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Variations in the Attachments and Innervation of Muscles in Axilla

KEYWORDS: Latissimus Dorsi; Musculoaponeurotic Arch; Musculcutaneous Nerve; Corachobrachialis; Lateral cord of Brachial Plexus

Dr Ranjana Verma
Department of Anatomy, Hamdard Institute of Medical Sciences & Research, Jamia Hamdard, New Delhi Pin code 110062

Dr Pooja Bhadoria
Department of Anatomy, Maulana Azad Medical College, BSJ Marg, New Delhi. Pin code 110002

ABSTRACT *Introduction: The axillary arch muscle is a rare muscle which usually extends between the latissimus dorsi and pectoralis major. The musculocutaneous nerve is a branch of lateral cord of brachial plexus which pierces corachobrachialis and supplies muscles of the flexor compartment of arm i.e. corachobrachialis, biceps and brachialis.*

Method: During a routine cadaveric dissection of right upper limb of a 50 year old male cadaver, we observed two major variations in the axilla. The left side of the axilla was also dissected but did not show any variation.

Observation: A variant muscular slip arose as separate fibres from the lateral aspect of latissimus dorsi and gained attachment as aponeurosis to the fascia covering the pectoralis major. This muscular slip coursed superficial to the axillary vessels and branches from the cords of brachial plexus. In addition to this the musculocutaneous nerve did not pierce the corachobrachialis and coursed immediately beneath the musculoaponeurotic arch. Moreover coracobrachialis is supplied by a separate branch arising directly from lateral cord of the brachial plexus.

Discussion: Awareness of this variation is important for surgeons and orthopaedicians during surgery for axillary lymph node removal in breast cancer, repair of brachial plexus lesions, arthroscopy for shoulder joints and repair of fracture humerus. The musculoaponeurotic arch may also be the cause of various compression syndromes like entrapment neuropathy or lymphoedema of upper limb.

INTRODUCTION

During past two centuries, the anatomical variations in the axilla have been described in literatures. Recently more attention has been paid to this region due to increasing surgical importance during axillary lymph node removal for breast cancer, use of latissimus dorsi flap for breast reconstruction, axillary bypass operations, repair of brachial plexus lesions, and arthroscopy for shoulder joints.[1,2]

Latissimus dorsi is a large flat triangular muscle which forms the posterior fold of axilla and has migrated to trunk for functional reasons. It was first described as an oblong muscle stretched between latissimus dorsi and pectoralis major and later named as Langer's axillary arch.[3] The axillary arch is a muscular a slip which is attached to the latissimus dorsi at one end and joins with the fascia of either of pectoralis major, biceps brachii or corachobrachialis at another end. It lies superficial to the axillary artery and committant veins, the median nerve, ulnar nerve and medial cutaneous nerve of the arm and forearm.[4] It is considered as a vestige of panniculus carnosus muscle. The frequency of this muscle anomaly is 7-8% as described in standard textbooks.[5]

The musculocutaneous nerve is a branch from the lateral cord of brachial plexus which leaves the axilla after piercing the corachobrachialis and descends laterally between biceps and brachialis in the arm. At the junction of the middle and lower third of the arm, it pierces deep fascia at the lateral border of biceps and continues down as lateral cutaneous nerve of forearm. It gives off branch to corachobrachialis before piercing the muscle. It supplies corachobrachialis, biceps and brachialis. The musculocutaneous nerve is described as having frequent variations like it may run behind coracobrachialis or pass behind biceps after adhering for some distance to the median nerve. Sometime few fibers may communicate between the median nerve and musculocutaneous nerve.[5]

We are reporting a combination of variation in the axilla- a rare musculoaponeurotic axillary arch and separate innervations of corachobrahialis from the lateral cord of brachial plexus.

CASE REPORT

During a routine cadaveric dissection of upper limb for teaching medical students at Maulana Azad Medical College, New Delhi, we observed a musculotendinous slip of latissimus dorsi and variation in the course of musculocutaneous nerve and innervations of corachobrachialis. The skin, superficial fascia and deep fascia were removed to expose the pectoral region, the flexor compartment of the arm and axilla. The latissimus dorsi muscle was dissected and a variant muscular slip was noted. The variant muscular slip, 10 cm in length and 2 cm width in dimension, was originated as separate fibres from the lateral aspect of the bulky latissimus dorsi muscle. The muscular slip coursed superficial to the axillary vessels and branches from the cords of brachial plexus: musculocutaneous nerve, median nerve, ulnar nerve, medial cutaneous nerve of forearm. Near the insertion the fibres become aponeurotic and attached to the pectoral fascia covering the inferior surface of pectoralis major. The musculocutaneous nerve did not pierce the corachobrachialis and coursed down between biceps and brachilais. Near elbow joint, it pierced the deep fascia and continued down as lateral cutaneous nerve of forearm. Moreover coracobrachialis is innervated by a separate branch from the lateral cord of brachial plexus.

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The left side of the axilla was also dissected; but the arrangement and attachment of the latissimus dorsi and pectoralis major muscles, course of musculocutaneous nerve and innervations of corachobrachialis were normal.

DISCUSSION

Axilla is clinically important region in practice due to the presence of cords and branches of the brachial plexus, axillary vessels and axillary lymph nodes which drains vast area of the thoracic region including breast and Currently the anatomical variations in the axilla has gained more attention due to increased incidence of breast cancer leading to more axillary surgery for axillary lymph node removal, use of latissimus dorsi flap for breast reconstruction and also axillary bypass operations.[6]

The axillary arch may present with axillary mass, which can be confused with enlarged lymph nodes or soft tissues tumors. It can impede adequate exposure of the true axillary fat and in particular may limit the access to the lower lateral group of lymph nodes, thus resulting in an incomplete clearance of the axilla.[7] It can also lead to costoclavicular compression syndrome, axillary vein entrapment, median nerve entrapment, hyperabduction syndrome, thoracic outlet syndrome and shoulder instability syndrome.[8]

The axillary arch muscle is considered into two groups, muscular form (type I) and tendinous form (type II).[9] However clinical classifications of the axillary arches could be defined as superficial and deep arch groups. Superficial arches cross in front of the vessels and nerves, and the veins could be affected primarily. Deep arches occur deeply on the posterior or lateral walls of the axilla. These arches usually cross only parts of the neurovascular bundle and axillary or radial nerves could possibly be affected.[10]

The variations of axillary arch have been reported by various researchers during surgery and mammography which may be unilateral or bilateral having more complex attachments.[11,12] In a MRI study, axillary arch was present in 6% cases and in most cases it is superficial to axillary lymph nodes. Patients with an arch had more chances of neurological deficit in the upper limb than patients without an arch.[13] Recently a study done during sentinel lymph node biopsy and axillary procedures, it was observed that out of the 758 patients, 9 (1.2%) were found to have a Langer's axillary arch.[14]

The musculocutaneous nerve innervates the muscles of the flexor compartment of arm and skin of the lateral side of the forearm. The variations in the course and innervations by the musculocutaneous nerve could be due to developmental inconsistency. In human the upper limb develops from paraxial mesoderm and the axons of the spinal nerves grow distally to reach the muscles and skin during 5th week of intrauterine life under the influence of five Hox D genes. The lack of co-ordination between the two processes due to altered signaling leads to variation in the course and supply.[15] A variant innervations of coracobrachialis muscle along with an alternative course of musculocutaneous nerve which is not passing through coracobrachialis muscle is of clinical and morphological relevance. The coracobrachialis is a primary muscle of adductor compartment without any significant function in humans; however its recent application in plastic surgeries for facial reanimation may provide a valuable application of this muscle in future.[16]

Nevertheless, variations have been reported and, among them are: the total absence of musculocutaneous nerve ranging from 1.4 to 15%, the absence of its passage through the coracobrachial muscle, its variable level of penetration as measured from the tip of the coracoid process, and its communicating branches with the median nerve.[17,18] In another study, it was described that corachobracialis the received its innervations by lateral root of median nerve.[19] There are reports regarding innervations of corachobracialis by direct branches from lateral cord of brachial plexus either unilaterally or bilaterally.[16]

In our study we observed a combination of the rare variation in the axilla- the presence of superficial musculoaponeurotic axillary arch and innervations of corachobrachialis separately from lateral cord of brachial plexus. The musculocutaneous nerve did not pierce the corachobrachialis and coursed distally underneath the axillary arch.

Fig 1:- Dissection of right upper arm demonstrating the accessory musculo-tendinous slip from latissmus dorsi is crossing over the structures in axilla and variation in the innervations of corachobrachialis.

PM: Pectoralis Major, CB: Coracobrachialis, LD: Lattissimus Dorsi, B: Biceps, LC: Lateral Cord, MCN: Musculocutaneous Nerve, MCB: Muscular branch to Coracobrachialis, MB: Muscular branch to Biceps, LCF: Lateral Cutaneous nerve of Forearm, MN: Median Nerve, UN: Ulnar Nerve, MCF: Medial Cutaneous nerve of Forearm, BV: Basilic Vein, BA: Brachial Artery.

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