

High Origin and Aberrant Superficial Course of Ulnar Artery: A Case Report

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Abstract: High origin and superficial ulnar artery (SUA) is a rare anatomical variant that usually arises either in the axilla or the arm and runs a superficial course in the forearm, enters the hand, and participates in the formation of superficial palmar arch. During the routine dissection of cadavers in the department of anatomy, whilst preparing the specimen for medical students, We observed a unilateral case of high origin and superficial ulnar artery in a 60 year old male human cadaver. It originated from the right brachial artery in the lower third of the arm, 2cms above the elbow joint. From its origin it passed downwards in the medial part of the arm and forearm in a superficial plane compared to normal ulnar artery. In the hand, the Superficial ulnar artery anastomosed with the superficial palmar branch of the radial artery, creating the superficial palmar arch. The existence of a SUA is undeniably of interest to the clinicians as well as anatomists. Knowledge of these variations is important during vascular and reconstructive surgery and also in evaluation of angiographic images. Superficial position of ulnar artery makes it more vulnerable to trauma and more accessible to cannulation.

Keywords: variations ulnar artery.

I. Introduction

Variations of the arterial patterns in the upper limb have been the subject of many anatomical studies due to their high incidence. Brachial artery is the main artery of the arm; it is a continuation of axillary artery at the lower border of teres major muscle. It usually terminates at the level of neck of radius in the cubital fossa by dividing into radial and ulnar arteries. The radial artery runs along the lateral part of the front of the forearm with the superficial branch of the radial nerve. The ulnar artery is the largest terminal branch of the brachial artery and is usually given off in the cubital fossa. It crosses deep under the median nerve and passes obliquely downward and medially, covered by the pronator teres, flexor carpi radialis, Palmaris longus and flexor digitorum superficialis muscles in the proximal half of the forearm. In the distal half of the forearm, it proceeds between the flexor carpi ulnaris and flexor digitorum superficialis muscles, being covered by the skin and fascia. The artery ends anterior to the flexor retinaculum by dividing into two terminal branches. The superficial one forms the superficial palmar arch (SPA) with a contribution from the superficial branch of the radial artery and the deep branch anastomoses with the radial artery to form the deep palmar arch. The SPA gives palmar digital branches to the medial three fingers and also to the medial half of the index finger. The lateral aspect of the index finger and the thumb normally receive their arterial supply from the radial artery⁵. The common interosseous artery is a short branch of the ulnar, passes back to the proximal border of the interosseous membrane and divides into anterior and posterior interosseous arteries.

A superficial ulnar artery (SUA) is an ulnar artery of high origin that lies superficially in the forearm, it usually arises either in the axilla or the arm and runs a superficial course in the forearm before entering the hand⁸. Its reported frequency ranges from 0.17% -2%. Although, variations of the upper limb arterial pattern are common, the presence of an ulnar artery of high origin is considered a rare anatomical variation with clinical significance¹¹. Its clinical importance should not be underestimated as several cases of intra arterial injections of drugs and subsequent amputations have been reported.

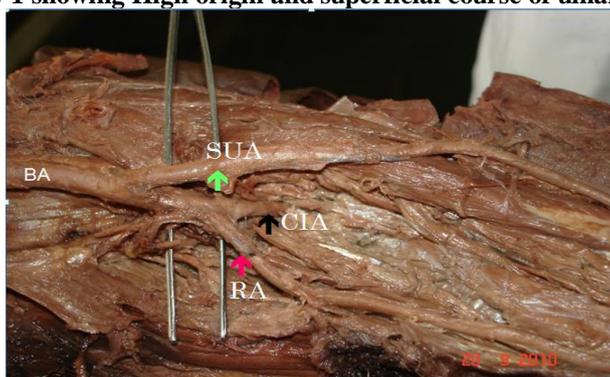
II. Observations

Variant origin and course of an ulnar artery (Fig.1) was found in the right upper limb of 60 year old male cadaver during routine dissection classes for under graduate medical students. However, the left upper limb showed no abnormalities. Dissections of both upper extremities (right and left) were carried out according to the instructions in Cunningham's Manual of practical anatomy.

The ulnar artery arose from the brachial artery in the lower third of the arm 2 cms above the elbow joint. The artery ran superficial to the bicipital aponeurosis where it was crossed by the median cubital vein. After that, the artery coursed downwards and slightly medially, superficial to the forearm flexor muscles (Fig.2) and under the superficial venous system to reach the distal third of the forearm, where it was seen on the lateral side of flexor carpi ulnaris close to the ulnar nerve. The artery then passed anterior to the flexor retinaculum where it divided into two terminal branches. The superficial one formed the superficial palmar arch (Fig.3) and the deep branch anastomosed with the radial artery to form the deep palmar arch.

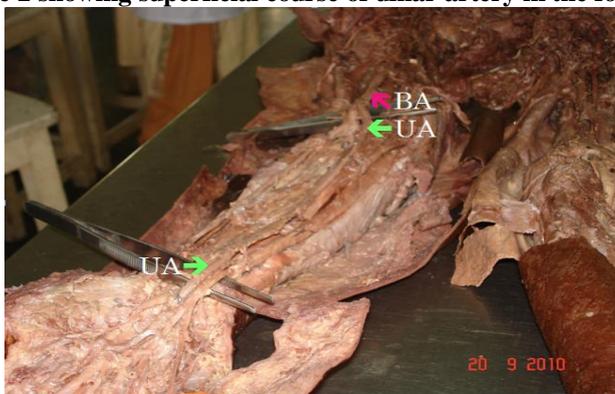
The brachial artery had a normal course in the arm but at the elbow level it divided into the radial and common interosseous arteries. The superficial ulnar artery was of a larger caliber than both the radial and common interosseous arteries. The radial and common interosseous arteries had a usual course and branching pattern.

Figure-1 showing High origin and superficial course of ulnar artery



SUA: Superficial Ulnar artery, BA : Brachial Artery, RA : Radial Artery, CIA : Common interosseous artery

Figure 2 showing superficial course of ulnar artery in the fore arm



BA : Brachial artery, UA : Ulnar artery,

Figure 3 showing normal course of ulnar artery in the palm



UA : Ulnar Artery

III. Discussion

The anomalies of the arterial system of the upper limb are not uncommon. These anomalies may be of various types such as variations in the mode of origin or branching pattern and unexpected relationships with surrounding structures. The superficial course of the ulnar artery described here places it at risk during trauma and intra venous cannulation. The arterial course could also lead to intra arterial injection and difficulties in angiographic procedures.⁴ It is also at high risk of damage during forearm surgery. Reconstructive surgeries using flaps are becoming increasingly common. Free forearm flaps based on the radial artery may damage the SUA causing ischemia of the hand. Demonstration of patency of the ulnar artery is very important before rising a free radial forearm flap. This can be accomplished by careful palpation of the cubital fossa and ulnar aspect of the forearm, or by Doppler Ultrasound examination.⁷

The knowledge of a SUA is also important in the following clinical /surgical interventions. a) In the present subject the ulnar artery was immediately subjacent to the median cubital vein. This would predispose the vessel to inadvertent penetration during attempts at venipuncture of the median cubital vein. The SUA was also closely related to the basilic vein along its course and hence was also at risk of unintended vascular puncture. b) This is also important in patients who require surgical intervention because of a thrombosed forearm artery and poor collateral circulation. c) When treating a rupture of a distal bicipital tendon, an orthopaedic surgeon should be aware of this a typical blood vessel. d) The presence of an SUA need not always be regarded as an adverse feature, as its presence may allow plastic surgeons to use it in a reconstructive ulnar flap.

Typically when the ulnar artery has a high origin, its course is always superficial to the forearm flexors. Mc Cormack et al stated high origin of ulnar artery as superficial ulnar artery found in 2.26% cases and was also observed by Adachi. The SUA arises most frequently from the lower third of the brachial artery less frequently from the upper third and rarely from the middle third. In the present case the SUA arose from the lower third of the brachial artery. The anatomic variations in the major arteries of the upper extremities have been reported in 11-24.4% of the individuals. The reported incidence of the SUA arising from the axillary artery varies is between 0.7% and 2%. The bilateral presence of the SUA with different origin on each side is even more rare¹³. High origin of superficial ulnar artery has been reported by Bozer et al³. The development and clinical significance of SUA has also been reported by Reddy and Vollala. Pulakunta et al have reported a variation of co-existence of superficial ulnar artery and aneurysm of the deep palmar arch in the hand⁹. Sieg et al and Fedel et al have reported Superficial ulnar artery and its clinical importance. Krishnamurthy et al have also reported a high origin and superficial course of ulnar artery⁶.

Presence of the unusual blood vessels may be due to persistence of vessels that normally get obliterated during the process of development.^{2,12}. The presence of SUA may be due to haemodynamic forces, chemical factors, foetal position in the uterus, first limb movements, developmental arrest in the early stages and genetic predisposition.^{1,10}

IV. Conclusion

Since a SUA may lead to many surgical and diagnostic problems, it is important to set the diagnosis before any surgical procedure. The SUA may be diagnosed during routine and careful palpation of the antecubital fossa and forearm in clinical examination. Additionally, Doppler ultrasound provides a confident diagnosis of this anatomical variation. In view of this, knowledge of this variation is very important not only to anatomists, but also to radiologists, angiologists and orthopaedic, plastic surgeons during their routine clinical practice.

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