

## Case report

# Termination of the brachial artery in the arm-a case report

\*Dr. Ritwik Baidya, \*\*Dr. Sushil Kumar

\*Assistant Professor, Anatomy division, Department of Radiology , Weill Cornell Medicine, New York

\*\*Assistant Professor, Anatomy division, Department of Radiology, Weill Cornell Medicine, New York

**Corresponding author:** Dr. Sushil Kumar

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## Abstract

Normally, the brachial artery terminates into the radial artery and ulnar arteries in the cubital fossa at the level of the neck of the radius. We observed a case in which there was a high termination of the brachial artery in the arm. Both the terminal branches had a tortuous course in the arm. The median nerve was seen passing between these two divisions. No other variations were seen with regards to their relation to the cords and branches of the brachial plexus.

**Key words:** Axis artery, axillary artery, brachial artery, arm, teres major, median nerve

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## Introduction

The brachial artery is the continuation of the axillary artery, which is main source of blood supply to the upper limb. It begins at the lower border of the teres major tendon and terminates into the radial artery, laterally and the ulnar artery, medially in the cubital fossa at the level of the neck of the radius. Sometimes, its termination is more proximal than what is usually seen. In these cases the brachial artery may bifurcate as usual or it may trifurcate into the radial, ulnar and common interosseous arteries. (1)

According to Feinberg, ectodermal-mesenchymal interactions and extracellular matrix components within the developing upper limb bud are responsible for the initial patterning of these blood vessels. The commonly accepted school of thought is that abnormal inductive factors from the limb mesenchyme are responsible for the altered variations in these blood vessels.

## Case report

During routine dissection at the anatomy lab of the Weill Cornell Medicine we observed an anomaly in the termination of the brachial artery. In a 91-year-old female donor the brachial artery was seen terminating into the radial and the ulnar arteries at about 2.26cm distal to the lower border of the teres major tendon. The median nerve formation was normal. Proximally, the median nerve was located medial to the axillary and brachial arteries. At about 5cm distal to the termination of the brachial artery, the median nerve was seen crossing the ulnar artery and then lying in between the radial and ulnar arteries for the remainder of its course. The course of the radial artery was superficial the arm and as well as in the forearm. The course of the ulnar artery was superficial in the arm but normal in the forearm. Both the arteries had a tortuous course but tortuosity was more apparent in the radial artery.(Fig.1)

## Discussion

Brachial artery is a continuation of the axillary artery from the lower border of teres major tendon to the neck of radius. (1) Variations in the arteries of the upper limb are fairly common. Its incidence is 25% in various populations

of the world. The termination of the brachial artery is one the common variations to be observed. (3) The highest percentage of variations of the brachial artery is mainly in high origin of the radial artery and the ulnar artery. (4) According to Keen, high origin of the radial artery from the brachial artery is due to persistence of the upper portion of the radial artery arising from the brachial artery proximal to the origin of the ulnar artery followed by the failure of development of a new connection between the radial artery with the brachial artery at the level of origin of the ulnar artery. (5)

Guha et al observed a case in which there was a high division of the brachial artery into the radial and ulnar arteries in the middle of the arm associated with a variant median nerve and an absent musculocutaneous nerve. (6)

Angiographic studies done by Karlsson and Niechaiev showed an incidence of high division in 10% patients. (7) Satyanarayana et al reported a case in which the brachial artery was seen dividing into the radial and ulnar arteries in the middle of the right arm. (8) Higher bifurcation of the brachial artery was also reported by Rossi et al, Singh et al, Puspalatha et al. (9,10, 11)

Gupta et al observed that in 2 out of 20 cadavers the brachial artery was very short and it was seen bifurcating at the level of insertion of the coracobrachialis muscle. (12)

Icten et al, Okoro et al reported a case in which the radial artery was seen to be arising directly from the axillary artery bilaterally in a cadaver. (13,14) Varlekar et al reported a case in which radial artery was originating from axillary artery proximal to the two roots of median nerve. (15)

Kaur et al reported two cases of high bifurcation of the brachial artery. In one case, the median nerve was seen lying medial to the brachial artery in upper part of the arm and then it crossed superficial to the brachial artery at the level of its bifurcation from the medial to the lateral side. After the division of the brachial artery, the nerve was seen located posterior to the radial artery and then in between the radial and ulnar arteries. In the other case, the median nerve was seen lying lateral to the brachial artery. After division, the nerve was present first behind the radial artery and then in between the radial artery laterally and ulnar artery medially. (16)

Our case is unique in many aspects. Firstly, the brachial artery was seen terminating near its commencement. Secondly, the median nerve was seen crossing the ulnar artery and was then running between the ulnar and radial arteries. Thirdly, both the radial and ulnar arteries had a tortuous course. This variation has not been reported previously.

### **Embryology**

The axis artery is the first artery that develops in the upper limb bud and is derived from the 7<sup>th</sup> intersegment artery (subclavian artery). It persists as the axillary artery, brachial artery, anterior interosseous artery and the deep palmar arch. The radial and ulnar arteries develop from the axis artery as sprouts. Initially, the radial artery originates proximal to the origin of the ulnar artery. Later, it establishes a new connection with axis artery near the origin of the ulnar artery. With this new connection, the initial connection of the radial artery with the axis artery degenerates. But sometimes, the initial connection persists, and the new connection fails to develop. In this condition the radial artery origin is present more proximally. The brachial artery distal to the origin of radial artery persists as the ulnar artery in the arm.

## Conclusion

The radial artery is frequently used in many procedures such as a graft for coronary bypass surgery and in transradial cubital fossa approach during coronary interventions. (17,18,19). The knowledge of variations is important for interventional radiologist and surgeons while doing cardiac catheterization for angioplasty and arterial grafting. Due to the superficial location of the radial artery, it may get damaged while performing a venipuncture. Ignoring these variation might result in unintentional catastrophe.



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