



## A STUDY ON VARIATIONS IN THE COURSE AND TERMINATION OF BRACHIAL ARTERY

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**ABSTRACT** Having knowledge regarding variations in the arterial pattern of upper limb is very important for clinician and surgeons during diagnostic and therapeutic purposes. Present study aimed at the variations in the course and termination of Brachial artery from the cadavers of routine dissection in the department of Anatomy, ACSR Government Medical college, Nellore. 54 specimens of upper limb were dissected and following variations were observed. Brachial artery has superficial course in relation to median nerve by crossing the median nerve at the level of insertion of Coracobrachialis in two specimens. Trifurcation of Brachial artery was observed in one specimen where common interosseous artery instead of arising from the ulnar artery, has taken its origin directly from the brachial artery so that three terminal branches were found at the level of neck of radius namely ulnar artery, radial artery and common interosseous artery. Superficial arteries of upper limbs can be mistaken for veins leading to intra arterial injections causing injury to the artery.

**KEYWORDS :** Brachial artery, variations, termination.

### Introduction:

The main arterial supply to the arm is provided by the Brachial artery. Superficial Brachial artery is one of the major variations (Yalcin B)[1]. The incidence of variations in the arterial anatomy of upper limb varies from 18.53% to 20%[2]. Brachial artery with variations in the course and branches may present a superficial pulse and hazard to venepuncture (hazlett, 1949) and lead to intra arterial injections or ligature instead of vein in the cubital fossa (Pabst & Lippert, 1968, Thoma and Young, 1992)[3,4,5].

Brachial artery begins as a continuation of axillary artery at the distal border of teres major, runs downward at first medial to the humerus and then inclines to lie in front of the bone until it appears in the cubital fossa, where it ends at the level of the neck of radius by dividing into radial and ulnar arteries. In the proximal arm Brachial artery lies on the medial side. It lies laterally in the distal arm. Median nerve crosses in front of the artery from lateral to medial side in the middle of the arm. In the cubital fossa it is crossed by bicipital aponeurosis which separates the artery from the median cubital vein and lies medial to the tendon of biceps brachii muscle. The branches of Brachial artery are arteria profunda brachii, nutrient artery, superior ulnar collateral artery, inferior ulnar collateral artery and muscular branches. Superficial Brachial artery can be used as a feeding artery to a free flap from medial arms skin (karamursel)[6].

### Material and methods

54 specimens of upper Limb were dissected in this study at ACSR Government Medical college, Nellore. According to the steps of Cunningham manual routine dissection of upper limb was done in the department of anatomy for medical students. Brachial artery was traced from its continuation of Axillary artery to the termination in the cubital fossa. Variations in the course and termination of brachial artery noted, tagged and photographs were taken. All the specimens were numbered from 01 to 54. After the detection all the specimens were preserved in 10% Formalin solution.

### Observations:

54 specimens of upper Limb were studied. Brachial artery was observed normal in its course and termination in 51(94.5%) specimens and exhibited 3 (5.5%) variations. Out of the 3 variations 2 specimens (3.7%) were observed to have variation in the course of brachial artery and 1 specimen (1.8%) showed variation in the termination of brachial artery.

### Observations

In the present study, two male cadavers of middle age, showed variations in the course of brachial artery where Brachial artery arised as a continuation of Axillary artery at the distal border of teres major. Brachial artery continued downwards and at the level of insertion of coracobrachialis it crossed the median nerve from medial to lateral side and its course was found to be located superficially. The branching pattern of brachial

artery were normal in the forearm. Brachioradialis muscle on its lateral side and flexor carpiradialis muscle on its medial side. In the cubital fossa it terminated into radial artery and ulnar artery at the level of neck of radius.

In an adult female cadaver of 52 years of age, an anomaly of trifurcation of brachial artery was observed in the left upper limb where common interosseous artery instead of arising from the ulnar artery, has taken its origin directly from the brachial artery so that three terminal branches were found at the level of neck of radius namely ulnar artery, radial artery and common interosseous artery.

### DISCUSSION

In humans the upper Limb is modified for the primary function of prehension hence its vascular supply is vital. Study of vascular pattern in a particular area of a human body is highly interesting as to the number of variations subjected with it. Anomalies of blood vessels may be due to various reasons. Arey 1957 is of the view that anomalies might be due to the choice of unusual pattern in the primitive vascular diseases, the persistence of vessels normally obliterated, the disappearance of vessels normally retained, incomplete development, fusion or absorption of parts usually distinct[7].

Development of arteries of upper Limb in 5 stages has been proposed. An axial arteries represented in adult by Axillary artery, brachial artery and anterior interosseous artery develops first, while other other branches develop later from axial system. In stage two, median artery branch from anterior interosseous artery while the ulnar artery branches from brachial artery in stage-3. Formation of superficial brachial artery from axillary region and traverses the medial surface of the arm and runs diagonally from the ulnar to the radial side of the forearm to the posterior surface of the wrist. At the elbow and anastomotic branch between brachial artery and superficial brachial artery becomes enlarged sufficiently to form with the distal portion of the latter, the radial artery, as a major artery of the forearm; the proximal portion of the superficial brachial artery atrophies correspondingly in stage-5. (Singer, 1933) [8]. The present variation showing superficial course of brachial artery in relation to median nerve was similar to the findings of study by Keen et al 1961. He observed superficial Brachial artery to be continuing till the cubital fossa and bifurcated as usual into radial artery and ulnar artery.[9] Where as Skopakoff 1959 described similar observation in 6.4% of cases. [10] Millar RA 1939 in his observations upon the arrangement of Axillary artery and brachial plexus in the American journal of anatomy published superficial course of brachial artery in 3% of cases. [11] In the present study brachial artery was found crossing the median nerve from medial to lateral and also superficial to median nerve for which it has been termed as superficial brachial artery by Adachi 1928. [12]

Patnaik et al (2002) observed variation of brachial artery in its termination as ulnar artery, radial artery, radial recurrent artery in 2%

of his subjects. He reported that radial recurrent artery instead of arising from radial artery it has taken its origin from brachial artery directly, thus terminating into three branches has mentioned above hence it is termed as trifurcation of brachial artery. The only difference between the present study and Patnaik et al report is that brachial artery has terminated into radial artery, ulnar artery and radial recurrent artery whereas in the present study brachial artery has terminated into ulnar artery, radial artery and common interosseous artery. [13] Nakatani et al (1997) observed trifurcation of brachial artery in the left upper limb where the brachial artery has terminated into ulnar artery radial artery and common interosseous artery. [14]

Venkataramana vollala et al (2008) reported a case of 45 year old male cadaver with variation of brachial artery in its termination into three branches namely ulnar artery, radial artery, common interosseous artery very close to the apex of cubital fossa which is noted as trifurcation of brachial artery. [15] Ganesha M et al imported a case with variation of brachial artery in its termination as radial artery ulnar artery common interosseous artery. These three arteries passed deep to the pronator teres muscle and he further mentioned that the courses of the branches were found to be normal. [16] Sharath Kumar pralhad sawant conducted a study on 100 upper Limb specimens and observed unusual trifurcation of brachial artery in two specimens where the brachial artery terminated into radial artery, ulnar artery and common interosseous artery which correlated with the observations of present study. [17] There are very few studies that reported trifurcation of brachial artery as variation. Among the terminal branches of trifurcation, common interosseous artery and median artery as a third branch are reported earlier. According to the literature radial recurrent artery as a third branch of trifurcation of brachial artery was reported rarely.

In the present study trifurcation of brachial artery was reported as one of the rare variation which correlated with the above studies where brachial artery has terminated into ulnar artery, radial artery, and common interosseous artery the findings of which are similar to the observations of Nakatani et al, Venkataramana vollala et al, Ganesh M et al in their case reports.

The causes of arterial variations can be explained on genetical basis and local factors like position of foetus in utero, unusual muscular development and early movement of limbs. Embryogenic basis for the incidence of such type of variation may occur due to derangement in the development of primordial arterial axis of upper Limb during conception. Development of blood vessels can be explained by the hemodynamic selection within vascular network hence variations may occur by the persistence of vessels that normally obliterate or from the disappearance of vessels that normally persists.

**Conclusion:**

Anatomical variations of Brachial artery are not uncommon. The present study demonstrated 5.5% of anatomical variations in the brachial artery. As the Brachial artery is the main artery of the arm, the variations of brachial artery may cause difficulty during measurement of blood pressure. Clinicians and surgeons should be aware of the possibilities of anatomical variations of brachial artery in order to avoid dangerous complications that might occur during diagnostic and interventional therapeutic procedures.

**Fig. No. 1 Specimen showing Superficial brachial artery in relation to median nerve**



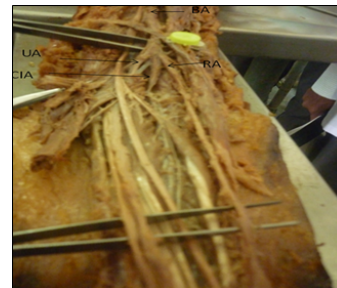
BA – Brachial Artery  
MN – Median Nerve

**Fig. No. 2 Specimen showing superficial course of Brachial artery in relation to median Nerve**



BA – Brachial Artery  
MN – Median Nerve

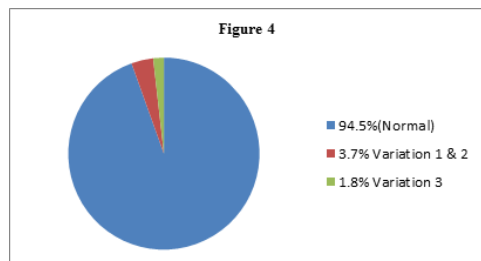
**Fig. No. 3 Specimen showing Trifurcation of Brachial artery**



BA – Brachial Artery  
UA – Ulnar Artery  
CIA – Common Interosseous Artery  
RA – Radial Artery

**Table-1 Variations of Brachial Artery**

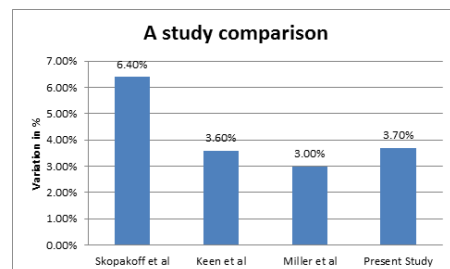
Total No. of Specimens (n=54)		
No. of Specimens with variations (n=3) 5.5%		
S. No.	Variations	Percentage
Variation 1&2	Superficial course of Brachial artery in relation to median nerve	3.7 %
Variation 3	Trifurcation of Brachial Artery	1.8 %



**Table-2 showing the superficial course of brachial artery in relation to Median Nerve**

A study comparison

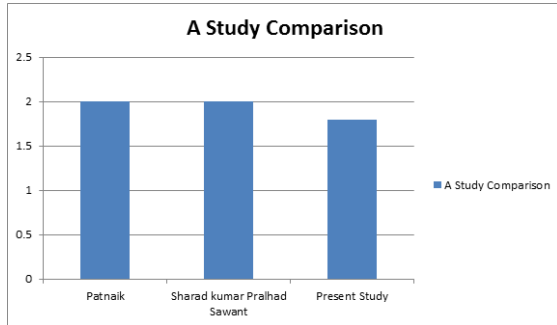
Author Name			
Skopakoff et al 1959	Keen et al 1961	Miller et al 1939	Present Study
6.4%	3.6%	3.0%	3.7%



The present study correlating with Keen et al 1961 (3.6%)

**Table -3 Comparison of Variation i.e. Trifurcation of Brachial Artery between different Studies**

Total No. of Specimens (n=54)		
No. of Specimens with variations (n=1) 1.8%		
Patnaik 2002	Sharad Kumar Pralhad Sawant	Present
2%	2%	1.8 %

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