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# Variations in the branching pattern of axillary artery and its relation to median nerve - a case report.

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**Abstract :** The relationship between axillary artery and brachial plexus along with variations in branching pattern of axillary artery bears much clinical significance. During routine dissection, the following variations were found in a male cadaver on the right side. The thoracodorsal artery was found to arise from the second part of axillary artery along with an alar thoracic artery. A common trunk from the third part was seen to pass between the two roots of median nerve. The common trunk gave rise to anterior circumflex humeral artery, posterior circumflex humeral artery, superior ulnar collateral artery, subscapular artery and profunda brachii artery. Also the two roots and the main trunk of median nerve were in a posterior relation to the third part of axillary artery. The knowledge of such variations are important to surgeons, orthopaedicians, anaesthesiologists and radiologists.

**Keyword :**axillary artery, common trunk, median nerve.

**Introduction :** The axillary artery is a continuation of the subclavian artery beyond the outer border of first rib and upto the inferior border of teres major. The axillary artery is divided into three parts for description purposes with regards to the pectoralis minor. The normal branching pattern seen in majority of individuals is, it gives off six branches. The first part which lies above the upper border of pectoralis minor is said to give rise to superior thoracic artery. The second part behind the pectoralis minor muscle gives off thoracoacromial artery and lateral thoaracic artery. From the third part, which lies below the lower border of pectoralis minor arise the subscapular artery, anterior and posterior circumflex humeral arteries. The subscapular artery then divides into circumflex scapular and thoracodorsal arteries (1). Also the trunk of the median nerve lies in a lateral relation to the third part of axillary artery (2). Although the branching pattern and relationship of the vessels are subjective to variations, there are few significant variations that are relevant clinically. One such clinically significant variation is described here. Materials and methods: During routine dissection in a 63years old male cadaver in the Department of Anatomy, Thanjavur, variations in the branching pattern of the second and third parts of the axillary artery were found. Also, the relationship between the third part of the axillary artery and the median nerve was altered. Case report: The following variations were observed in a 63 years old male cadaver on the right side. First part : The branching pattern of the first part was normal. The superior thoracic artery arose from the first part and supplied first and second intercostal spaces (Fig.1)

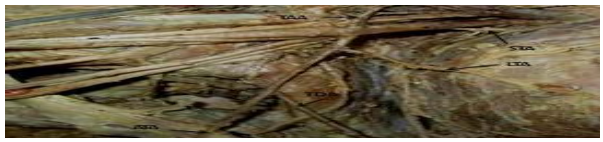

**Fig 1 shows branches from first and second parts of axillary artery. STA-Superior Thoracic Artery, TAA-Thoraco Acromial Artery, LTA-Lateral Thoracic Artery, TDA-Thoracodorsal Artery, ATA-Alar Thoracic Artery.**

**Fig 2 shows the common trunk (CT) from the third part of axillary artery passing between the medial (MR) and lateral (LR) roots of median nerve(MN).**

Second part: The thoracoacromial artery with its four named branches was normal in position. Another branch found just opposite to the origin of the thoracoacromial artery divided into lateral thoracic artery and a common division. The common division then gave off an alar thoracic artery and thoracodorsal artery. The alar thoracic artery was found supplying the skin and fat of the axillary region. The thoracodorsal artery supplied the latissimus dorsi muscle(Fig. 1)

**Fig 3 shows branches of the Common Trunk (CT) arising from the third part of axillary artery. ACH-Anterior Circumflex Humeral Artery, SUC-Superior Ulnar Collateral artery, PBA-Profunda Brachii Artery, SSA-Subscapular Artery, CSA-Circumflex Scapular Artery, BTM-Branch to Teres Major. UN-Ulnar Nerve, RN-Radial Nerve, AN-Axillary Nerve. * - Quadrangular space.**

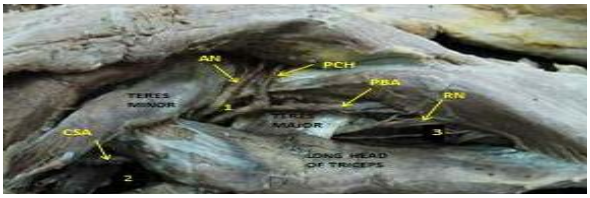


**Fig 4 – View from the back to show the origin of Posterior Circumflex Humeral artery(PCH) from Profunda Brachii Artery(PBA).CSA-Circumflex Scapular Artery, AN-Axillary Nerve, RNRadial Nerve. 1-Quadrangular space, 2-Upper triangular space, 3-Lower triangular space.**

Third part: From the third part, arose a large common trunk which was found to pass between the two roots of median nerve (Fig. 2). The common trunk gave rise to anterior circumflex humeral artery, superior ulnar collateral artery, profunda brachii artery and subscapular artery. The subscapular artery divided into two branches, one supplying teres major muscle and the other branch was circumflex scapular artery (Fig.3). The profunda brachii artery entered into the quadrangular space along with the axillary nerve and gave rise to the posterior circumflex humeral artery posteriorly. The posterior circumflex humeral artery passed below the axillary nerve to reach the surgical neck of humerus(Fig. 4). The profunda brachii artery continued its course by passing through the lower triangular space along with the radial nerve. Also the two roots and the main trunk of median nerve was found to be in a posterior relation to the third part of axillary artery (Fig. 5).


**Fig 5 shows the medial (MR) and lateral (LR) roots of Median Nerve(MN) lying in a posterior relation to the third part of Axillary Artery(AA).**

The branching pattern of the axillary artery and it's relation to the median nerve was normal on the left side.

**Discussion :** The branching pattern of axillary artery is subjective to variations in many individuals. The number of branches may vary between 5 and 11 (1). It is not uncommon to find many sepa rate branches arising from a common stem and usually grouped branches arising separately. When the branches are given off as a common trunk, the brachial plexus surround this trunk instead of the main vessel(3). The axillary artery itself is sometimes found to be divided into two equal sized arteries (4). In such cases, the superficial branch represents the radial or ulnar artery and the deeper branch corresponds to brachial artery(1). This deep branch should not be confused with profunda brachii artery which arises from the brachial artery. The abnormal branching pattern involving the first part includes a branch to the serratus anterior muscle which arises as the first branch apart from the superior thoracic artery (5). In the second part, a branch supplying the fat and skin of the axillary region called alar thoracic artery is given off as an additional branch(2,6). The lateral thoracic artery and the thoracodorsal artery may arise as a common stem from the second part(7). Along with these branches the subscapular artery and the humeral arteries may also be given off as a common trunk from the second part itself (8). In the third part, the subscapular artery, humeral arteries, superior ulnar collateral arteries and the profunda brachii artery may arise from a common trunk(9,10,11). An author has proposed to name this branch as common subscapular trunk(12). Not only do the arteries vary in branching pattern but also they can be either absent or supernumerary(13). The relationship between the third part of axillary artery and the median nerve is clinically significant. When the branches or the main artery itself is caught between the roots of median nerve, both the arteries and the nerve are prone for compression (14). In aneurysm of axillary artery, there is every chance that the nerve roots can get compressed. Also the nerve roots can cause compression of the arterial branch caught between it (1).

The development of upper limb vessels can be explained as follows. The seventh cervical intersegmental artery forms the axis artery of the upper limb (15,16) .This axis artery forms the axillary artery, brachial artery and interosseous artery of the forearm. Later a median artery develops from the interosseous artery and the ulnar artery arises from the brachial artery. Thereafter, a superficial brachial artery arises from the axillary artery and continues down as radial artery. The median artery regresses and an anastomosis occurs between brachial artery and superficial brachial artery (16). The part of superficial brachial artery proximal to the site of anastomosis disappears and the rest of the superficial brachial artery persists as the definitive radial artery. The smaller branches arise as sprouts from these branches. The development of upper limb vessels starts as capillary plexuses. The regression, persistence, in-complete development, enlargement and improper differentia-tion of the initial capillary plexus results in abnormal branching patterns(17,18). At the molecular level, Forkhead box O(Foxo) transcriptional factors act as critical integrators in regulating proliferation, differentiation and survival of endothelial cells. Silencing of either Foxo 1 or 3a led to profound increase in migratory and sprout forming capacity of endothelial cells (19). Even a slight alteration in the spatial and temporal regulation of capillaries with surrounding nerve plexuses during development, can result in abnormal relationship between vessels and nerves (20). The investigation modalities for detecting the variations include Doppler ultrasound imaging, angiography and digital subtraction angiography (21). The implications of such variations in clinical practice are numerous and they should be borne in mind while performing procedures like axillary lymph node dissection, brachial plexus block, treatment of axillary artery aneurysm, using medial arm skin as free flap, axillary approach to chronic dislocation of shoulder joint and catheterization for creating a bypass between axillary artery and subclavian artery in subclavian artery occlusion (22,23).

**Conclusion :** A thorough idea of various branching patterns and relationship of axillary artery with the surrounding branches of brachial plexus has numerous practical implications. It helps in accurate interpretation of imaging studies and in avoiding untoward complications while performing various surgical procedures involving the axillary region. Thus the knowledge of variations in branching pattern of the axillary artery is a great aid to surgeons, cardiologists, anaesthesiologists, orthopaedicians and radiologists in preventing diagnostic errors and planning of a surgical intervention.

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