

# Study of Formation of Median Nerve Variation and Branching Pattern of Axillary Artery Variations

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**Abstract:** *Introduction:* Axillary artery is a continuation of subclavian artery at outer border of first rib. Variations in branching pattern of axillary artery and formation of median nerve variation is uncommon. The knowledge of these variations is anatomical, radiological and surgical interest to explain clinical signs and symptoms. *Material and Methods:* Bilateral dissection of axilla was studied in 10 embalmed cadavers during routine dissection. *Observations & Results:* Unilateral variations were observed in three cadavers. In the first case double thoraco acromial arteries arose from second part of axillary artery on left side. In second case thoraco acromial artery arose from first part of axillary artery on right side, and it does not piercing the clavipectoral fascia. In third case three roots of median nerve which are two roots are arose from medial cord and one root from lateral cord as usual. *Conclusion:* The detailed knowledge about variations of branching pattern axillary artery and formation of median nerve helpful for surgeons, radiologist performing cardiovascular diseases and inter ventional procedures.

**Keywords:** Median nerve, medial cord, axillary artery, thoraco acromial artery

## 1. Introduction

Axillary artery begins as a continuation of the third part of subclavian artery at the lower border of the first rib. It ends at lower border of teres major. The pectoralis minor crosses in front of the artery and divides into three parts. First part proximal to the muscle, second part behind the muscle, third part distal to muscle.

### Thoraco acromial artery

It is a branch of second part of axillary artery. It pierces the clavipectoral fascia. It divides into four branches-pectoral, acromial, clavicular and deltoid<sup>1</sup>.

Variation in branching pattern of axillary artery is important to anatomists, surgeons and vascular surgeons. Knowledge about variations in axillary artery is used during surgeries for lymphnodes in the axilla and pectoral region.<sup>2</sup>

It is uncommon, most of the variations arises from main trunk of axillary artery. Extensive collateral circulation associated with the branches of subclavian and axillary artery around the scapula.<sup>5</sup>

### Median nerve

It consists of lateral and medial roots. The lateral root (C<sub>5</sub>-C<sub>7</sub>) is the continuation of the lateral cord. Medial root (C<sub>8</sub>-T<sub>1</sub>) is derived from medial cord. The trunk of the median nerve descends on the lateral side of axillary artery.<sup>1</sup>

Median nerve is one of the major nerve in upperlimb. Knowledge of variations in formation of median nerve helpful to evaluate the nerve injuries.<sup>6</sup>

Formation of nerves of upper limb have been described by many authors(Vollala, Raghu nathan, Radrigues 2005, saralaya, Nayak, Sequera et.al, 2009).Nerve variations of upper limb are very important in routine surgery and during radical neck dissection. Where these variations are prone to injury.(Gacek 1990).<sup>13</sup>

## 2. Material and Methods

Bilateral dissection of axilla was studied in 10 embalmed cadavers during routine dissection for under graduate students at Dr.VRK womens medical college. Aziz nagar, Ranga Reddy (Dist). Exposure of axillary artery, median nerve and its branches. Dissection procedure was followed by cunningham's manual of practical anatomy. Variations were observed, photographed findings were noted.

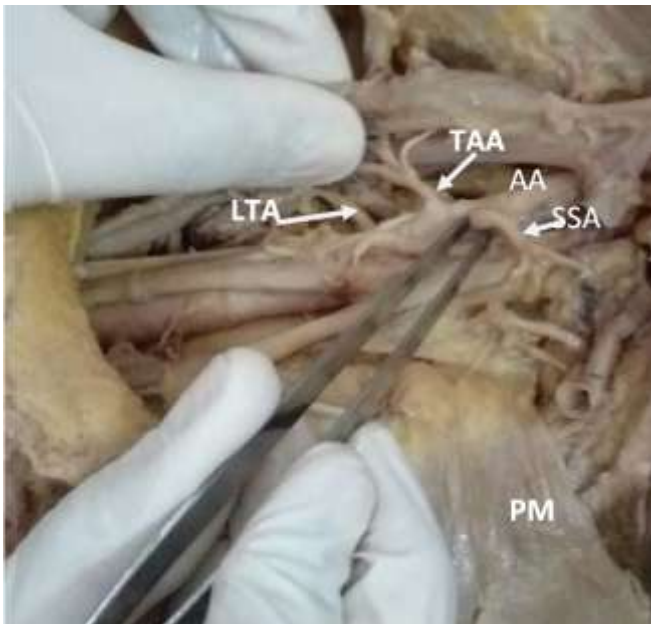
## 3. Observations and Results

Unilateral variations were observed in three cadavers out of ten cadavers. Branching pattern of axillary artery and formation of median nerve variation.In rest of the cadavers axillary artery, median nerve was normal in its course.

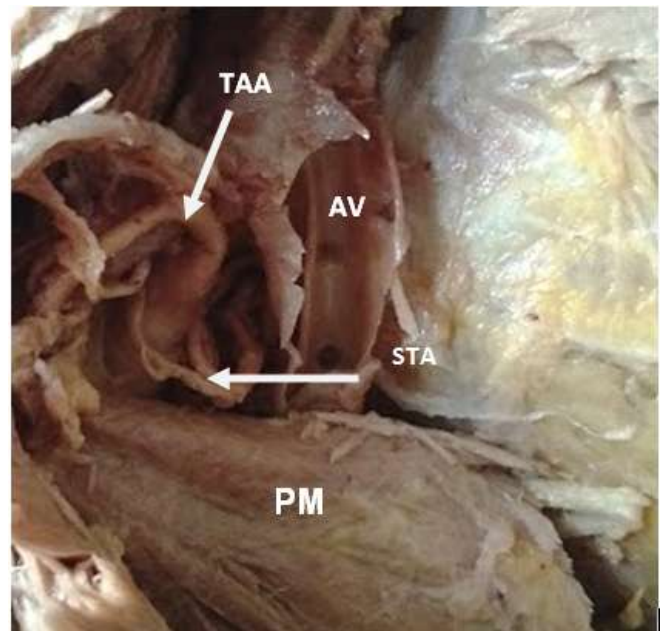
- 1) In the first case double thoraco acromial arteries arose from second part of axillary artery on left side.
- 2) In second case thoraco acromial artery arose from first part of axillary artery on right side, and it does not piercing the clavipectoral fascia.
- 3) In third case three roots of median nerve which are two roots are from medial cord and as usual one root from lateral cord.

## 4. Discussion

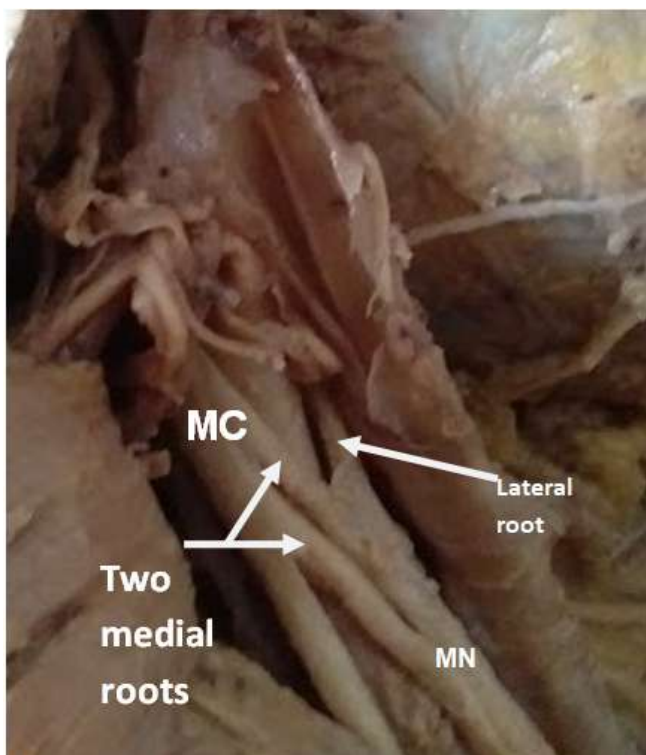
Any variation in development of blood supply of upper limb bud may cause variations in the branching pattern of axillary artery. This is occurs due to regression, retention, reappearance at any stages of development of vessels. Anamalous branching pattern may represent persisting branches of vascular plexus of developing limb buds and their unusual course. It may lead to complications in surgeries that involve the axillary and pectoral region.



**Figure 1:** Showing second part of axillary artery giving three branches-AA-Axillary artery, PM-Pectoralis minor, TAA-Thoraco acromial artery, LTA-Lateral thoracic artery, SSA-Supra scapular artery, left side



**Figure 3:** First part of axillary artery showing two branches



**Figure 2:** Showing two roots of median nerve arise from medial cord, MC-medial cord, MN-Median nerve right side

According to srinivasulu et.al found that posterior circumflex humeral artery arose from subscapular artery in 25% cases, common trunk of subscapular and thoraco acromial trunk arose from second part of axillary artery in 15% cases.<sup>3</sup> In the present study posterior circumflex humeral artery arose from third part of axillary artery in all cases. In one cadaver thoraco acromial artery arose from first part of axillary artery.

The literature contains many reports of median nerves with three roots, in which two originated from lateral cord and one from medial cord (saeed 2006, Rufai 2003, Goyal et.al 2005), Ramachandran e.al 2006.

Knowledge of such variations is essential in the evaluation of unexplained sensory (or) motor loss after trauma (or) surgical intervention of upperlimb.<sup>4</sup>

Satyanarayana.N 2009 et.al concluded that anomalous median nerves formation in three adult male cadavers.

- 1) There was variation of median nerve and its relation with axillary artery
- 2) Formation of median nerve by three roots.
- 3) Median nerve was found to be formed by four roots. Knowledge of these variations is important to surgeons for carrying out surgical procedures in axilla.<sup>5</sup>

In the present study Median nerve was formed by three roots. Two roots derived from medial cord, one root arose from lateral cord.

Deepak .A observed that common trunk of axillary artery gave origin to subscapular, anterior and posterior circumflex humeral arteries, profunda brachii artery. Subscapular artery gave circumflex scapular; thoraco dorsal artery.<sup>6</sup> In the present study second part of axillary artery gave two thoraco acromial trunks on left side.

Sawarawickrama found that formation of median nerve by three roots.They occurred as unilateral variations one male and other one is female. Both of them were formed by three lateral roots and medial root anterior to third part of axillary artery.Common site of variation of median nerve formation is around the third part of axillary artery.<sup>7</sup> In our study median nerve was formed by three roots in male cadaver, it lies lateral to third part of axillary artery.

Pandey and Shukla studied about, thoracoacromial trunk variations particularly at the level of origin of its branches, more on the right side, and divided these variations into

three groups. In the first group, the common trunk was absent but deltoacromial and clavipectoral sub-trunks arose directly from the second part of the axillary artery. In the second group, only one branch, i.e., a clavicular branch of from the second part of an axillary artery and the remaining three were arising from thoracoacromial trunk. In the third group, all classical branches of thoracoacromial trunk arose directly from the second part of the axillary artery.<sup>8</sup>

In the present study followed third group of above study. Cavdar et al. mentioned the third part of axillary artery variation as its division into superficial and deep brachial arteries: The superficial brachial artery was divided into radial and ulnar arteries in cubital fossa; and deep brachial artery divided into anterior circumflex humeral, posterior circumflex humeral, subscapular, and profunda brachial arteries.<sup>9</sup> In our study observed the variations of first and second parts of axillary artery. Third part axillary artery branches were normal.

Daimi et al. found duplex origin in the posterior circumflex humeral arteries arising from the third part of the axillary artery as two trunks: One artery continued laterally together with axillary nerve and appeared in the quadrangular space; the other one passed medially piercing teres minor muscle and appeared on the dorsal surface of scapula.<sup>10</sup> In our study we observed that duplex origin of thoraco acromial artery arising from second part of axillary artery.

Median nerve usually formed in the axilla. Nayak, Samuel and Somayaji (2006) observed a case where median nerve was formed just below the midpoint of the arm. In their case medial and lateral roots of median nerve were very long and median nerve was formed just medial to brachial artery.<sup>11</sup> In the present study median nerve formed in front of third part of axillary artery.

Normally formation of median nerve comes in lateral relation of third part of axillary artery, as medial root crosses the axillary artery anteriorly to join with lateral root, lateral to axillary artery. Haviarova, Falougy and Killinggerova (2001) reported a case where median nerve was formed posterior to axillary artery. There are also reports where median nerve was formed medial to axillary artery.<sup>12</sup> In the present study reported that median nerve was formed lateral to third part of axillary artery in all upper limb but except in one upper limb median nerve was formed posterior to artery.

Variations in the formation of median nerve were reported earlier by some authors (BHANU, JANKER, SUSAN 2010).

According to Bhudiraja confirmed that unusual formation of median nerve including additional roots taking part in formation, formation in the arm, formation medial to artery, formation anterior to artery and correlated it embryologically and clinically.

The variations can be explained embryologically. The upper limb bud lies opposite to lower five cervical and upper two thoracic segments. The variations could be arise circulatory factors at the time of fusion of brachial plexus cord. In human forelimb muscles develop from mesenchyme of para axial mesoderm during 5<sup>th</sup> week of intrauterine life

(Larsen1997).The axons of spinal nerve grow distally to reach the limb bud mesenchyme. The peripheral process of motor and sensory neurons grows in the mesenchyme in different directions once formed and developmental differences would obviously persist postnatally. (Brown, Hopkins, Keyens 1991)<sup>13</sup>

## 5. Conclusion

Any clinical procedures in pectoral region and axillary regions requires accurate knowledge of normal and variant arterial anatomy of axillary artery. The importance of axillary artery and its branches is useful for coronary bypass and flaps in reconstructive surgeries.

Variations in median nerve formation is important not only to anatomists but also in clinical practice to evaluate nerve injuries and images in the upper limb and for surgeons to prevent in advertent damage to nerves during surgery.

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