

# A CADAVERIC STUDY ON HIGHER ORIGIN OF ANTERIOR INTEROSSEOUS ARTERY AND ITS CLINICAL CORRELATION

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## ABSTRACT –

**Background** – The brachial artery is the extension of the axillary artery starting at the lower margin of the teres major muscle and is the major artery of the upper extremity. The brachial artery reaches the cubital fossa and bifurcates into the radial and ulnar artery. The ulnar artery further gives short trunk called common interosseous artery which in turn divided into anterior and posterior interosseous. In this study we observed that the anterior interosseous artery instead of arising from the ulnar artery it took origin from brachial artery and there was absence of common interosseous artery. Ulnar artery is very much thin which is continuing as its normal course in forearm as well in hand. **Aim** - To study the variations in origin of anterior interosseous artery. **Material and Method**- Dissection of the upper limb in dissection hall of anatomy department of National Institute of Medical Science & Research Rajasthan, India, in 24 cadavers of both sexes, who has donated their precious body to NIMS & Research institute. **Result** – We found higher origin of anterior interosseous artery in five cadavers out of 24 cadavers (20.83%); in that four were male cadaver and one were female cadaver. All variations were same in right upper limb of both cadavers. **Conclusion**- 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 re-constructive surgery and therapeutic interventions.

**KEY WORDS:** Variations; Brachial Artery; Superficial Ulnar Artery; Superficial Radial Artery, Common Interosseous Artery, Anterior Interosseous Artery.

## **INTRODUCTION**

The principal source of arterial supply to the arm is brachial artery. The Axillary artery at the distal border of the teres major muscle continues as brachial artery which then bifurcates into medial ulnar and lateral radial artery at the level of neck of radius. 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.<sup>1</sup> 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 emergence of principal arteries, anastomoses and periarticular networks and functional dominance followed by regression of some paths.<sup>2</sup> Variations of brachial artery division are common and have been documented by many researches. It frequently divides more proximally than usual into radial, ulnar and common interosseous artery or it may be superficial.<sup>3</sup> The division of brachial artery can be determined with reference to line joining the epicondyles; the bifurcation of brachial artery above this line is terminated as high division.<sup>4</sup>

Brachial artery is clinically important because it is used for recording blood pressure, pulsed Doppler sonographic measurements, and arteriography of different parts of body. Hence, precise knowledge of variations in the course and branching pattern of brachial artery is having a great importance to the physicians, radiologists, orthopedic, plastic and vascular surgeons.<sup>5</sup>

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

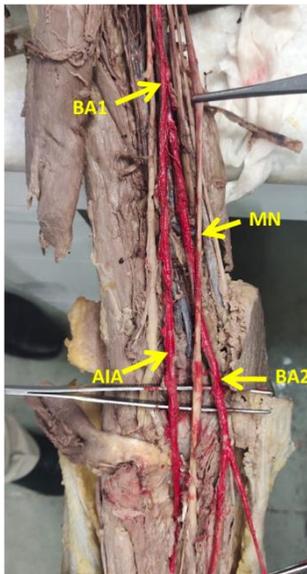
## **MATERIALS AND METHODS**

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 2022), four Male and 1 Female cadavers of age 62 years Male, and 73 years Female, 52 years Male, 64 years Male, 51 years Male, who has donated their precious body to NIMS & R institute belongs to Rajasthan, during upper limb routine dissection of all cadavers, The cadavers were dissected by using scalpel and forceps. An incision was made from axilla to wrist. The skin & fascia were reflected in layer by layer; the axillary artery & brachial artery were traced and studied carefully for any variations. At that time we found in their right upper limb this variation in five the cadavers, this showed the higher origin of the anterior interosseous artery.

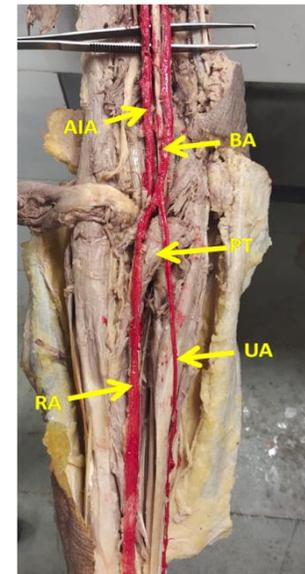
## **RESULTS**

Among the 24 cadavers, variations were found in four male and one female cadaver of age 62 years Male, and 73 years Female, 52 years Male, 64 years Male, 51 years Male. In all the

cadavers, the brachial artery present in right limb gave one branch in upper 1/3rd of arm. Then the main artery descended and remained superficial to pronator teres. Just below the elbow joint it underwent bifurcation into radial artery laterally and ulnar artery medially. Subsequent course of those two arteries was normal. The other branch of brachial artery went downwards and became deep to pronator teres and continued as the anterior interosseous artery. (Fig-1), so the anterior interosseous artery instead of arising from the ulnar artery it took origin from brachial artery and there was absence of common interosseous artery. In the forearm, radial artery had more superficial course than ulnar artery. Ulnar artery is very much thin which is continuing as its normal course in forearm as well in hand. (Fig-2) We found higher origin of anterior interosseous artery in all five cadavers out of 24 cadavers (20.83%). This variation was same in right upper limb of all five the cadavers.



**Figure 1:** Showing higher origin of anterior interosseous artery (AIA). MN- Median nerve, BA1 – Brachial artery bifurcation, BA2 – Proper brachial artery which divide into Radial and ulnar artery.



**Figure2:** Showing Radial and ulnar artery course and Anterior interosseous artery course in arm ,cubital fossa, forearm. AIA- Anterior interosseous artery , BA – Brachial artery , RA – Radial artery, UA- Ulnar artery , PT- Pronator teres.

It has been well documented by many authors about variations of the arterial system of the upper limb and has considerable significance from the clinical and surgical point of view. According to 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 bend 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<sup>6</sup>

Bergman RA, Thompson SA, Afifi AK, Saadeh FA. Compendium of human anatomic variation. Baltimore: Urban & Schwarzenberg; 1988.<sup>7</sup>

The brachial artery occasionally 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 arise proximally, the radial and common interosseous arteries forming the other division; the common interosseous artery may also arise proximally<sup>2</sup>

Embryological Explanation: Every variation in the peripheral vascular anatomy can be related to genesis, regression or persistence of one or other segment of the embryologic axial artery<sup>8</sup>. The lateral branch of the seventh intersegmental artery gives the axis artery of the upper limb bud. 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 bend of the elbow the axis artery gives rise to radial and ulnar artery which is the latest arteries to appear in the forearm from the axis artery. Probably in this case also the axis artery undergoes bifurcation. It is important to mention that the normal vascular development including the patterning of the blood vessels is influenced greatly by the local hemodynamic factors. Altered hemodynamic environment may give rise to variant patterning of blood vessels.<sup>9</sup>

The ulnar artery usually gives the common interosseous artery which in turn splits into anterior and posterior interosseous branches. In few report studies, the common arterial trunk referred as radio-ulnar interosseous trunk found to be a branch of the axillary<sup>6</sup> and brachial<sup>10,11,12</sup> and described as a high origin of the common interosseous artery<sup>13</sup>. On series studies, it arose from radial artery<sup>14,15</sup> or deep branch of ulnar artery instead or regular origin<sup>16</sup>. Further, it may become a replacement regular origin of ulnar artery in case of high origin of ulnar artery<sup>17,18</sup>. In present study, the anterior interosseous artery 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 continues as 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 normal course. This all happened due to altered hemodynamic environment according to embryological explanation.

## CONCLUSION

Higher origin of anterior interosseous artery is a rare anomaly and is separately available in the medical literatures. Therefore for 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 the radiologists, orthopaedic and surgeon. Diagnostically this type of variation can disturb the angiographic images. 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 past studies reported that higher origin of anterior interosseous artery can be found up to 10% cases not as like in our study on 24 cadavers. We found higher origin of anterior interosseous artery in four male and one female cadaver on right upper limb which is about 20.83% 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.

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**Conflict of Interest:** No conflict.

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