

Superficial Brachial Artery with its High Division

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ABSTRACT

The upper extremity arterial system shows a large number of variations attributed to the complex and multiple sites of their embryonic development. It is important to be aware of arterial variations in this region because upper extremity is a frequent site of injury. Moreover, brachial artery is of significance in cardiac catheterization for angioplasty, pedicle flaps, or arterial grafting. Accurate knowledge and relationships of major arterial conduits and their variational patterns is important in reparative surgery in the arm, forearm and hand. One such variation is superficial brachial artery with prevalence rate of 0.2- 25%. In this report, the brachial artery emanated normally but coursed superficial to the median nerve and about five cm above the intercondylar line, bifurcated into its terminal branches i.e. radial and ulnar artery.

Keywords: *brachial artery; high division; variations.*

INTRODUCTION

The upper extremity arterial system in humans shows a large number of variations attributable to the complex and multiple sites of their development. These are observed so frequently that it can be aptly said about them that variation is a rule rather than an exception.¹ Since the upper extremity is a frequent site of injury and various surgical and invasive procedures are performed in this region, it is of utmost importance to be aware of arterial variations of this region.² Most of the variations occur in either radial or ulnar artery; brachial artery variations are less common. One such variation is superficial brachial artery in which the brachial artery crosses superficial to median nerve. It is reported by different authors with a prevalence rate of 0.2- 25%.

Normally the brachial artery commences at the lower margin of the teres major and ends about one cm below the bend of the elbow by dividing into the radial and ulnar arteries. During its course in the arm, it passes deep to median nerve. However when it passes superficial to median nerve, it is called superficial brachial artery.³ One such case of superficial brachial artery was encountered in the Department of Anatomy, Government Medical College, Amritsar which is being reported here.

CASE REPORT

During a routine undergraduate dissection of right upper limb of a forty year old female the brachial artery after its normal origin, coursed superficial to the median

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nerve and about five cm above the intercondylar line, bifurcated into its terminal branch i.e. radial and ulnar artery. The radial artery went downwards and slightly laterally, superficial to the tendon of biceps to reach at the junction of upper and the middle third of lateral border of forearm. Its further course was normal. The ulnar artery passed deep to the bicipital aponeurosis and then deep to the deep head of pronator teres. Thereafter, it ran its usual course (Figure 1).

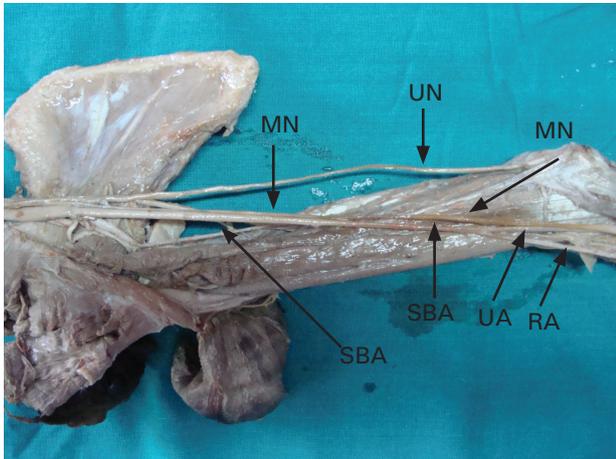


Figure 1. Showing Superficial Brachial artery and its high division.

BA – Brachial Artery, MN – Median Nerve, RA – Radial Artery, UA – Ulnar Artery, UN – Ulnar Nerve.

DISCUSSION

Superficial brachial artery is named so because it runs superficial to median nerve.³ It has also been reported with a prevalence rate varying from 0.2% to 25% (see Table 1). A pattern similar to the one found in present case i.e. brachial artery passing superficial to median nerve and bifurcating into radial and ulnar artery has been reported earlier by Lengele⁶ in 3.6% and Dhem⁴ in 0.8% of population.

Table 1. Prevalence of Superficial Brachial Artery.

Author	Year	Percentage
Quains ⁵	1844	0.2
Miller ⁶	1939	3.0
Lanz and Wachsmuth ⁷	1959	25.0
Fuss et al ⁸	1985	17.0
Langle and Dhem ⁴	1989	0.8

According to Yang et al,⁹ superficial brachial arteries may be classified into three types :-

Type I : The superficial brachial artery bifurcating into the radial and ulnar artery in the cubital fossa after giv-

ing off muscular branches in the arm.

Type II : The superficial brachial artery continuing as the radial artery. It is also termed as superficial radial artery. The ulnar artery in such cases comes as continuation of the usual brachial artery which passes deep to the median nerve.

Type III : The slender superficial brachial artery supplies the arm musculature and ends in the arm itself. The main brachial artery bifurcates into radial and ulnar arteries as usual.

The present specimen partially fits into type I of this classification in that the superficial brachial artery bifurcated terminally into radial and ulnar artery but with the difference that this bifurcation was not in cubital fossa but 5cm proximal to it.

Ontogeny: Arey¹⁰ is of the view that anomalous blood vessels at any site in the body may arise due to:

1. The choice of unusual paths in primitive vascular plexus.
2. The persistence of vessels normally obliterated.
3. The disappearance of vessels normally retained.
4. Incomplete development.
5. Fusions and absorption of the parts usually distinct.

Development of brachial artery has been described in the following five stages by Singer;¹¹

Stage I : Originally the subclavian artery extends to the wrist, where it terminates by dividing into terminal branches for the fingers. The distal portion of the artery becomes the interosseous artery of the adult.

Stage II : The median artery arises from the interosseous artery and becomes larger while interosseous artery subsequently undergoes retrogression. During this process the median artery fuses with the lower portion of interosseous artery and ultimately forms the main channel for the digital branches becoming the principal artery of the forearm.

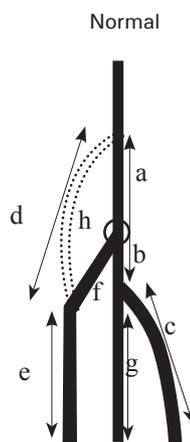
Stage III : In embryos of 18 mm, the ulnar artery arises from brachial artery and unites distally with the median artery to form superficial carpal arch. Digital branches arise from this arch.

Stage IV : In embryo of 21 mm length, the superficial brachial artery develops in the 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. There it divides over the carpus into branches for the dorsum of the thumb

and index finger.

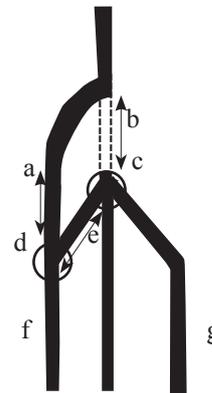
Stage V : Finally three changes occur. When the embryo reaches the length of 23 mm the median artery undergoes retrogression becoming a small slender structure, now known as arteria comes nervimediani. The superficial brachial artery gives off a distal branch which anastomoses with the superficial palmar arch already present. At the elbow an 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 the present specimen it seems that during Singer stage V the distal part of superficial brachial artery (Figure 2, a) failed to disappear but the distal portion of brachial artery (Figure 2, b) atrophied due to haemodynamic preference for superficial brachial artery. The brachial artery which usually bifurcates at c (Figure 2, c), now bifurcates at d (Figure 2, d). The communication between superficial brachial artery and brachial artery (Figure 2, e) which usually forms proximal part of radial artery now forms proximal part of ulnar artery.



- a) Part of axial artery which forms brachial artery
- b) Part of axial artery which forms proximal ulnar artery
- c) Trunk of origin of ulnar artery
- d) Part of superficial brachial artery which disappears
- e) Part of superficial brachial artery which forms radial artery
- f) Communicating branch between superficial brachial artery and brachial artery which forms proximal part of radial artery
- g) Terminal part of primitive axial artery
- h) Point of bifurcation of brachial artery

PRESENT CASE



- a) Distal Part of superficial brachial artery.
- b) Distal portion of brachial artery.
- c) Point at which brachial artery usually bifurcates.
- d) Point of bifurcation of brachial artery in present case.
- e) Communication between superficial brachial artery and brachial artery which will form proximal part of ulnar artery
- f) Radial artery
- g) Ulnar artery

Figure 2. Ontogenetic explanation of superficial brachial artery in present case.¹²

Phylogeny: The superficial brachial artery has also been reasoned out to be an atavistic condition since a main brachial artery crossing superficial to median nerve is said to be the usual arrangement in the primates.⁶

Clinical Importance: Accurate knowledge of the relationships and course of the major arterial conduits like brachial artery, radial artery and ulnar artery and particularly of their variational patterns, is of considerable practical importance in the conduit of reparative surgery in the arm, forearm and hand.¹³

Variation in the branching pattern of the brachial artery is of significance in cardiac catheterization for angioplasty, pedicle flaps, or arterial grafting. Any abnormal positions or divisions of the brachial artery should be identified before surgery.¹⁴

The presence of superficial brachial artery can be hazardous because its very vulnerability.¹⁵ An accidental intraarterial injection via the superficial brachial artery can cause thrombosis or gangrene, leading to amputation of the arm or fingers.¹⁶

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