

Origin of Superficial Brachial Artery from Second Part of Axillary Artery-Its Embryological Basis and Clinical Significance

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Abstract: During routine dissection in a male cadaver of about 60 years of age, left upper limb showed bifurcation in the second part of Axillary artery into Superficial and Deep brachial arteries. Superficial brachial artery runs antero-medial to median nerve and continued its course in the arm and divided into radial and ulnar arteries in cubital fossa. Deep brachial artery trifurcated into anterior circumflex humeral artery, posterior circumflex humeral artery and Profunda brachii artery. Knowledge of such variation in axillary artery is important for surgeons during surgical procedures.

Keywords: Axillary artery(AA), superficial brachial artery(SBA), deep brachial artery(DBA), profunda brachii artery(PBA).

I. Introduction

Axillary artery is a continuation of Subclavian artery, extending from the outer border of first rib to the lower border of teres major muscle where it continues as brachial artery. The pectoralis minor muscle is related anteriorly to the Axillary artery and it divides Axillary artery into three parts, first part extending from outer border of first rib to the upper border of pectoralis minor muscle, second part lies behind the pectoralis minor muscle, and third part extending from lower border of pectoralis minor muscle to lower border of teres major muscle. Axillary artery normally gives off superior thoracic artery from the first part, lateral thoracic artery and thoracoacromial artery from the second part and Subscapular, anterior circumflex humeral and posterior circumflex humeral arteries from the third part(1). Although this is the classic arterial pattern, branching abnormalities and rare anomalies in the axillary artery origin and course may occur(2)(3). In the present case, left Axillary artery in its second part bifurcated into Superficial brachial artery and Deep brachial artery.

II. Observations

During routine dissection for undergraduate medical students in a male cadaver of about 60 years of age, high division of Axillary artery in the left arm was observed. Left Axillary artery gave origin to Superior thoracic artery from its first part as usual. Second part of artery at a distance of about 5 cm from outer border of first rib, and behind the Pectoralis minor muscle (figure-2) gave Thoracoacromial artery, divided into Superficial brachial artery (medial) and Deep brachial artery (lateral) (figure-3). They are equal in calibre. Axillary vein is related inferomedial to Axillary artery. Median nerve is present in between two divisions of Axillary artery (figure-2). The Superficial brachial artery coursed antero-medial to the Median nerve, gave lateral thoracic artery, alar thoracic artery and continued its course in the arm. It entered cubital fossa and terminated as Radial and Ulnar arteries (figure-4). Deep brachial artery located lateral to Median nerve, gave subscapular artery and trifurcated into Anterior circumflex humeral artery, Posterior circumflex humeral artery and Profunda brachii artery (figure-2).

Branches arising from Axillary artery proper are Superior thoracic artery and Thoracoacromial artery, from Superficial brachial artery are lateral thoracic artery and alar thoracic artery, from Deep brachial artery are Subscapular artery, Branch to shoulder joint, Anterior, Posterior circumflex humeral arteries and Profunda brachii artery.

III. Discussion

Deviations in normal development of vasculature result in variations in arterial pattern(10).

According to (2,6) Anomalous vessels are due to: (a) Unusual paths in the primitive vascular plexus, (b) Persistence of vessels that normally obliterate, (c) Disappearance of vessels that are retained normally, (d) Incomplete development of vessels, (e) Fusion and absorption of parts that is usually distinct.

The arterial variations can be explained as a deviation from the normal vascular pattern (8)(18) and especially the Superficial brachial artery presence is based on the persistence of more than one inter segmental cervical artery, which remains and can even increase in size (6). The definition of Superficial brachial artery was set for the first time by Adachi in 1928 and runs as follows: "the Superficial brachial artery is the one that runs superficial to the median nerve"(1)

The Superficial brachial artery, especially the level of its origin from the Axillary artery gathers the greatest interest. Recently (7), (13) & (21) mentioned the unilateral presence of the Superficial brachial artery in 5-12.2%, while (6), (21) & (17) described cases of bilateral occurrence. The presence of the Superficial brachial artery is more frequent in males and on the right side (16). In cases in which the Superficial brachial artery gave no branches (3), the Deep brachial artery supplied the whole area (20).

In the present case, similar to (9), (14), (15) and (22) a high division in the 2nd part of the Axillary artery into Superficial brachial artery and Deep brachial artery occurred. Other authors(3),(4),(7), (19),(13),(11)(20) found the Axillary artery bifurcation at the 3rd part, while a rare bifurcation at the 1st part, absence of the Subscapular Artery and origin of the Acromio-thoracic artery from the Deep brachial artery, was also referred (6).

classification of superficial brachial artery(21):-

Type I - The superficial brachial artery bifurcated in to radial and ulnar arteries in the cubital fossa

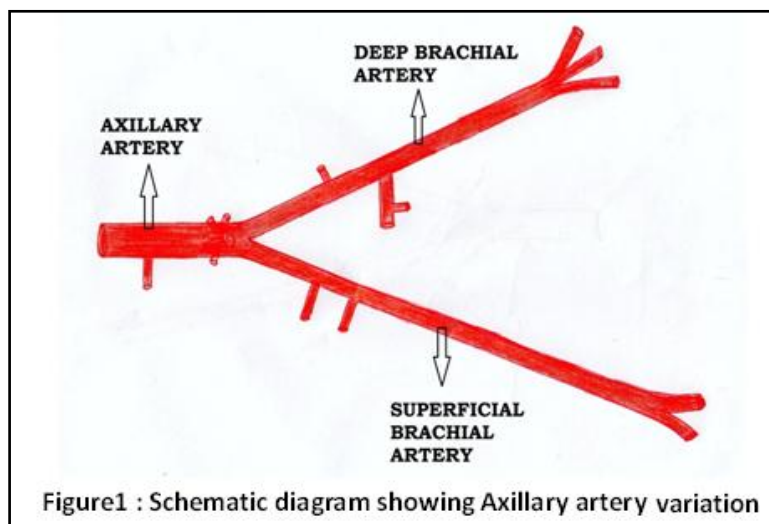
Type II- (i.e. superficial radial artery) – it continued as radial artery

Type III -The slender superficial brachial artery supplied the arm

In Present case superficial brachial artery variation corresponds to type -I Yang et.al (21) classification, where it bifurcated in to radial and ulnar arteries in the cubital fossa.

IV. Conclusion

The variable pattern of the Axillary artery is important for surgeons and interventional physicians. The high bifurcation of the Axillary artery and its abnormal branching pattern may pose problems to clinician during angiographic procedures leading to diagnostic errors. The Superficial brachial artery due to its abnormal origin and position may be more prone to serious injury leading to hemorrhage. The possibility of it to be mistaken for a vein is evident; leading to accidental intra-arterial injection and as a consequence may lead to thrombosis or gangrene. Therefore, the variable arterial pattern is important to be identified preoperatively using Doppler ultrasound & Angiography, especially in emergency cases of chest wall reconstruction such as in Poland's Syndrome, during surgery for carcinoma breast and axillary lymph nodes dissection, when surgeons have to correctly identify and protect the Axillary vessels. Hence the anatomic knowledge of vascular variations would allow more accurate diagnosis and surgical treatment.



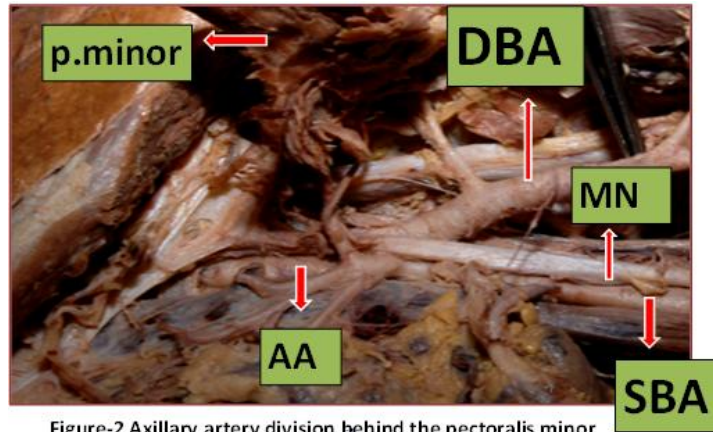


Figure-2 Axillary artery division behind the pectoralis minor
AA=Axillary artery , DBA=Deep brachial artery, SBA=Superficial brachial artery, MN=Median nerve, P.minor= pectoralis minor

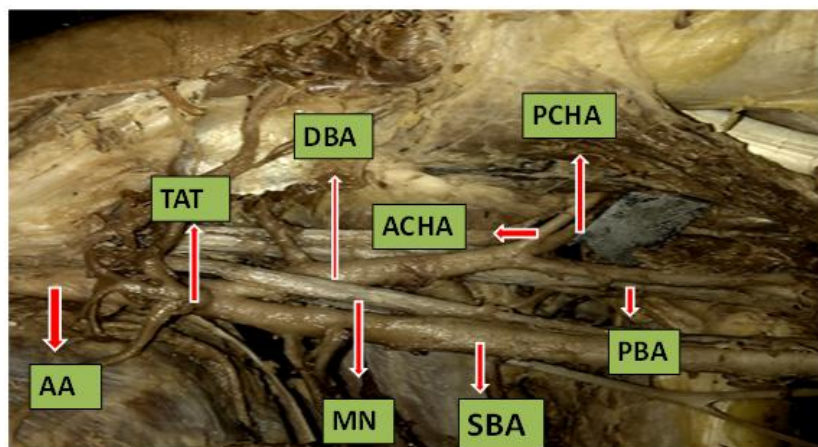


Figure-3 branches of Axillary artery.
AA=Axillary artery, TAT=Thoraco acromial trunk, ACHA=Anterior circumflex humeral artery ,PCHA=Posterior circumflex humeral artery, PBA=Profunda brachii artery, MN=Median nerve, SBA=Superficial brachial artery ,DBA=Deep brachial artery

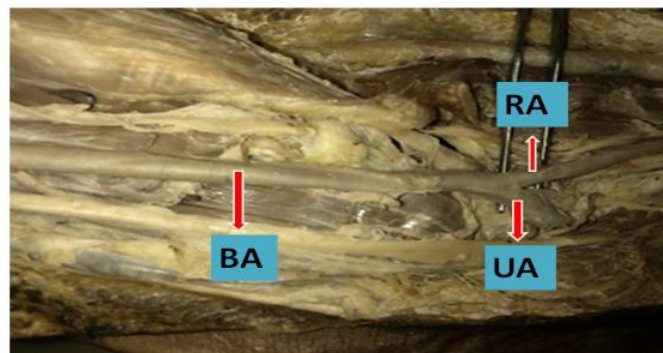


Figure-4 Superficial brachial artery division in cubital fossa
BA=Brachial artery , RA=Radial artery, UA=Ulnar artery

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