

Case Report

High Origin of Ulnar Artery with Unusual Superficial Course and Abnormal Additional Branches from the Superficial Palmar Arch

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Abstract

Though ulnar arterial variations are rare, superficial ulnar artery (SUA) is one of its commonest variations. During routine dissection in our department, we observed a unilateral case of SUA in a 70-year-old male human cadaver. It originated from the left brachial artery in the middle of the arm, 13cm above the medial epicondyle of humerus (15cm below the outer margin of first rib). From its origin, it passed downwards in the medial part of arm and forearm in a superficial plane compared to normal ulnar artery. In the hand, the SUA anastomosed with the superficial palmar branch of the radial artery, creating the superficial palmar arch. The superficial palmar arch gave additional branches to the thumb and index finger. Brachial artery divided into the radial and common interosseous arteries in the cubital fossa. The normal ulnar artery was absent. The existence of a SUA is undeniably of interest to the clinicians as well as to the anatomists. We hereby present a case of unilateral SUA along with a brief review of the literature and analysis of its clinical significance.

Keywords: Superficial, ulnar, brachial, arteria radialis indicis, arteria princeps pollicis, variation, anomaly

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Introduction

Normally, brachial artery divides in the cubital fossa at the level of the neck of the radius into two terminal divisions, radial and ulnar arteries (1). The larger terminal branch; ulnar artery reached the medial side of the forearm mid-way between elbow and wrist. In the proximal part of the forearm, it lies on the brachialis and deep to pronator teres. In the distal part of the forearm, it lies on the flexor digitorum profundus between flexor carpi ulnaris and flexor digitorum superficialis. Normally, ulnar artery gives off the anterior and posterior ulnar recurrent arteries and common interosseous artery in the cubital fossa. Common interosseous artery arises just distal to radial tuberosity and runs posteriorly to the upper border of interosseous membrane, where it divides into the anterior and posterior interosseous arteries (1).

We hereby report a case of superficial ulnar artery (SUA), where the ulnar artery arises high in the arm from the brachial artery and runs superficially in the arm and forearm to reach the palm. In the same limb, additional branches arising from the superficial palmar arch was also noted.

Case Report

During routine dissection of upper limb for undergraduate teaching in the Department of Anatomy, Faculty of Medicine, Asian Institute of Medicine Science and Technology University, Malaysia, unusual high origin of ulnar artery and its abnormal superficial course in the arm and forearm was observed in about 70-year-old male human cadaver. In the left upper limb of the cadaver, the

brachial artery ended at its normal level of termination by dividing into radial and common interosseous arteries. The ulnar artery (superficial ulnar artery) originated from the brachial artery in the middle of the arm, 13cm above the medial epicondyle of the humerus (15cm below the outer margin of first rib). From this point of high origin, the ulnar artery descended posterior to the median nerve initially, and then ran medial to it in the distal part of arm in a superficial plane deep to brachial fascia. About 3cm above the medial epicondyle, it gave a branch which pierced the medial intermuscular septum to reach the back of the arm. This branch was corresponding to the posterior branch of a normal inferior ulnar collateral artery, which anastomoses with superior ulnar collateral, middle collateral and interosseous recurrent arteries.

In the forearm, the ulnar artery descended in front of the common tendinous origin of superficial forearm flexors from the medial epicondyle, but just deep to the bicipital aponeurosis; a position superficial to the normal ulnar artery. Then it descended on the medial aspect of front of the forearm, superficial to pronator teres, flexor carpi radialis and flexor digitorum superficialis but deep to palmaris longus tendon. Just proximal to the flexor retinaculum, it was accompanied by the ulnar nerve on the lateral side with which it descended in front of the retinaculum to reach the palm. In the palm it continued as superficial palmar arch after giving a deep branch. The formation of superficial palmar arch was normal but, in addition to its normal branches it also gave branches to the thumb and lateral side of index finger.

In its course through the forearm, the ulnar artery gave minimum branches to the muscles and skin. It failed to give common interosseous, posterior ulnar recurrent, palmar carpal and dorsal carpal branches.

Discussion

Variations of the upper limb arterial pattern are well-documented. Ulnar artery variations are not common. Commonly reported ulnar artery variations are its high origin from axillary artery or from brachial artery in the arm and its superficial course in the arm and forearm (2, 3). The occurrence of such superficial ulnar arteries in cadavers is reported to be 0.67% to 9.38% (4). Similar incidence in clinical practice is reported to be 9.12% (5). A case has been reported, where SUA originated from the axillary artery, crossed over the lateral root of the median nerve and supplied the biceps brachii muscle (6). There are reports of SUA coursing superficial and deep to bicipital aponeurosis (2, 3). A case of SUA originating from

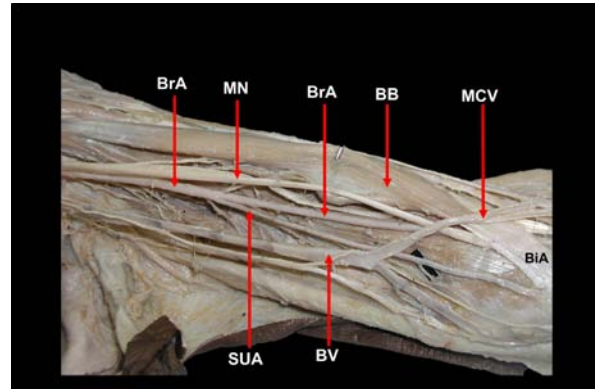


Figure 1: Dissection of the front of the arm showing the high origin of superficial ulnar artery (SUA) from the brachial artery (BrA). Median nerve (MN) and biceps brachii muscle (BB) are pushed laterally to expose the vessels. (MCV- Median cubital vein, BiA- Bicipital aponeurosis, BV- Basilic vein)

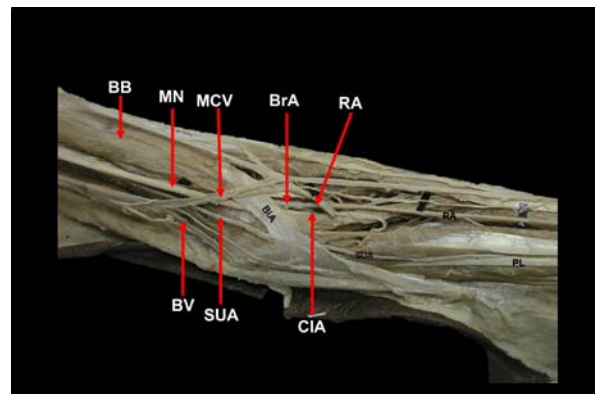


Figure 2: Dissection of the cubital region showing the superficial course of superficial ulnar artery (SUA) immediately deep to the bicipital aponeurosis (BiA). Termination of brachial artery (BrA) by dividing into radial artery (RA) and common interosseous artery (CIA) is also seen. (MN- Median nerve, BB- biceps brachii muscle, MCV- Median cubital vein, BV- Basilic vein, PL- Palmaris longus)

axillary artery and terminating by anastomosing with normal ulnar artery in the distal third of the forearm has been reported by Mannan et al. (7). A case of bilateral SUA originating from axillary artery has been reported. In the left limb, it branched directly from the axillary artery and in the right limb, the SUA originated in common with the subscapular artery (8). In another case of bilateral SUA, on left side it branched from axillary and on right side it originated from brachial artery (9).

Arterial variations such as SUA may increase the risk of complications during some clinical or surgical procedures. However, they may be beneficial too for some surgical procedures. Superficial arteries are more vulnerable to trauma and hemorrhage.

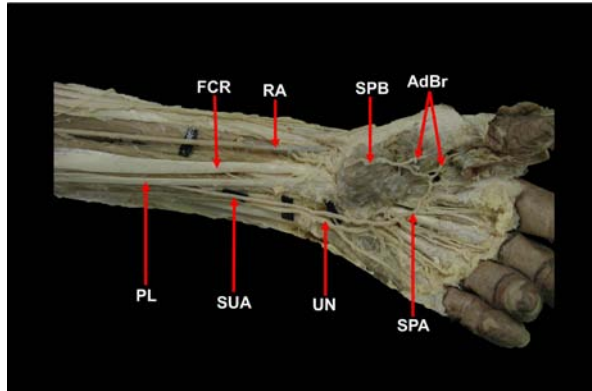


Figure 3: Dissection of the distal part of the front of forearm and the palm showing the superficial palmar arch (SPA) formed by the superficial ulnar artery (SUA) and completed by the superficial palmar branch (SPB) of radial artery (RA). Origin of additional branches (AdBr) from superficial palmar arch (SPA) to the thumb and radial side of the index finger is also seen. (FCR- Flexor carpi radialis tendon, UN- Ulnar nerve, PL- Palmaris longus tendon).

Accidental cannulation of such variant artery by an ignorant clinician may lead to ischemia of the hand. It is essential for the surgeons to be aware of such variant vessels and adapt the surgical procedure accordingly, especially during radial forearm flaps (10). The possibility of superficial arteries getting mistaken for superficial veins is also well reported (3). Such mistakes might lead to intra-arterial injections, wrong interpretations of incomplete angiographic images or severe disturbances of hard irrigation during surgical procedures on the arm or forearm (3). Possible impairment of the SUA by mistake during harvesting of fasciocutaneous forearm flaps has been reported by Sieg et al. (11). They report that SUA is a calculable anatomic variation as long as its possible presence is considered during flap harvesting and in such cases; the use of SUA flap is an easy and safe alternative (11). SUA has been described as a "hidden trap" in the harvest of radial forearm flap because, during the surgery of the forearm and hand, as well as during reconstructive surgery which involves the harvest of ulnar artery-based forearm free flaps, the abnormal arteries may complicate the procedure even when they are not apparent (7, 12). By careful palpation or by using vascular doppler, the presence of SUA and its course can be diagnosed preoperatively and accidental division of these vessels during the raising of the radial forearm flap can be avoided (5).

Though there are many reports regarding the variations in the formation of the superficial palmar arch, the reports of variations in their branches, especially the additional branches from them supplying the index finger and thumb are few. Erbil et al. have reported five cases where the first web space of the hand

received arteries from the superficial palmar arch. They observed that none of these branches was large enough to be called "princeps pollicis artery" (13). In the present case also, we made similar observation of additional thin branches arising from the superficial palmar arch not only to the thumb but also to the radial side of index finger. The precise knowledge of the pattern of blood supply of the hand is crucial to avoid possible complications during hand surgery.

Conclusion

High origin of ulnar artery and its superficial course is one of the variations of the vessels of the upper limb. It is very essential not only for the anatomists but also for the clinicians and surgeons to be aware of the probable variations of this artery for the proper diagnosis and planning of operative treatment. The observations made by us in the present case will supplement our knowledge of variations of this vessel, which should be useful in forearm and hand surgeries.

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