

Variant Course and Anamolous Branching Pattern of Major Ateries In Upper Limb in Telangana Region.

KEYWORDS	axillary artery, brachial artery, profunda brachi artery , branching pattern, common interosseous artery.		
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ABSTRACT BACKGROUND : Knowledge of course and branching pattern of major arteries is very important for the vascular surgeons & plastic surgeons.

METHOD: This study was carried over a span of three years on 30 human cadavers in the department of anatomy, osmania medical college, Hyderabad, telagana state , India. Dissection instruments were used for dissecting the entire upper limb in all the cadavers according to the steps of the cunnigham's manual and variations are noted

RESULT : In our study we observed variant course and anamolous branching pattern of major arteries in upper limb particularly in the region of axilla , arm and forearm. In our routine dissection of cadavers in anatomy department we observe these variations particularly in axillary , brachial and other major arteries in arm and forearm. In our present study this type of gross variation we found in one body out of 30 cadavers.these variations in the both limbs also different . In the left upperlimb of this cadaver 3rd part of axillary artery is devided into large superficial (60%)(we named it as superficial brachial artery) and small calibre deep branch(40%)(we named it as deep brachial artery) one centimeter below the pectoralis minor at the lower border of lattissmus dorsi muscle and infront of the teres major muscle. Deep Brachial artery is possibly a high-origin artery of the common interosseous. The course of this artery resembles the course of the brachial axial artery of the embryo. It supplies the anterior compartment of brachial artery) lies antero medial to the median nerve and also superficial to the nerve through out it's course in the arm and reaches base of the cubital fossa where it lies deep to the bicipital aponeurosis medial to the tendon of biceps femoris. Superficial Brachial artery is possibly a high-origin and persisting embryological radial artery. It gives no collaterals in the arm. At the base of the cubital fossa it divides into two equal-sized radial and ulnar arteries at the condylar line of humerus instead of at the neck of radius in the cubital fossa.

CONCLUSION: Although the abnormal branching pattern is quiet infrequent ,according to this study, here we get only in one limb out of 60 upperlimbs , the frequency rate is only 1.6% even though frequency is in narrow range it is essential to know such rare variations.

INTRODUCTION:

Axillary artery is the main artery of upperlimb. It is a continuation of subclavian artery at outer border of 1st rib. At the lower border of teres major muscle it is continous as brachial artery. Brachial artery is the continuation of the axillary artery beyond the lower boarder of the teres major muscle, opposite the neck of the radius in the anterior cubital region it divides in to radial and ulnar arteries. Variations in upper limb arteries have been frequently observed majority of these variations occur in radial artery followed by ulnar artery ¹, however brachial artery variations are less common². Accurate knowledge of muscular and neurovascular variations is important for both surgeons and radiologists, which may prevent diagnostic errors³.

The term accessory brachial artery was first established by McCormack and embryologically it referred to as the superficial brachial artery which is based on the persistence of more than one intersegmental cervical artery which does not deteriorate but persists and can even enlarge its diameter ^{4,5}. Tohno Y et al reported a case of double brachial arteries in which superficial brachial artery descended in the arm superficial to the median nerve and deep bra-

chial artery with its normal course descended behind the median $\mathsf{nerve}^6.$

Ulnar artery provides the much of blood supply to the fore arm than radial artery by giving common interosseous artery which provides blood supply to the deeper regions of the flexor and extensor compartment through anterior and posterior interosseous arteries. In the hand both radial and ulnar arteries form two arterial arches (superficial and deep) and provide blood supply to the terminal regions of the digits. Variations other than normal pattern is very much important in the various reconstructive surgeries, limb solving procedures, radiological studies regarding blood flow and other studies. It is very much essential to know the variations and abnormal patterns of distributions of major arteries. Hence this study was carried . Clinical correlation and embryological basis for these abnormal patterns have been discussed.

METHOD:

This study was carried over a span of three years on 30 human cadavers in the department of anatomy, osmania medical college, Hyderabad, telagana state , India. Dissec-

tion instruments were used for dissecting the entire upper limb according to the steps of the cunnigham's manual and variations are noted.

RESULTS:

In our present study this type of gross variation we found in one body out of 30cadavers. these variations in the both limbs also different . In the left upperlimb of this cadaver 3rd part of axillary artery is devided into large superficial (60%)(we named it as superficial brachial artery) and small calibre deep branch(40%)(we named it as deep brachial artery)one centimeter below the pectoralis minor at the lower border of lattissmus dorsi muscle and infront of the teres major muscle.

Deep brachial artery is possibly a high-origin artery of the common interosseous. The course of this artery resembles the course of the brachial axial artery of the embryo. It supplies the anterior compartment of brachial muscles and continues as the common interosseous artery. This deep small calibre artery(Deep Brachial artery) encroached by the two roots median nerve. this deep artery gave all three branches of third part of axillary artery and descend down wards along posterolateral to the median nerve till the cubital fossa. In the cubital fossa where it lies lateral and deep to the median nerve passes between two heads of pronator teres , at the distal border of pronator teres muscle this artery devides into anterior and posterior interosseous arteries. This Deep Brachial artery in the arm it gave all muscular branches, nutrient artery to humerus, superior and inferior ulnar collateral arteries , profunda brachi artery in the arm, In the cubital fossa it passes between two heads of pronator teres, at the lower border it devides into anterior and posterior interosseous arteries.

The large caliber superficial artery (Superficial Brachial artery) lies antero medial to the median nerve and also superficial to the nerve through out it's course in the arm and reaches base of the cubital fossa where it lies deep to the bicipital aponeurosis medial to the tendon of biceps femoris. Superficial Brachial artery is possibly a high-origin and persisting embryological radial artery. It gives no collaterals in the arm. At the base of the cubital fossa it divides into two equal-sized radial and ulnar arteries at the condylar line of humerus instead of at the neck of radius in the cubital fossa. it is separated from the median nerve and deep small caliber brachial artery by superficial head of pronator teres muscle. In the arm it gave few muscular branches for the adjascent muscles and also accompanied by venae commitans through out its course. It is separated from the median cubital vein by the aponeurosis of biceps tendon which merges with the deep fascia in the cubital fossa. The rest of the course of the radial artery showed normal pattern. The ulnar artery instead of going deep to the ulnar head of pronator teres it is going superficial to the flexors in the forearm through out it's course and accompanied by ulnar nerve on the medial side(usually this ulnar artey in the cubital fossa it is separated by deep head of pronator teres from median nerve going deep plane in the upper 1/3rd of forearm, where it joins and accompanies with ulnar nerve. In the middle 1/3rd of fore arm ulnar artery accompanied with ulnar nerve medially it passes just beneath the flexor carpi ulnaris muscle). In the present case the ulnar artery is very superficial in the upper 1/3rd of forearm and passing superficial to superficial flexors in the upper 1/3rd of forearm. In the middle 1/3rd of fore arm it passes beneath the flexor carpi ulnaris muscle and lies lateral to the tendon of flexor carpi ulnaris muscle in the lower 1/3rd of forearm.

In the right limb only variation we found is common interosseous artery arises from the radial artery instead from ulnar artery. The course and pattern of all other arteries were normal.

DISCUSSION AND CONCLUSION:

Superficial Brachial artery is possibly a high-origin and persisting embryological radial artery. It gives no collaterals in the arm. At the base of the cubital fossa it divides into two equal-sized radial and ulnar arteries. These arteries run completely superficial to flexor muscles of the forearm .

Persistent of superficial brachial artery was observed mostly in the right upper limb^{6,7,8} and few cases also reported in the left upper limb⁹. In this study we also reported the left dominance of persistent of superficial brachial artery. Keen suggested that the superficial brachial artery is in fact high origin of the radial artery¹⁰, whereas prevalence of the superficial brachial artery originating from the axillary artery was reported as 3% by Muller¹¹, 0.24% by Adachi ¹², 1.25% by Kachlik et al¹³. Such superficial course of accessory brachial artery can serve as a route for a catheter during the radial approach to coronary procedures for catheterization. At the same time existence of such superficial brachial artery is more prone to injuries which can lead to bleeding and ischaemia.

Deep Brachial artery is possibly a high-origin artery of the common interosseous. The course of this artery resembles the course of the brachial axial artery of the embryo. It supplies the anterior compartment of brachial muscles and continues as the common interosseous artery.Kachlik et al., reported accessory brachial artery emerging from the third part of axillary artery and its reunion with the main brachial artery in the cubital fossa¹⁴. Yoshinaga et al., reported bifurcation of brachial artery into large superficial and small deep branches at the lower border of teres major muscle¹⁵. The superficial branch further divided into radial and ulnar arteries in the cubital fossa, while the deep branch mainly supplied the muscles of arm these findings are correlated with present study. Baeza et al., noted duplication of brachial artery and reported that superficial brachial artery ended by anastomosing with the radial artery in the cubital fossa and in few cases, it continued as antibrachial artery¹⁶.

Main artery of the upper limb is axillary artery which is a continuation of subclavian artery embryologically derived from 7th intersegmental artery normally C6,C7, T1 inter segmental arteries and longitudinal anastomosis connecting these arteries degenerate slowly during 10-11 weeks of intrauterine life any abnormalities during this phase of development may lead to such type of anomalies. The present abnormality may be due to such reasons. The axis artery is derived from the lateral branch of the seventh intersegmental artery. Along the axial line the axis artery grows outwards and proximal part of it forms the axillary and brachial artery. Initially the radial artery arises more proximally than the ulnar artery, later it establishes a new connection with main trunk at or near the level of origin of ulnar artery. In the later stages of development the upper portion of radial artery (above the connection with main trunk) usually disappears. The type of anomalies presented in this study is due to origin of radial artery from the axial artery in the arm and persistence of upper portion of radial artery above its connection with axial artery or the abnormal bifurcation of axial artery in the arm and its reunion in the cubital fossa.

Prevalence of the profunda brachii artery originating from

RESEARCH PAPER

the axillary artery was reported as 8.7% by Charles et al.¹⁷, 16.6% by Anson ¹⁸, 2% by Patnaik ¹⁹and 4% by Chauhan K et al.²⁰. Knowledge of this unusual anatomy is important during brachial artery catheterization and harvesting of lateral arm flaps.

In few cases higher origin of radial artery in arm with normal course in forearm have been reported ^{21,22}. Maruti Ram et al²³.reported the continuation of the superficial brachial artery as radial artery, Shweta Solan et al., ²⁴reported the continuation of the superficial brachial artery as ulnar artery and Kodama²⁵, reported the continuation of the superficial brachial artery as radial artery and deep brachial artery as ulnar artery. In a study of 68 specimens unilateral superficial brachial artery reportedly divided into superficial radial and superficial ulnar arteries²⁶. Although the abnormal branching pattern is quiet infrequent ,according to this study, here we get only in one limb out of 60 upperlimbs , the frequency rate is only 1.6% even though frequency is in narrow range it is essential to know such rare variations.

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Ethical approval : not required



division of axillary artery at lower border of latissmus dorsi deep brachial artery encroached by two roots of median nerve

deep brachial artery

superficial brachial artery



superficial brachial artery

arteries. -median nerve -pronator teres muscle

and posterior interosseou arteries

deep brachial artery

devides into anterior

devides into ulnar and radial

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Fig-3 : showing deep brachial artery accompanies with median nerve and passing between two heads of pronator teres muscle.



Fig-4 : deep brachial artery continous as common interosseous artery and devides into anterior and posterior interosseous arteries.

Fig-1: showing division of axillary artery into superficial brchial artery and deepbrchial artery

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Fig-2 : showing division of superficial brachial artery into radial and ulnar arteries at inter condylar line.

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