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SUPERFICIAL BRACHIORADIAL ARTERY WITH ITS EMBRYOLOGICAL BASIS - A CASE REPORT

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ABSTRACT

Axillary artery is the continuation of subclavian artery beyond the outer border of first rib. A case of anomalous branch of the Axillary artery, concerning the variant called superficial brachioradial artery was found in the right upper limb of a female cadaver. This brachioradial artery was seen running superficially on the cubital fossa and continued in the forearm as radial artery and terminated by forming deep palmar arch. An anastomosing branch from deep brachial artery was associated with another one concerning the brachial plexus. Medial and lateral roots of median nerve joined to form median nerve just below the origin of this brachioradial artery. The superficially located artery brings an elevated risk of bleeding complications in unexpected situations.

Key Words: *Superficial Brachioradial Artery, Brachioradial Artery, Radial Artery, Axillary Artery*

INTRODUCTION

Variations in the arterial pattern of upper limb are common and have been reported by several investigators (Fuss *et al.*, 1985). The great variability of this arterial pattern may be attributed to the failure of regression of some paths of embryonic arterial trunks (Tountas *et al.*, 1993). Axillary artery is the continuation of subclavian artery from the outer border of the first rib and continues as the brachial artery at the inferior border of teres major. It continues down the ventral surface of the arm until it reaches the cubital fossa at the elbow. It then divides into the radial and ulnar arteries which run down the forearm. Radial artery is one of the terminal branches of the brachial artery arising in the cubital fossa; the other being the ulnar artery. Radial artery usually begins in the cubital fossa about 1 cm below the bend of the elbow at the level of the neck of the radius just medial to the tendon of biceps brachii muscle, and terminates in the hand by forming the deep palmar arch after anastomosing with the deep branch of the ulnar artery (Susan, 2008).

CASES

During routine under graduate dissection of a female embalmed cadaver, an anomalous branch arising from the third part of the axillary artery proximal to the union of the two roots of the median nerve was observed in right upper limb. From there it was seen passing between the two roots of the median nerve superficial to both the median nerve and the brachial artery. It then crossed over from medial to the lateral side of the arm superficial to biceps brachii muscle. In the cubital fossa it anastomosed with brachial artery via a communicating branch. In the forearm, its course was similar to the radial artery and it descended superficially in the lateral part of forearm and entered the hand superficial to the flexor retinaculum and entered the anatomical snuffbox. Finally it terminated by forming the deep palmar arch completed by the deep branch of ulnar artery. This anomalous artery can be considered as radial artery originated from the axillary artery. Such an anomalous radial artery has been called a superficial brachioradial artery (Rodríguez-Niedenführ *et al.*, 2001). Because of its superficial course in arm and forearm it is called as superficial brachioradial artery. In the present case superficial brachioradial artery is accompanied by its venae comitantes.

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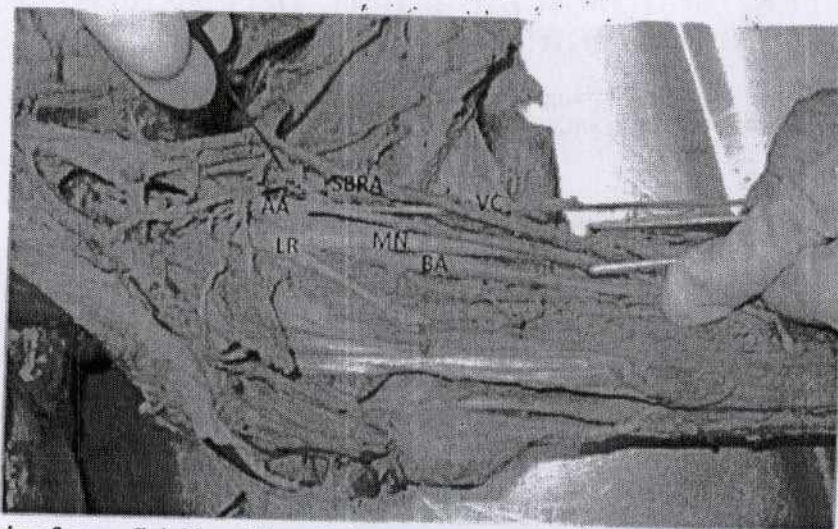


Figure 1: Origin of superficial brachioradial artery from the 3rd part of Axillary artery
 AA – Axillary artery, BA – Brachial artery, SBRA – Superficial brachioradial artery; VC – Venae comitantes of superficial brachioradial arter, LR - Lateral root of median nerve, MN – Median nerve

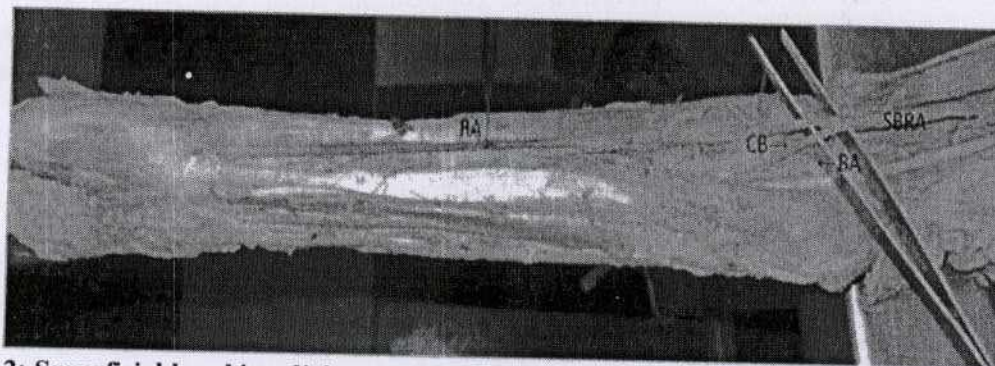


Figure 2: Superficial brachioradial artery communicating with brachioradial artery at the cubital fossa and continuing downwards as radial artery.

SBRA – Superficial brachioradial artery, BA – Brachioradial artery, CB – Communicating branch, RA – Radial artery

DISCUSSION

The high origin of radial artery was the most common arterial variation observed in the upper limb, showing an incidence of 14.27% in dissected material and 9.75% in angiographic exploration (Karlsson *et al.*, 1982). The brachioradial artery, one of the varieties of radial artery with anomalous origin, was the commonest arterial variation of the upper limb (Rodriguez-Niedenführ *et al.*, 2003). Rodriguez-Niedenführ *et al.* studied the variations of the arterial pattern in the upper limbs, and observed that the incidence of brachioradial artery to be 13.8% whereas superficial brachioradial artery 0.26% (Rodriguez-Niedenführ *et al.*, 2001). The case we reported here had superficial brachioradial artery a rare variation which originated directly from the axillary artery just above the formation of median nerve where the two roots of median nerve joined and this was hypoplastic in the proximal portions, which makes it difficult for angiographic procedure or guiding catheter into the axillary arteries during cardiac catheterization (Tong *et al.*, 2010). Unusual origin of the radial artery may cause failure in the reconstructive surgery of the upper limb; it can be ligated or cut considering it as a vein leading to disorder in circulation of the

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hand. When the superficial artery persists it is more vulnerable to the accidental injuries, it can be easily mistaken as a vein and intravenous injections into it can be disastrous (Waghmare, 2009).

Developmental Correlation

Distribution of the axillo-brachial axis artery of the upper limb is one of the potential anatomical fields to show variations in many ways. Such variations in axillo-brachial vascular archade can be the resultant outcome of the unusual path chosen by the axis artery of the upper limb. The development of the entire arterial tree of the upper limb occurs in stage wise fashion.

Singer staging of development

Stage1: The lateral branch of seventh intersegmental artery, i.e., subclavian artery extends to the wrist and terminates by forming capillary plexus; its distal portion forms the anterior interosseous artery.

Stage 2: Median artery arises from the anterior interosseous artery grows along the median nerve to communicate with palmar capillary plexus. By this time the anterior interosseous artery undergoes regression.

Stage 3: The ulnar artery arises from brachial artery and unites distally with the existing median artery to form superficial palmar arch.

Stage 4: The superficial brachial artery develops in axillary region from the axial trunk and traverses the medial surface of the arm, runs diagonally from the ulnar to the radial side of the forearm to the posterior surface of the wrist to divide over the carpus into digital branches.

Stage 5: Three changes occur simultaneously

- The median artery regresses to a small slender vessel, familiar in adult life as the arteria nervi mediana.
- The superficial brachial artery gives off a distal branch which anastomoses with the superficial palmar arch formed already.
- At the elbow, an anastomotic branch develops between the main trunk of brachial artery and the existent superficial brachial artery. The distal part of superficial brachial artery enlarges to form the radial artery where as the proximal portion of superficial brachial artery atrophies correspondingly.(Singer, 1933)

In the present study the deep brachial artery continued with usual distribution and the superficial brachial artery, instead of regression as in Singer's Stage 5, was retained with embryonic brachioradial continuity.

CONCLUSION

The superficially located superficial brachioradial artery is the result of changed embryological conditions. It elevates the risk of heavy bleeding in unexpected situations, not only in medical care but also during common personal daily activities and it is more prone for trauma and thus leads to excessive bleeding but also more accessible to cannulation if needed. It may be mistaken for a vein and if certain drugs are injected into it, the results may be dangerous like gangrene or loss of a hand.

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