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Anatomical Study of the Axillary Arch

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Abstract: *The axillary arch is a musculotendinous structure that arises from the latissimus dorsi muscle and crosses the axilla before inserting to the humerus, brachial fascia or coracoid process. A cadaveric study was done to know the incidence of axillary arch muscle, the extent of its different attachments and the applied aspects. In total, 84 upper limbs were meticulously dissected to locate the axillary arch. Wherever found, the arch was dissected carefully from its origin to its insertion. The nerve supply and blood supply was noted, the dimensions of the arch were measured, its relations to the structures in the axilla were studied in detail. Any additional related variations were investigated. The axillary arch was found unilaterally in two middle aged cadavers (one male and one female) and bilaterally in two female cadavers of age about 40 to 45 years. All the 6 arches arose from the anterior border of the latissimus dorsi muscle, crossed over the neurovascular bundle in the axilla and inserted to the fascia covering the deep surface of pectoralis major or the capsule of the shoulder joint.*

Keywords: *Achselbogen Muskel, Arcus axillaris, Axillary arch, Axillopectoral muscle, Langer's muscle, Pectodorsal muscle*.

I. Introduction

Anatomical variations in the axilla are of paramount importance for the surgeons dealing with breast cancer or other surgical procedures in the axilla like reconstruction techniques and axillary bypass operations [1]. The muscular variations include chondroepitrochlearis, dorso-epitrochlearis, costo-corocoideus, etc. [2]. Among the variations, the best known is a muscular or fibromuscular slip extending from the latissimus dorsi muscle to the tendons, muscles or fasciae of the superior part of the humerus which has an incidence of 7-8% [3]. This variation was first described by Ramsay in 1795 and confirmed by Langer in 1864 and so named as axillary arch of Langer. Sachatello identified this variation as the axillopectoral muscle in 1977 [4]. The popular description of the axillary arch in the textbooks of Anatomy is "A muscular slip of varying dimension extending between the upper border of the latissimus dorsi to the deep surface of the tendon of the pectoralis major, the coracobrachialis or the fascia over the biceps brachii; thus it crosses over the neurovascular bundle of the axilla." From such a common description, three characteristics of the typical axillary arch could be extracted:

- Constant origin (medial attachment) from the latissimus dorsi;
- Variable insertion (lateral attachment) to the structures around the superior-anterior part of the humerus;
- Course over the axillary neurovascular bundle in direction from dorso-medially to ventro-laterally.

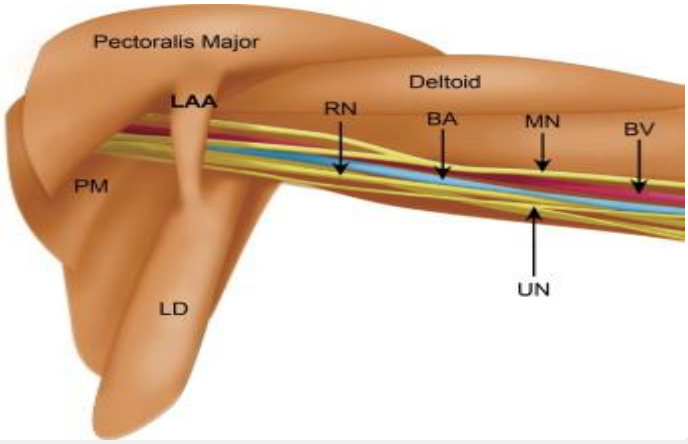

Fig. 1. Diagram shows relationship of the anatomy with the Langer's axillary arch (LAA). BA, Brachial artery; BV, basilic vein; LD, latissimus dorsalis; MN, median nerve; PM, pectoralis major; RN, radial nerve; UN, ulnar nerve

II. Materials And Methods

The present study was done in the Dissection Hall of Anatomy Department, SCB Medical College, Cuttack, Odisha. In total, 84 upper limbs were meticulously dissected to locate the axillary arch. Wherever found, the arch was dissected carefully from its origin to its insertion. The nerve supply and blood supply was noted, the dimensions of the arch were measured, its relations to the structures in the axilla were studied in detail. Any additional related variations were investigated.

III. Observation

The axillary arch was found unilaterally in two middle aged cadavers (one male and one female) and bilaterally in two female cadavers of age about 40 to 45 years. All the 6 arches arose from the anterior border of the latissimus dorsi muscle, crossed over the neurovascular bundle in the axilla and inserted to the fascia covering the deep surface of pectoralis major or the capsule of the shoulder joint. The muscle slips measured 10 to 15 cm in length and 6 to 15 mm in thickness. Blood supply was derived from either a branch from circumflex scapular artery or any other branch from the third part of axillary artery. Nerve supply was derived from medial pectoral nerve or thoracodorsal nerve or from the perforating branches of the 2^{nd} and 3^{rd} intercostal nerves.

Fig. 1. showing the axillary arch mucle of left side

Fig. 2. showing the axillary arch mucle of right side

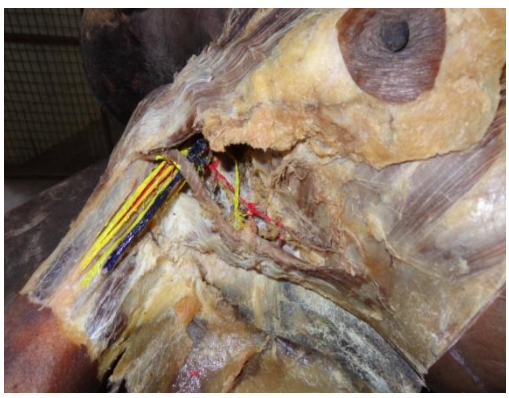

Fig. 3. Axillary arch in a female cadaver

Fig. 4. showing the nerve supply and blood supply of right side

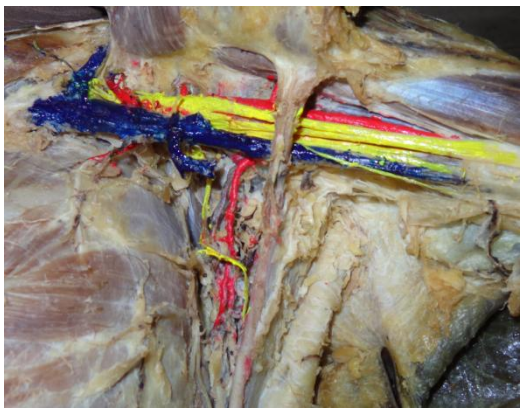

Fig. 5. Showing the nerve supply and blood supply of left side.

IV. Discussion

An axilla or the armpit is the space between the upper part of the arm and the side of the thorax, bounded in front by the pectoralis major muscle, behind by the subscapularis and latissimus dorsi muscle, medially by serratus anterior muscle and laterally by the shaft of humerus. It contains neurovascular bundle and lymph nodes draining the upper limb and the lateral wall of thorax. Axillary arch is an accessory muscle typically crossing the axilla from latissimus dorsi inserting into pectoralis major.

The latissimus dorsi muscle originates from sacrum, iliac crest and along the five lumbar and lower six thoracic vertebrae. It is a flat triangular muscle which covers lumbar regions and is gradually contracted into a narrow fasciculus before its insertion. The quadrilateral tendon of latissimus dorsi muscle is about 7 cm long, lies in front of the tendon of the teres major muscle and is inserted into the intertubercular groove of the humerus. Variations of latissimus dorsi can be seen at its origins where the number of dorsal vertebrae to which it is attached, vary from four to seven or eight, as well as the varying number of costal attachments and muscle fibers that may or may not be reaching to the crest of the os ilium.

Latissimus dorsi muscle is supplied by the sixth, seventh and eighth cervical spinal nerves through the thoracodorsal (long subscapular) nerve. Axillary arch can receive nerve fibers from the lateral pectoral nerve, medial pectoral nerve, intercostobrachial nerve or thoracodorsal nerve [5]. This muscle has been implicated in axillary vein compression, deep vein thrombosis of upper limb and neurovascular compression syndromes [6-8]. It also plays an important role in the management and kinesiology of the overhead shoulder mobility [9]. Its embryonic origin is not clear but some Anatomists consider muscular arches of the axilla as rudimentary phylogenetic remnants of the panniculus carnosus [10].

Panniculus carnosus is an embryological remnant of a more extensive sheet of skin along with associated musculature lying at the junction between superficial fascia and subcutaneous fat[11, 12]. This structure is well developed in lower animals, particularly in rodents while in higher primates and humans it is evident only as muscle such as platysma and dartos; in the remainder of body it becomes vestigial. In lower animals the panniculus carnosus is highly developed to form the pectoral group of muscles. However in man it has regressed because its functional importance is decreased during evolution in favor of wider range of mobility of upper limb. Others suggest that, limb muscles generally arise in situ from the somatopleuric layer of lateral plate mesoderm around the developing bones[13, 14].

Testut (1884) classified the axillary arches into "complete" and "incomplete" forms. According to him, the "complete" axillary arch extended between the latissimus dorsi and the tendon of the pectoralis major near its insertion on the humerus; the "incomplete" one extended from the latissimus dorsi to the axillary fascia, biceps brachii muscle, coracobrachialis muscle, the distal end of the bicipital groove and the inferior edge of pectoralis minor muscle or the coracoid process. It is clear from the information above that the principal definition of the axillary arch becomes too extensive and unclear. Thus, we have a group of "classical" axillary arch and also a group of "unusual" axillary arches. In clinical practice, these attachment points are difficult to determine precisely without a detailed dissection. So, in clinical practice, the existence of a "superficial" or "deep" axillary arch could be suspected because of the vessels or nerves predominantly affected.

V. Conclusion

A proper knowledge of the axillary arch muscle would help the clinicians during the clinical examination of the axilla as it can be mistaken for a tumour or axillary lymph nodes. The axillary neurovascular bundle may be compressed by this arch leading to paresthesia, wasting of flexor compartment muscles of the forearm due to involvement of median nerve. It may be the cause of shoulder instability syndrome, costoclavicular compression syndrome, hyperabduction syndrome, thoracic outlet syndrome, etc. Thus, it is important for the neurosurgeons as well. The surgeons should keep it in mind for the cause of DVT (Deep Vein Thrombosis) or lymphoedema and during operations in the axilla like carcinoma breast, axillary lymphatic dissection, drainage of axillary abscesses, reconstruction of latissimus dorsi flaps, etc. The radiologists should know the possible variations in the axillary arch as it can be seen as a soft tissue shadow. The diagnosis can be made using mammography and cross-sectional imaging including CT or MRI.

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