



A Cadaveric Study on Higher Origin of Common Interosseous Artery and its Clinical Correlation

Sachendra Kumar Mittal*, Suresh Sharma, Rekha Parasha and Sakshi Mathur

Department of Anatomy, National Institute of Medical Sciences and Research, Jaipur, Rajasthan, India

*Corresponding e-mail: mittal.sachendra891@gmail.com

ABSTRACT

During routine dissection of the upper limb in National Institute of Medical Science & Research Rajasthan, India, in 24 cadavers of both sexes (Cadavers dissected from 2017 to 2020), Two male cadavers of age 62 years and 73 years who have donated their precious body to NIMS & R institute belongs to Rajasthan, during upper limb routine dissection of both cadavers we found in the Right upper limb this variation, this showed the higher origin of the common interosseous artery. The brachial artery present in the right limb gave one branch in the upper 1/3rd of the arm. Then the main artery descended and remained superficial to pronator teres. Just below the elbow joint, it underwent bifurcation into the radial artery laterally and ulnar artery medially. The subsequent course of those two arteries was normal. The other branch of the brachial artery descent downwards and became deep to pronator teres and continued as the anterior interosseous artery. So the anterior interosseous artery instead of arising from the ulnar artery it took its origin from the brachial artery and the common interosseous artery was absent. In the forearm, the radial artery had a more superficial course than the ulnar artery. The ulnar artery is very much thin which is continuing as its normal course in the forearm as well as in the hand. We found a higher origin of an anterior interosseous artery in two cadavers out of 24 cadavers (8.33%). In that one was a 62-year-old male cadaver and another 73-year-old male cadaver. Both variations were the same in the right upper limb of both cadavers. The purpose of this article is to highlight the need for the awareness of the potential existence of such anatomical variation during vascular and reconstructive surgery and how it can be preoperatively detected by color Doppler imaging, which would help the surgeons and clinicians to plan out vascular and reconstructive surgery and therapeutic interventions. The superficial position of the ulnar and radial artery makes it more vulnerable to trauma and more accessible to cannulation.

Keywords: Variations, Brachial artery, Superficial ulnar artery, Superficial radial artery, Common interosseous artery

INTRODUCTION

The principal source of arterial supply to the arm is the brachial artery. The Axillary artery at the distal border of the teres major muscle continues as a brachial artery which then terminates at the level of the neck of radius distal to the elbow joint into two branches-lateral one is the radial artery and the medial one is an ulnar artery. Other branches taking origin from it are profunda brachii artery, superior ulnar collateral artery, inferior ulnar collateral artery, muscular branches, and nutrient artery to humerus [1].

Anomalies of the upper limb arterial tree are very much common. This is mainly because of their multiple and plexiform sources, the temporal succession of the emergence of principal arteries, anastomoses, and periarticular networks, and functional dominance followed by regression of some paths [2].

Variations of brachial artery division are common and have been documented by many researchers. It frequently divides more proximally than usual into a radial, ulnar and common interosseous artery or it may be superficial [3].

The division of the brachial artery can be determined concerning the line joining the epicondyles. The bifurcation of the brachial artery above this line is terminated as a high division [4].

The brachial artery is clinically important because it is used for recording blood pressure, pulsed Doppler sonographic

measurements, and arteriography of different parts of the body. Hence, precise knowledge of variations in the course and branching pattern of the brachial artery is having of great importance to physicians, radiologists, orthopedic, plastic, and vascular surgeons [5].

In the present cadaveric study, a rare anomaly of high origin of an anterior interosseous artery in the right forearm was studied, its clinical and embryological significance has been discussed.

MATERIALS AND METHODS

During routine dissection of the upper limb in National Institute of Medical Science & Research Rajasthan, India, in 24 cadavers of both sexes (Cadavers dissected from 2017 to 2020), Two male cadavers of age 62 years and 73 years who have donated their precious body to NIMS & R institute belongs to Rajasthan, during upper limb routine dissection of both cadavers The cadavers were dissected by using scalpel and forceps. An incision was made in the upper limb from axilla to wrist. The skin & fascia were exposed in layers. The axillary artery and brachial artery were traced carefully for any variations. At that time we found in their right upper limb this variation in both the cadavers, which showed the higher origin of the anterior interosseous artery.

RESULTS

Among the 24 cadavers, variations were found in two male cadavers one is 62 years old and another one is a 73-year-old male cadaver. In both, the cadaver, the brachial artery present in the right limb gave one branch in the upper 1/3rd of the arm. Then the main artery descended and remained superficial to pronator teres. Just below the elbow joint, it underwent bifurcation into the radial artery laterally and ulnar artery medially. The subsequent course of those two arteries was normal. The other branch of the brachial artery went downwards and became deep to pronator teres and continued as the anterior interosseous artery (Figure 1), so the anterior interosseous artery instead of arising from the ulnar artery it took origin from the brachial artery and common interosseous artery was absent. In the forearm, the radial artery had a more superficial course than the ulnar artery. The ulnar artery is very much thin which is continuing as its normal course in the forearm as well as in the hand (Figure 2). We found a higher origin of an anterior interosseous artery in two cadavers out of 24 cadavers (8.33%). In that one was a 62-year-old male cadaver and another 73-year-old male cadaver. Both variations were the same in the right upper limb of both cadavers.

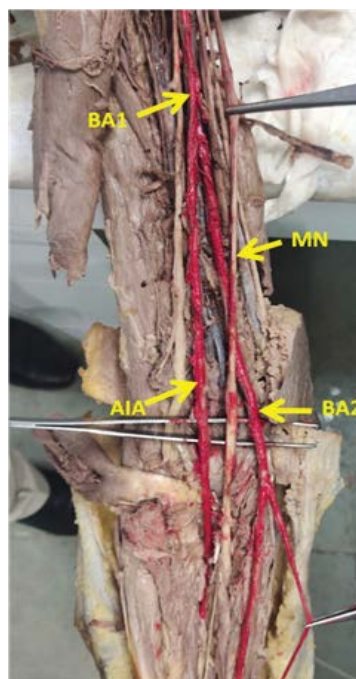


Figure 1 Showing higher origin of Anterior Interosseous Artery (AIA). MN: Median Nerve, BA1: Brachial Artery bifurcation, BA2: Proper Brachial Artery which divides into radial and ulnar artery

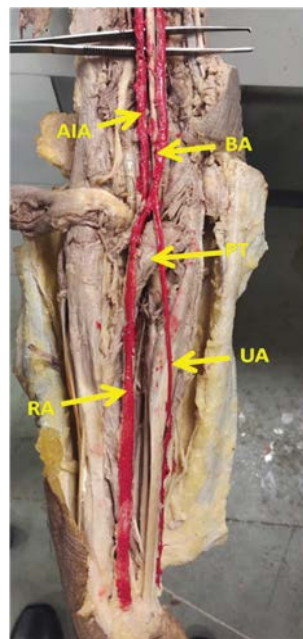


Figure 2: Showing radial and ulnar artery course and anterior interosseous artery course in the arm, cubital fossa, forearm; AIA: Anterior Interosseous Artery, BA: Brachial Artery, RA: Radial Artery, UA: Ulnar Artery, PT: Pronator Teres

DISCUSSION

Variations of the arterial system of the upper limb have been well documented by many authors and have a considerable significance towards the clinical and surgical points of view.

According to the Compendium of human anatomic variation, major variations are present in about 25% of the subjects studied for the brachial artery. The variations in the form of high proximal division into terminal branches occur in the radial artery (15%), ulnar artery (2%), and common interosseous artery. This high division may occur at any point in the normal course of the vessel, but it is more common in the middle third. The two vessels run parallel to each other to the end of the elbow, in the usual position of the brachial artery. From this point, one branch follows the normal course of the radial artery through the forearm and the other one takes the normal course of the ulnar artery. This arrangement is considered a simple high division of the brachial artery [6,7].

Occasionally the brachial artery divides proximally into two trunks, which may reunite. Frequently it undergoes high up division more than usual, and this short brachial artery may bifurcate as usual or it may trifurcate into radial, ulnar, and common interosseous arteries. More often the radial branches arise proximally, leaving a common trunk for the ulnar and common interosseous; sometimes the ulnar artery arises proximally, the radial and common interosseous arteries forming the other division; the common interosseous artery may also arise proximally [2].

Embryological Explanation

Every variation in the peripheral vascular anatomy can be related to genesis, regression, or persistence of one or other segments of the embryologic axial artery [8].

The axis artery of the upper limb bud is derived from the lateral branch of the seventh intersegmental artery. The proximal part of the main trunk forms the axillary and brachial arteries and its distal part persists as the anterior interosseous artery, close to the end of the elbow the axis artery gives rise to the radial and ulnar artery which is the latest arteries to appear in the forearm from the axis artery. Probably in this case the axis artery undergoes bifurcation. It is important to mention that normal vascular development including the patterning of the blood vessels is influenced greatly by the local hemodynamic factors. An altered hemodynamic environment may give rise to variant patterning of blood vessels [9].

The common interosseous artery usually arises from the ulnar artery and splits into anterior and posterior interosseous branches. In few report studies, the common arterial trunk referred to as radio-ulnar interosseous trunk was found to be a branch of the axillary and brachial and described as a high origin of the common interosseous artery [10-13].

In series studies, it arose from a radial artery or deep branch of the ulnar artery instead of regular origin [14-16]. Further, it may become a replacement regular origin of the ulnar artery in case of high origin of the ulnar artery [17,18].

In the present study, the anterior interosseous artery was found to be a higher origin from the brachial artery in 8.3%.

In this case, lateral division of the axis artery gradually became narrower and it formed the anterior interosseous artery. The medial branch became dominant and it continued as the brachial artery and it was given two branches the radial and ulnar artery with the normal course. This all happened due to an altered hemodynamic environment according to embryological explanation.

CONCLUSION

Higher origin of the anterior interosseous artery is a rare anomaly and is separately available in the medical literature. Therefore the clinicians should be alerted about the possible existence of these arterial anomalies of upper limb vasculature, Knowledge of these variations is very much important for radiologists, orthopedics, and surgeons. Diagnostically this type of variation can disturb the angiographic images. The surgeon should be aware of this variation before doing any upper limb surgery to prevent injury, thrombosis especially in patients requiring dialysis or arteriography The present study report that higher origin of the anterior interosseous artery can be found in up to 10% of cases as like in our study on 24 cadavers we found the higher origin of an anterior interosseous artery in two male cadavers on a right upper limb which is about 8.33% and it also adds to the existing knowledge of these abnormal vascular pattern stresses on the use of different diagnostic techniques for its accurate diagnosis thereby avoiding further complications while planning different interventions.

DECLARATIONS

Conflicts of Interest

The authors declared no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

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