Among variations of the deltoid muscle, anomalous origin of the deltoid muscle from the lateral (axillary) border of the scapular is exceptionally uncommon. While the prevalence is yet unknown, the knowledge of this unique variation, and its influence on the normal anatomical landmarks of the back of the scapular and shoulder region, are clinically relevant to surgeons who harvest posterior deltoid and scapular flaps for a wide range of posterior scapular and shoulder joint reconstructions. Knowledge of this variation will help to ensure a better understanding and accurate interpretation of radiological images, and serve as a guide to circumvent difficulties during reconstructive shoulder joint procedures.

Key words: Costodeltoideus, Rare Anomaly, Deltoid, Origin, Scapula, Surgery

INTRODUCTION

Deltoid is the thick, curved, triangular muscle, that forms the rounded contour over the shoulder joint.^{1,2} It arises from the anterior border and superior surface of the lateral third of the clavicle, the lateral margin and upper surface of the acromion, and the lower lip of crest of the scapular spine.^{1,2,3} These fibres converge on a short tendon, that inserts into the deltoid tubercle, on the lateral aspect of the midshaft of the humerus. The muscle is innervated by the axillary nerve, and its divided into a unipennate anterior and posterior parts, and a multipennate central part, each, capable of independent action.^{1,2,3} The deltoid is a powerful abductor of the arm above 15°, while the anterior and posterior fibres, produces medial and lateral arm rotations respectively.^{1,2,3}

Anatomical variations in the deltoid muscle, ranging from muscle segmentation, differences in fascial sheet coverings, to fusion with trapezius and pectoralis major muscles have been reported.³⁻⁷ In 1866, Calori,⁸ described a rare accessory slip of muscle, referred to as costodeltoideus, that took origin from the lateral border of the scapula, between the points of origin of teres minor and infraspinatus, and inserts on the

posterior border of the deltoid muscle. Proximal attachments of the deltoid head to the middle third of the medial (vertebral) border of the scapular,^{5,9} or from the infaspinous fascia,³ and conjoined origin with the proximal aspect of teres minor,⁷ have also been reported. Generally, variations of origin of the deltoid are rare and infrequently reported in literature.^{6,7,10}

CASE REPORT

During routine dissection of the upper limb and scapular regions of a muscular, adult male cadaver (age and cause of death unknown), for medical students at the Department of Anatomy, Usmanu Danfodiyo University, Sokoto, Nigeria, an unusual, superficial, long cylindrical muscle mass at the back of the left shoulder was observed. It was found extending from the axillary border of the scapular to the shaft of the humerus (Figure 1). The dissection was carefully performed to identify the origin, insertion and the neurovascular supply of this variant head of deltoid, which was absent on the right side. The observations were documented using high definition photograph images.

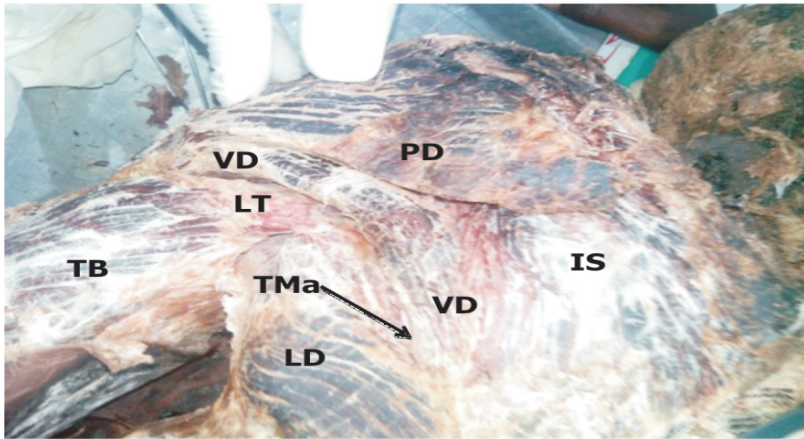


Figure 1: Posterior aspect of the left shoulder and scapular region. The variant deltoid (VD) is seen as a long curved cylindrical muscle flanked by teres major (TMa) and infraspinatus (IS) proximally, and distally by the posterior fibres of deltoid (PD) and long head of triceps brachii (LT). LD = Latissimus dorsi, TB = Triceps Brachii.

This variant was found within its own fascial sheet, arising from the posterolateral aspect of the lateral border of the left scapular, just behind the origin of the teres minor, and the adjoining part of the infraspinatus. It ascends superolaterally, along the lateral edge of the infraspinatus, perpendicular to the horizontal posterior fibres of deltoid, and slightly overlapping the proximal end of teres major on its lateral side (Figure 1). Reaching the posterior free border of the deltoid, it turns laterally to align with this part of the muscle which slightly overlaps it, while the proximal third of the long head of triceps brachii, is seen emerging deep to it (Figure 2). It rapidly turns into a flat sheet of tendon that fuses with the tendon of deltoid to insert into the deltoid tuberosity of the humerus. The nerve supply was derived from a branch of the axillary nerve, which entered the muscle from its medial aspect, as it laid side by side with the deltoid. However, we couldn't find any vessels entering the muscle. It is possible that these vessels were damaged during the course of the dissection. It could have been supplied by branches from the circumflex scapular or thoracodorsal arteries, probably due to their proximity, and distance away from the posterior circumflex humeral artery, and branches of the thoracoacromial artery.

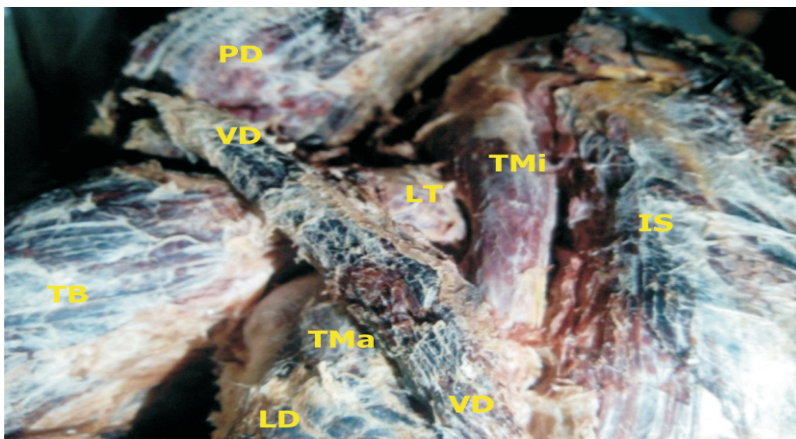


Figure 2: Further dissection showing muscles on the dorsal scapular region and posterior aspect of the left shoulder. The variant deltoid (VD) arises just behind teres minor (TMI), ascends superolaterally, with the teres major (TMa) and long head of triceps brachii (LT) lie deep to it. IS = infraspinatus, PD = reflected posterior fibres of deltoid, LD = Latissimus dorsi, TB = Triceps Brachii

There was an obvious initial confusion, especially when this variant deltoid was originally thought to be the teres major for its bulky superficial location, and later, the teres minor, for its relationship with the infraspinatus, and now seen deviating, towards the shaft of humerus. It only became clear, when further dissection revealed a teres minor that was completely buried by the variant deltoid, while overlapping the teres major on its left side (Figure 2). The long head of triceps brachii, the quadrangular and triangular spaces, were identified, deep to this variant.

DISCUSSION

The muscles of the limbs develop from myoblasts surrounding the developing bones.¹¹ During the 5th week of gestation, precursor myogenic cells derived from the somatic mesoderm, fuses to form ventral (flexor) and dorsal (extensor) muscle masses.^{12, 13} These muscle masses subsequently undergo splitting and segmentation to give rise to the definitive muscles of the upper limb.^{11, 12, 13} The deltoid muscle is derived from the dorsal muscle mass, and the variations in its origin has been attributed to an unusual splitting and segmentation of the dorsal muscle mass.^{12, 13, 14} This could possibly explain the basis for the variation in the origin of this variant deltoid.

The variant in this report, fits adequately into the description of an accessory muscle slip, called the costodeltoideus, which originates from the lateral border of the scapular between teres minor and infraspinatus, and inserts into the posterior border of the deltoid muscle.⁸ however, this variant deltoid, wasn't such an accessory muscle slip, but a well formed muscle mass, characterised by a distinct proximal and distal bony attachments. The variant deltoid in this report is similar to the rare accessory slip of deltoid, conjoined in origin with the teres minor that fused with the posterior part of the deltoid muscle,⁷ but different from the multiple head of deltoid seen on the middle third of the medial border of the scapular.^{5,9} According to Fraser et al,⁷ very few reports of costodeltoideus-like cases, similar to the variant in this paper, are being described in modern literature.

Studies have shown that, surgical procedures have been complicated by anatomical variations.¹⁵ Although, the prevalence of this variant deltoid is unknown, the knowledge of this variation is clinically relevant to surgeons, who are involved in elevating fasciocutaneous, posterior deltoid and scapular flaps for surgical repairs and reconstruction of pathologic or traumatic shoulder conditions like the rotator cuff tears and glenohumeral radionecrotic defects.⁵

The presence of this variation may cause confusion in muscle identification, and in clearly dissecting out their borders. However, future challenges will require adequate, non-invasive pre-interventional methods, like the 3D Doppler ultrasound, to identify variants of this nature,¹⁶ in order to control and prevent post surgical complications.

CONCLUSION

Despite its unknown prevalence, costodeltoideus and costodeltoideus-like variants appear to be increasing. Information about this variation and the ability to identify its presence prior to surgery will be of considerable clinical relevance.

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CONFLICT OF INTEREST

None

AUTHORS CONTRIBUTION

Aliu Abdul-Hameed: Dissection/Manuscript Writing/logistics

Garzali Marwana Bala: Dissection/Manuscript Writing.

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