

“Clinically Significant Variation in the Branching Pattern of the Human Axillary Artery – A Case Report”

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Abstract: Axillary artery begins at the outer border of the rib, divides into 3 parts by the pectoralis major muscle. Though anomalies in the origin, course and branching pattern is not frequent with axillary artery, previous research reports shows different types of anomalies in it. We observed an unusual unilateral variation in a 55 year old male cadaver, during routine dissection, in the branching pattern of the axillary artery. The variation reported in this study is in the second part of the axillary artery where the lateral thoracic and subscapular artery arises from the common trunk which arises at the junction between the second and third part of the axillary artery. Rest of the branching pattern are standard as explained in the gross anatomy text books. As there is a high rate of rupture and damage to the axillary artery during the surgical interventions, the orientation of the axillary artery and its branches is vital for efficient clinical practice. Thus the sound knowledge about the normal, its variation is prerequisite for the clinicians [surgeon, radiologist, orthopedician, anaesthesiologist and clinical anatomist] for accurate diagnosis and surgical intervention.

Keyword: Axillary artery, common trunk, lateral thoracic artery, subscapular artery.

I. Introduction:

Arterial system of the upper limb starts with the axillary artery, which is a direct continuation of the subclavian artery at the outer border of first rib and extends upto the lower border of teres major muscle. Anatomical textbooks state that this axillary artery has three divisions with reference to the pectoralis minor muscle, crosses anterior to it. First part of this axillary artery along with the axillary vein and brachial plexus is enclosed within the axillary sheath. Second part of the axillary artery passes deep to the pectoralis minor muscle. Third part passes between the lateral border of the pectoralis minor and inferior border teres major muscles [1]. Axillary artery has 6 major branches. The first part of this artery gives rise to the superior thoracic artery, second part gives rise to the thoraco-acromial artery, lateral thoracic artery and third part gives rise to subscapular artery, anterior and posterior circumflex humeral arteries. The axillary artery continues as brachial artery distal to the lower border of teres major [2]. Variation in the origin, course and branching pattern of the axillary artery is not frequent. Standard textbooks of anatomy explained that during embryogenesis, the lateral branch of the 7th cervical inter segmental artery enlarges to form the axial artery of the upper limb which further develops as the axillary and brachial artery, in which the later divides as the radial and ulnar artery [3,4]. Though this is the normal branching pattern of the axillary artery previous research studies documented different types of variations in their branching pattern and course, shows that there is no fixed and standard branching pattern of the axillary artery [5-11].

Sound knowledge of the normal anatomy as well as the variations in the branching pattern of the arterial system is vital for the accurate diagnosis of the underlying pathology. The vascular pattern is important for the radiologist, surgeons, anaesthesiologist and the clinical anatomist while doing the procedures around the axilla. Research on the variations of subclavian-axillary arterial system shows that the vascular variations in the axilla are well known [12]. The branches of the subclavian and axillary artery form an extensive collateral circulation around the scapula. This forces the surgeons to acquire a detailed study and thorough knowledge of the neurovascular variations when removing the axillary lymph node. Similarly the sound knowledge of variations is important for anaesthesiologist and orthopedician who do procedure in this area. Hollinshed WH in his textbook stated that sometime branches of the axillary artery may arise from a common trunk or stem or may arise separately [3]. Research reports by various authors have documented different types of variations in the branching pattern of axillary artery [13-23]. As there is a high rate of rupture and damage to the axillary artery, the thorough knowledge of its origin, course and the branching pattern crucial for surgeon, radiologist, orthopedician, anaesthesiologist and clinical anatomist [15-17].

II. Methodology

During the routine educational dissection study for the practical demonstration of the medicine students in the year 2012, we found this unique variation in the right axilla of a 55 year old male cadaver in the department of anatomy, MIMSR medical college, Latur. The cadaver was examined and does not have any pathological lesion, traumatic lesions or surgical procedure in the neck and the axilla area.

III. Observation:

Dissection of the axillary region was done as explained by the Romanes in the textbook of Cunningham’s manual of practical anatomy [4]. After dissection the axillary artery is exposed and cleaned, the branching pattern and the course was then noted and reported in this study. We report a variation in the second part of the axillary artery where the lateral thoracic and subscapular artery arises from the common trunk. This common trunk arises at the junction between the second and third part of the axillary artery [Fig. 1]. Other branches of the axillary artery such as the thoraco-acromial artery arises from 2 part, subscapular artery, anterior and posterior circumflex humeral arteries arises from the third part of the axillary artery with the normal branching pattern as explained in the standard anatomical textbook [1,2,4].

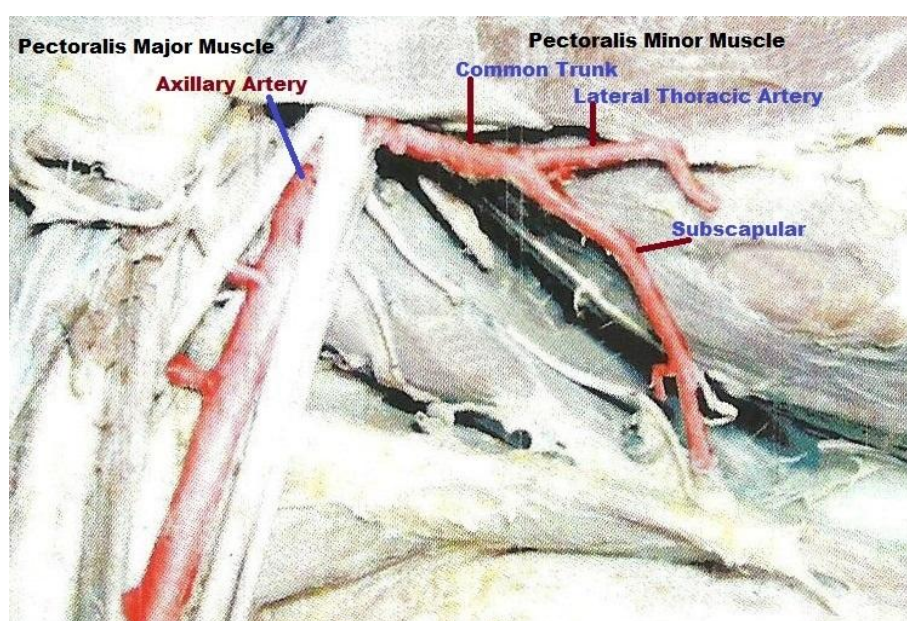


Fig 1: Variation in the axillary artery – lateral thoracic and subscapular artery arising from the common trunk.

IV. Discussion

Variation of the branching pattern in the axillary artery is not uncommon. De Garis and Swartley [1928] in their study of 512 cases about the axillary artery among white and negro stocks documented 5-11 branches, though the commonest number being 8 branches [5] against the textbook document of 6 branches [1]. In the present study, we found a common trunk arising in the second part of the axillary artery which is similar to the variation documented by Saeed et al., [2002] [12]. But in our case this common trunk gives rise to the lateral thoracic and subscapular artery whereas for Saeed in addition to these arteries the thoraco-acromial artery, anterior and posterior circumflex humeral artery also arose from the same common trunk.

Patnaik et al. [2000] in their detailed study about the branching pattern of axillary artery described that in 92% of the limbs lateral-thoracic artery arising from second part whereas 6% from the first part. In our study we found that the lateral-thoracic artery arising from the common trunk arising at the junction between the second and third part of the axillary artery [19].

Rodriguez-Niedenfuhr et al., [2001] in their embryonic study about the development of the arterial pattern in the upper limb reported that the axial artery includes both subclavian and axillary artery in the developing upper limb bud at the 15th stage of development [33rd day, 7+9mm]. These arteries ramify into its capillary network after the closure of the neural plate [24].

Arey LB. [1957] explained embryologically that the causes of the anomalies of blood vessel are persistence of vessels normally obliterated, disappearance of vessels normally retained, incomplete development, fusions and absorption of the parts usually distinct and choice of unusual paths in the primitive vascular plexuses [25].

Hamilton and Mossman [1972] in their textbook on human embryology of cardiovascular system explained that the anomalies or variations in the branching pattern of artery of the upper limb is due to the defects in the embryonic development usually termed as sprouting and regression of the arterial system in the upper limb buds. Similarly the arrest at any stage of this development of the upper limb bud shown usually as regression, retention or reappearance is also a cause for the different variation in the origin, branching patterns or course of the major vessels in upper limb. In addition the defects in the surrounding tissue also alter the origin, course and branching pattern of the artery [26].

Bhat et al. [2008] reported a similar case like the present study but the common trunk in their study gave rise to many branches such as the thoraco-acromial artery, the lateral thoracic artery, posterior circumflex humeral artery and sub scapular artery. The anterior circumflex humeral artery was found to arise from the 3rd part [18].

Literature review shows that the most common variation in the branching pattern of the axillary artery is that the artery dividing into 2 trunks, one directly continuous as the brachial artery and the other gives all the branches of axillary artery [18, 21, 23]. Hollinshed & Rosse [1985] in their textbook of anatomy described that this doubling of brachial artery is more common in arm than axilla [27].

Variation in the origin, course and the branching pattern of the major arteries are clinically important for the vascular radiologist. Similarly the orthopaedic surgeons who do surgical correction for the dislocation of shoulder joint with the transverse incision may injure the axillary artery. Thus, sound knowledge about the abnormal branching pattern is needed to avoid faulty injury to the artery which may cause bleeding [28, 29].

Abnormal branching pattern of the axillary artery is important for the surgeons, since except the popliteal artery, the axillary artery is more frequently lacerated by violence than other surgery. It is usually ruptured when reducing the dislocation that too in cases where the artery is adherent to the articular capsule [30].

Bhat et al [2008] documented the clinical significance of the variations in the upper limb arterial system for clinicians. Variations especially the large trunk arising directly from the axillary artery which gives off branches, like the one described in this present study, is clinically important for the clinicians in the following factors: during the antegrade cerebral perfusion surgery in aortic surgery [31], when creating bypass between axillary artery and subclavian artery in subclavian artery occlusion., treating aneurysm of axillary artery, axillary haematoma, brachial plexus palsy, axillary artery thrombosis [32], reconstructing the injured axillary artery, using axillary artery as the graft for replacing the damaged artery, axillary-coronary bypass shunting, radical mastectomy, catheterisation of axillary artery, assessment of axilla using ultrasonography, medial arm skin flapping procedure [33], orthopaedic surgeries for fracture of humerus [upper end] and shoulder dislocation.

Thus the sound knowledge about normal and the abnormal origin, course and branching pattern of the axillary artery is vital for the clinician's scientific practice including the accurate diagnosis and surgical intervention.

Conflict of interest:

There is no conflict of interest and funding source for this research study.

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