Case Report

A Rare, Variant Overlapping of the Brachioradial and the Deep Brachial Artery in the Arm: A Potential Hazard for Angiography

Anatomy Section

IVAN JAMES PRITHISHKUMAR, MADHAVI CHATHU

ABSTRACT

We report a hitherto unobserved variant of high division of the brachial artery, 7.8 cm distal to the tendon of the teres major and 13.0 cm proximal to the intercondylar line of the elbow into an unusual, medially placed brachioradial artery and a laterally placed deep brachial artery in a 68-year-old male cadaver. These branches again overlap each other, 3.5 cm proximal to the elbow and are very closely related to the median nerve. This variation may pose extreme difficultly and a potential hazard during cardiac catheterization, angioplasty, arterial cannulation, blood pressure monitoring, creation of arteriovenous fistulas and vascular repairs.

Key Words: Brachial artery, Brachioradial, Deep brachial

KEY MESSAGE

- The brachial artery is an important route for cardiac catheterization, angioplasty, and reparative procedures of the arm. Unusual variations may pose a hazardous threat to the procedure.

INTRODUCTION

Morphological variations in the arterial pattern of the upper extremity bears considerable significance from the surgical point of view. The upper extremity is a frequent site of injury, and various surgical and interventional procedures are also performed in this region [1]. Traumatic brachial artery injuries constitute a relatively large proportion of the peripheral arterial injuries [2]. A percutaneous brachial artery access (PBA) for coronary interventions is beginning to be seen more frequently in interventional cardiology [3]. An awareness of the vascular anomalies at the common surgical sites should tend to decrease the likelihood of injury during any surgical intervention.

CASE REPORT

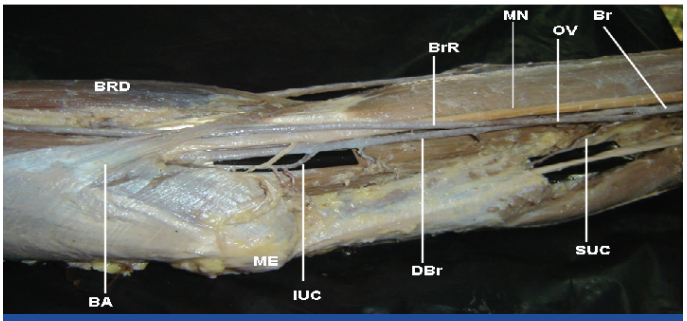
During the regular dissection of the right upper limb of a 68-year-old male cadaver, (donated to the department of anatomy for teaching and research purposes) we observed a hitherto undescribed rare variant of high division of the brachial artery. The brachial artery divided into a variant, medially placed brachioradial artery and a laterally placed deep brachial artery (It is well noted that the converse is usually true), about 7.8 cm distal to the tendon of the teres major and 13.0 cm proximal to the intercondylar line of the elbow [Table/Fig-1]. The other branches of the brachial artery included the profunda brachii artery and the nutrient artery of the humerus [Table/Fig-2]. The median nerve was situated lateral to the brachial artery in the proximal arm and lateral to the deep brachial artery in the distal portion of the arm.

Brachioradial artery: Just distal to its origin, the brachioradial artery crossed the median nerve anterolaterally, and then proceeded lateral to the median nerve. The brachioradial artery again overlapped the deep brachial artery, 3.5 cm proximal to the intercondylar line [Table/Fig-1]. At the elbow, it passed below the bicipital aponeurosis lying lateral to the median nerve. Distal to the elbow, the brachioradial artery gave the radial recurrent artery to supply the elbow joint [Table/Fig-2]. In the forearm, the artery was medial to the brachioradialis, and taking the usual course of the radial artery, it passed deep into the tendons of the brachioradialis, the abductor pollicis longus and the extensor pollicis brevis.

Deep brachial artery: At its origin in the arm, the deep brachial artery was situated lateral to the brachioradial artery. It was unusually overlapped anterolaterally by the brachioradial artery, 3.5 cm proximal to the intercondylar line of the elbow [Table/Fig-1]. Proximal to the elbow, the deep brachial artery gave the superior ulnar collateral artery and the inferior ulnar collateral artery [Table/Fig-1]. Just distal to the intercondylar line, the deep brachial artery passed beneath the bicipital aponeurosis and continued in the forearm deep into the pronator teres. It was medial to the median nerve along its entire length. The deep brachial artery divided into the common interosseus artery and the ulnar artery, 7.2 cm distal to the intercondylar line [Table/Fig-2]. The branches of the common interosseous artery were the anterior interosseous, the posterior interosseous and the interosseus recurrent arteries. Thereafter, the ulnar artery ended by forming the superficial palmar arch.

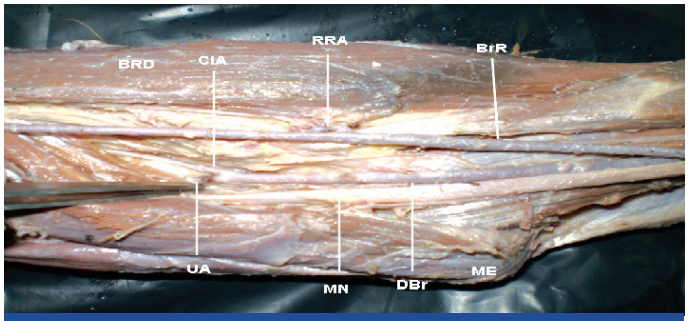
DISCUSSION

The early limb bud receives blood via the intersegmental arteries which contribute to the formation of a primitive capillary plexus. A terminal plexus present at the tip of the limb bud is constantly



[Table/Fig-1]: Variant high division of brachial artery in right arm.

Br- Brachial artery, BrR- Brachioradial artery, DBr- Deep brachial artery, MN- Median nerve, OV- Overlapping of brachioradial and deep brachial arteries, SUC- Superior ulnar collateral artery, IUC- Inferior ulnar collateral artery, BA- Bicipital aponeurosis, ME- Medial epicondyle, BRD- Brachioradialis



[Table/Fig-2]: Brachioradial artery and deep brachial artery in right forearm.

DBr- Deep brachial artery, BrR- Brachioradial artery, MN- Median nerve, UA- Ulnar artery, CIA- Common interosseus artery, RRA- Radial recurrent artery, ME- Medial epicondyle, BRD- Brachioradialis

renewed in a distal direction as the limb bud grows. Later, one main vessel supplies the limb and the terminal plexus and this is termed as the axis artery. In the upper limb bud, the axis artery is derived from the lateral branch of the seventh intersegmental artery (subclavian). The axis artery grows outwards along the ventral axial line and terminates in the deep plexus of the developing hand. The proximal part of the main trunk forms the axillary and the brachial arteries, and its distal part persists as the anterior interosseous artery and the deep palmar arch [3, 4].The normal vascular development and the patterning of the blood vessels is greatly influenced by local haemodynamic factors; an altered haemodynamic environment gives rise to the variant patterning of the blood vessels [5]. Ectodermal-mesenchymal interactions and extracellular matrix components also control the initial patterning of the blood vessels within the limb [6].

The brachial artery normally commences at the lower margin of the tendon of the teres major and passing down the arm, ends about 1 cm below the bend of the elbow (at the level of the neck of the radius), where it divides into the radial and the ulnar arteries [7]. Reports on the high division of the brachial artery have been cited in literature [1,8-14]. Many of these reports have failed to take account of previous ones because of which the brachioradial artery has been variously termed as type 5, the brachialis superficialis continuing as the radial artery, the high origin of the radial artery, type B1 and the superficial radial artery [15]. In a recent attempt to simplify the terminology, Rodriguez et al. (2001) unified previous descriptions to a total of 12 different arterial variations in the upper limb [15].

We report the occurrence of a variant which has still been undescribed in the literature. It is of particular interest for two reasons. One is that, at the bifurcation, the brachioradial artery is medial and the deep brachial artery is lateral in position (Table/Fig-1). The second is an unusual overlapping of these vessels, 3.5 cm proximal to the intercondylar line of the elbow. These branches are closely related to the median nerve. Only Quarrat et al. report a similar high division of the brachial artery where the radial artery was placed medially and the ulnar artery lateral in position [16]. However, there is no overlapping of the arteries as described by them.

Vascular anomalies which are present at the common surgical sites tend to increase the likelihood of damage during surgery, and the failure to recognize these vascular anomalies may result in a compromised surgical outcome [17]. Deligonul et al. described a case where the brachial artery bifurcation variants posed a potential hidden hazard which is encountered in percutaneous brachial artery catheterization techniques [18]. The proximal origin of the radial artery is also known to be a potential pitfall in hand angiography [19].

This particular variation may pose extreme difficultly during cardiac catheterization for angioplasty, pedicle flaps, blood pressure monitoring, arterial cannulation, creation of arteriovenous fistulas and vascular repairs. The accurate knowledge of the course, relationship and the variational patterns of these major arterial conduits is of considerable practical importance in the conduct of reparative surgery of the arm.

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AUTHOR(S):
1. Dr. Ivan James Prithishkumar
2. Dr. Madhavi Chathu

PARTICULARS OF CONTRIBUTORS:
1. Corresponding Author.
2. Professor, Department of Anatomy
Christian Medical College and hospital
Vellore – 632002, India.

NAME, ADDRESS, TELEPHONE, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Ivan James Prithishkumar
Assistant professor, Department of Anatomy
Christian Medical College and hospital
Vellore – 632002, India.
Phone: +91 416 2284245; Fax: +91 416 2262788
E-mail: drivanjames@gmail.com

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