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Bilateral Presence of Axillary Arch Muscle Passing Through the Posterior Cord of the Brachial Plexus

Presencia Bilateral del Arco Muscular Axilar Pasando por el Fascículo Posterior del Plexo Braquial

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SUMMARY: The axillary arch can be described as an anomalous muscular slip of latissimus dorsi muscle. In this paper, a rare case of bilateral axillary arch is reported during routine dissection of the axillary region of a 57-year old male cadaver. On both sides, the axillary arch muscle took origin from latissimus dorsi and teres major, and passed upwards through the posterior cord of the brachial plexus, but posterior to the bulk of axillary neurovascular bundle. It then split into two slips: the medial slip was inserted into the root of the coracoid process, while the lateral slip which was intracapsular, was attached to the lesser tubercle, above the attachment of subscapularis. The presence of the muscle has important clinical implications, and the position, bilateral presence, penetration of the posterior cord, and multiple connective tissue attachments makes the case most unique. The anatomy, surgical implications, and embryology of the anomalous muscle are discussed in this paper.

KEY WORDS: Axillary arch muscle; Posterior cord of brachial plexus; Axillary anatomy.

INTRODUCTION

Anatomical variations of the axilla are of great relevance due to the increasing surgical importance of this region during axillary surgery for breast cancer, reconstruction procedures, and axillary bypass operations.

One of the variations reported has been the presence of a muscle extending from the latissimus dorsi muscle to the pectoralis major muscle called variously as Langer's axillary arch, axillopectoral muscle, pectodorsal muscle and arcus axillaris (Langer, 1846; Bonastre *et al.*, 2002). The presence of this muscle has important clinical implications. The muscular arch first identified by Ramsay in 1795, and described in 1812 (Ramsay, 1812), was later confirmed by Langer (Langer). Different variations of the axillary arch muscle have been reported subsequently by many authors (Ucerler *et al.,* 2005; Rizk & Harbaugh, 2008; Inzunza *et al.*, 2008). We report here a very unusual case of bilateral anomalous axillary arch muscle.

CASE REPORT

During the routine dissection of a 57 year-old male cadaver in the Department of Anatomy, School of Medicine, Amrita Institute of Medical Sciences, Kochi, Kerala, we came across a bilateral anomalous axillary arch muscle. On both sides, the muscle had a tendinous origin from teres major and latissimus dorsi, arched across the axilla deep to the pectoralis major passing deep to the bulk of the axillary neurovascular bundle. The muscle was then observed to pass through the posterior cord of the brachial plexus (Figs. 1 and 2). The axillary nerve lay posterior to the muscle, while the lower subscapular nerve was medial to the muscle. Part of the subscapular artery was posterior to the origin of the muscle from teres major, and the muscular branch to subscapularis passed posterior to the fleshy part of the axillary arch muscle. The muscle ended in a tendon, which split into 2 slips on both sides (Fig. 3, which shows the right side). The medial slip was found to be inserted into the scapula near the coracoid process, while the lateral slip passed deep

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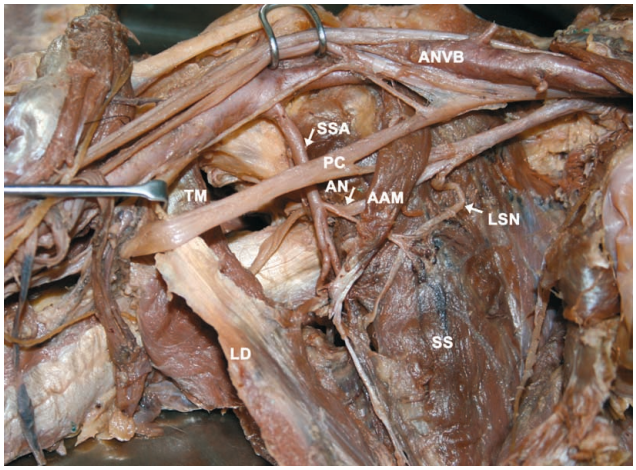

Fig. 1. Anterior view of the right axillary region with the axillary arch muscle exposed. AAM - axillary arch muscle, AN - axillary nerve, ANVB - axillary neurovascular bundle, LD - latissimus dorsi, LSN - lower subscapular nerve, TM - teres major, PC - posterior cord, SS – subscapularis, SSA - subscapular artery, USN - upper subscapular nerve.

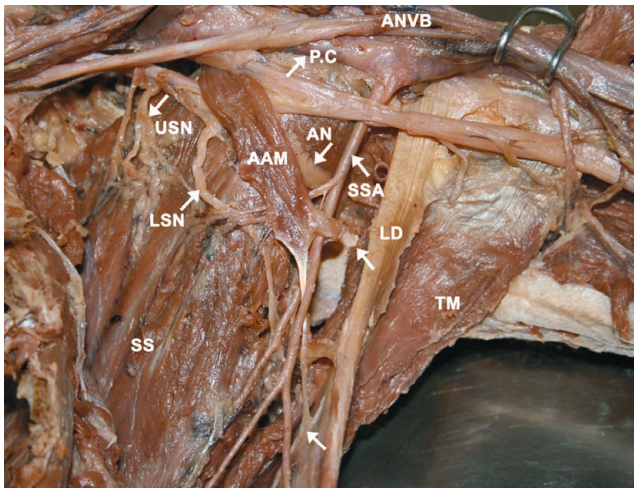

Fig. 2. Anterior view of the left axillary region, showing left axillary arch muscle. AAM - axillary arch muscle, AN - axillary nerve, ANVB - axillary neurovascular bundle, LD - latissimus dorsi, LSN - lower subscapular nerve, TM - teres major, PC - posterior cord, SS – subscapularis, SSA - subscapular artery, USN - upper subscapular nerve.

to the capsule of the shoulder joint and was inserted into the upper part of the lesser tubercle of the humerus, above the subscapularis. The muscle was innervated by the lower subscapular nerve. The position, attachments and nerve supply of the muscle were similar on both sides.

DISCUSSION

Though the presence of an axillary arch has been

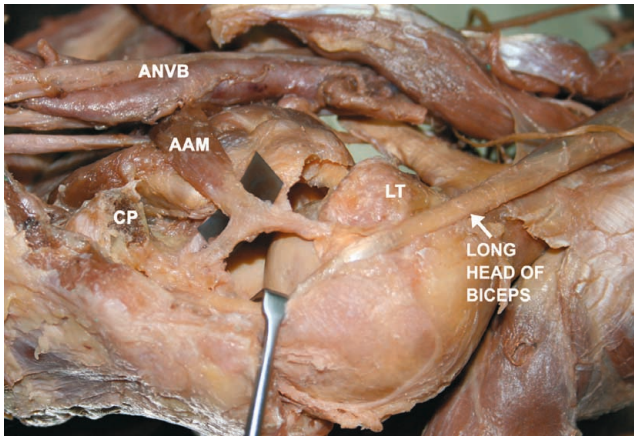

Fig. 3. Dissection of the right shoulder, showing the insertion of axillary arch muscle. AAM -axillary arch muscle, ANVB - axillary neurovascular bundle, CP - coracoid process, LT - lesser tubercle.

reported in 7 to 13% of cadaver dissections (Babu & Khashaba, 2000; Perre & Zoetmulder, 1989), this is the first time that such a variation as described in this paper has been encountered in our dissection experience that goes back to the year 1995. Clinically, the incidence of this anomalous muscle varies considerably from 0.25% to 25% (Babu & Khashaba; Serpell & Baum, 1991). The highly variable incidence of axillary arch muscle may be related to differing sample size. Even racial variations could be responsible for this disproportion (Babu & Khashaba). The muscular arch of the axilla is usually described as extending from the proximal border of latissimus dorsi to about the middle of the posterior axillary fold, subsequently arching across the axilla anterior to the axillary vessels and nerves, to join the under surface of the tendon of pectoralis major, or tendon of coracobrachialis, or the fascia over the biceps brachii (Lin, 1988).

In the case being reported here, the muscle passed behind the bulk of axillary neurovascular bundle, but through the posterior cord of the brachial plexus. The muscle passed over the axillary nerve on both sides. Though Kameda (1976) made similar observations of the axillary arch muscle passing through the posterior cord, in most of the other studies reported, the axillary arch was observed to pass anterior to the axillary neurovascular bundle (Dharap, 1994; Soubhagya *et al.,* 2006). Langer's arch is usually seen as a single band, but it can divide into two, or rarely multiple structures across the axilla. In its complete and common form, it arises from the latissimus dorsi and inserts into the trilaminar tendon of pectoralis major on the humerus, while in its incomplete form, it presents with varying insertions into pectoralis minor, coracobrachialis, the long or short head of biceps, teres major, coracoid process, first rib, and axillary brachial or coracobrachial

fascia (Bonastre *et al*.; Daniels & della Rovere, 2000; Kutiyanawala *et al.*, 1998). In our case, the muscle was found attached to latissimus dorsi and teres major. Both these muscles are closely linked anatomically and functionally (Beck & Hoffer, 1989; Herring *et al.*, 1993). Thus, the muscular slip reported could be a developmental remnant of an association between these two muscles (Dharap). The bilateral presence, multiple connective tissue attachments, and penetration of the posterior cord all put together, makes this case a very unique one.

Limb muscles generally arise in situ from the somatopleuric layer of lateral plate of the mesoderm around the developing bones (Hamilton & Mossman, 1972). Cihak in 1972 described fundamental phases in the ontogenesis of muscle pattern (Cihak, 1972). According to him, during phase-III, some muscle primordia from different layers fuse to form a single muscle. Grim (1972) stated that some muscle primordia disappear through cell death, despite the fact that cells within them have differentiated to the point of containing myofilaments. Persistence of some cells between latissimus dorsi and teres major may account for the musculus slip in the case described. During Phase IV, a prominent feature is the formation of connective tissue elements and their integration with their muscle fibres. The multiple connective tissue attachments in the present case were probably formed during this stage. According to Besana-Ciani & Greenall (2005), the axillary arch muscle originates from panniculus carnosus, which is an embryological remnant of a more extensive sheet of skin-associated musculature lying in the junction between the superficial fascia and the subcutaneous fat.

Clinical and surgical importance. Langer's arch can occasionally be palpable during clinical examination, when presenting as an axillary mass, and can be confused with enlarged lymph nodes or soft tissue tumours (Besana-Ciani & Greenall). Compression by the muscular axillary arch should be considered in the differential diagnosis of patients with thoracic outlet and hyper-abduction syndromes (Rizk & Harbaugh). However, Langer's arch is usually asymptomatic, and its main importance is in the confusion it can cause during routine axillary surgery for breast cancer. The presence of muscular or tendinous fibres of the arch can impede adequate exposure of the true axillary fat, and in particular may limit access to the lower lateral group of axillary lymph nodes, thus resulting in an incomplete clearing of the axilla (Besana-Ciani & Greenall). Although lymph node dissection for breast cancer is the most common type of surgery performed in the axilla, there are other surgical procedures in this area which may be affected if Langer's arch is encountered. Access for bypass surgery using the axillary vessels may be compromised if there is failure to identify Langer's arch (Serpell & Baum). Ischaemic necrosis can complicate latissimus dorsi breast reconstruction, if the thoracodorsal pedicle is stretched or compressed by an un-suspected axillary arch (Miguel *et al.,* 2001).

It is possible that the Langer's arch could form a direct relation of the axillary structures, such as thoracodorsal neurovascular bundle, the brachial plexus, the lateral lymphatic trunks, or the axillary vein. These structures may be at risk if the presence of Langer's arch is not considered, leading to bleeding and nerve damage. Inadequate dissection may also predispose to excessive lymphatic destruction and consequent lymphoedema (Petrasek *et al*., 1997; Daniels & della Rovere).

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RESUMEN: El arco axilar puede ser descrito como un fascículo muscular anómalo del músculo latísimo del dorso. En este trabajo, un raro caso de arco axilar bilateral se encontró durante la disección de rutina de la región axilar de un cadáver de 57 años de sexo masculino. En ambos lados, el músculo arco axilar se originó desde los músculos latísimo del dorso y redondo mayor y pasó hacia arriba a través del fascículo posterior del plexo braquial, pero posterior a la mayor parte del paquete neurovascular axilar. A continuación, se dividió en fascículos: el fascículo medial se insertó en la raíz del proceso coracoides, mientras que el fascículo lateral, era intracapsular y se insertaba en el tubérculo menor del húmero, por encima de la inserción del músculo subescapular. La presencia de este músculo axilar tiene importantes implicaciones clínicas, y la posición, la presencia bilateral, la penetración del fascículo posterior, y múltiples uniones de tejido conectivo hacen al caso más especial. La anatomía, las implicaciones quirúrgicas y embriología del músculo anómalo son discutidos en este trabajo.

PALABRAS CLAVE: Músculo arco axilar; Fascículo posterior plexo braquial; Anatomía axilar.

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