

Research Article

Variant course and branching of right brachial artery: a case study

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ABSTRACT

A variant course and branching pattern of the right brachial artery was recorded in a 54-year-old male cadaver during the practical sessions of University College of Medical Sciences, Delhi, India. The right brachial artery divided in the middle third of arm into a medial superficial and lateral deep branch. The superficial medial branch descended anterior to the median nerve and ended by dividing in the cubital fossa into ulnar and radial arteries, whereas the lateral branch descended postero-medial to the median nerve, ending deep to pronator teres as the common interosseous artery. The left brachial artery showed a normal branching pattern by dividing into radial and ulnar arteries in the cubital fossa. The probable origin of such a variation is embryological and familiarity with such variations is imperative as they might affect dynamics of limb function or alter the course of interventional procedures.

Keywords: Brachial artery, Common interosseous artery, Cubital fossa, Vascular anomaly

INTRODUCTION

The primary axial artery of the upper limb is the brachial artery, which is a continuation of the axillary artery at the distal border of the tendon of teres major muscle. In its normal anatomical course, the artery descends superficially along the medial aspect of arm and near the distal attachment of coracobrachialis; it is crossed anteriorly by the median nerve, such that the artery lies lateral to the median nerve. On entering the cubital fossa, the brachial artery terminates by dividing into radial and ulnar arteries. The radial artery appears in the forearm through the apex of cubital fossa. After giving off the radial recurrent artery, it runs a sub-fascial course in the arm, intervening between the tendons of brachioradialis and flexor carpi radialis. The ulnar artery after giving off the common interosseous, anterior and posterior recurrent branches traverses deep to pronator teres while passing downwards beneath the superficial flexor group of

muscles. In the lower 2/3rd of the forearm it assumes a sub-fascial course while accompanying the ulnar nerve laterally.¹

Deviations from the normal vascular pattern of upper limb are attributed to their intricate and manifold sites of embryonic development.¹⁻³ Quain et al first provided a systematic classification of these variations by their analysis of cadaveric dissection and angiographic studies however, some important aspects have remained perplexing or unexplored, due to the use of different terminologies/criteria for classifying and/or sub-classifying them.⁴⁻⁷ Anomalous arterial patterns in the upper limb have been the focus of many anatomical deliberations due to its clinical implication in routine interventional and surgical practice. Although many variations are possible their reporting becomes imperative when observed during the course of operative and dissection procedures. The present report demonstrates a

variant branching pattern and course of the right brachial artery during routine cadaveric study, highlighting the need for a standardized documentation regarding such vascular anomalies.

METHODS

120 upper limbs were dissected over a period of seven years during routine dissection in the department of Anatomy, University College of Medical Sciences, Delhi. Mostly, the cadavers were adults of unknown age. All cadavers were dissected according to the instructions given in the Cunningham's manual of Practical Anatomy volume 1.

RESULTS

All the cadavers dissected showed brachial arteries having a typical branching pattern in the cubital fossa except one male cadaver of approximate 54 years of age. In this cadaver, the left brachial artery had a normal course but the right artery had a variant branching pattern. On the right side, the brachial artery divided into a medial and a lateral branch in the middle third of arm. The medial branch accompanied the median nerve on its medial aspect and persisted superficially down the medial side of the arm. It entered the cubital fossa above the bicipital aponeurosis, as a content of the roof of the cubital fossa where it divided into ulnar and radial arteries opposite the neck of radius (Figure 1, 2).

The radial branch descended superficially in the forearm along the medial border of brachioradialis muscle and had a normal anatomical course thereon (Figure 2).

The ulnar branch descended medially, superficial to the flexor group of muscles upto the lower third of the forearm. In the interval between the tendons of flexor digitorum superficialis and flexor carpi ulnaris, it was positioned superficial to the ulnar nerve. The artery and ulnar nerve then passed into the hand between the superficial and main fibres of the flexor retinaculum with the further course of the ulnar artery being unremarkable (Figure 2).

In the arm, the lateral branch of brachial artery was narrower than the medial branch described above. It was enclosed in a fascial sheath accompanied by venae comitantes. In the cubital fossa it descended just medial to the median nerve providing muscular branches to the superficial flexor group of muscles and then progressed deep to the pronator teres as the common interosseous artery (CIA) (Figure 3). The radial recurrent, anterior and posterior ulnar recurrent arteries were found to arise from the common interosseous artery in the cubital fossa. The common interosseous artery terminated by dividing into anterior and posterior interosseous arteries. After formation, anterior interosseous artery emerged inferior to the lower border of pronator teres and ran superficial to the deep group of flexor muscles of forearm along with the median nerve (Figure 4). At the upper border of

pronator quadratus it pierced the interosseous membrane to anastomose with the posterior interosseous artery. The posterior interosseous artery followed its normal anatomical course.



Figure 1

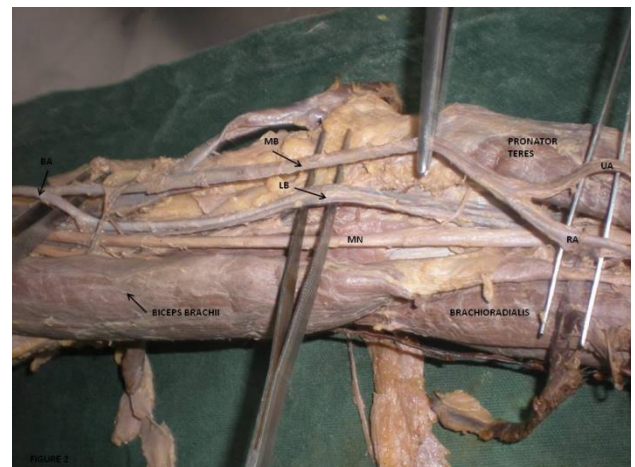


Figure 2



Figure 3

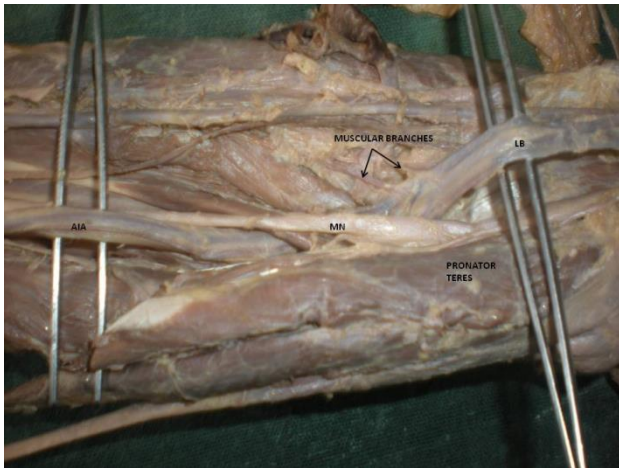


Figure 4

DISCUSSION

Careful observation and documentation of variable arterial patterns of the upper limb becomes essential in the era of advanced micro-vascular and reconstructive surgery. Having been the subject of many anatomical studies due to their high incidence, anomalies of the brachial artery can be attributed to genetic or racial factors or to derangements in the development of the primordial arterial axis of the upper limb. The primitive vasculature of the limb bud consists of a primary axial artery and its branches draining into a peripheral marginal sinus with new vessels developing as sprouts from existing vessels.⁸ A single trunk arising from the 7th intersegmental artery develops as the subclavian artery in the primitive limb bud and persists as the brachial artery in the arm and common interosseous artery in the forearm.^{1,3,8} The anterior and posterior interosseous arteries arise as branches from the common interosseous artery, while terminal branches of the brachial artery, the ulnar and radial arteries appear last.^{1,3,9} Hence any aberration of the brachial artery may occur due to alterations in its normal course of development.

Jurjus et al, Baral et al reported multiple vascular variations in the axilla, forearm and palm.^{10,11} Tohono et al reported a high origin of the left ulnar artery arising from brachial artery in the upper arm, where the brachial artery branched into radial and common interosseous arteries in the cubital fossa.¹² Different branching patterns of the brachial artery have been published by Nakatani et al, Durgun et al, Yoshinaga et al and Cherukupalli et al, however as per our report the brachial artery divided into medial and lateral branches in the middle third of arm, with the medial branch continuing superficially to divide into radial and superficial ulnar arteries.¹³⁻¹⁶ This pattern of branching has been named as superficial brachioulnoradial artery by Moncayo- Marques (1941) and its incidence has been reported to range from 0.14% - 1.3%.⁴

In the present study, the lateral branch of brachial artery descended down along the arm with venae comitantes in a fascial sheath posteromedial to the median nerve. In the cubital fossa it lay medial to the median nerve then ran deep to the pronator teres to continue as the common interosseous artery. This rare arterial anomaly has been described as Brachiointerosseous artery which has been defined as a high origin of interosseous artery coexisting with a brachial artery that branches into radial and ulnar arteries. Its incidence has been considered to be less than 0.26%.^{17,18}

In summary, the present report documents some rare variations which are highly significant in traumatic vascular repair and reconstructive plastic surgery as in radial forearm flaps. Such anomalies thwart simple radiologic diagnostic techniques / cannulations and pose intra-operative challenges for surgeons.

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