

An unusual course of the radial artery

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Radial artery variations are of importance for clinicians, whether in angiographic examinations or surgical approaches. The high origin radial artery is the most frequent arterial variation observed in the upper limb, showing an incidence of 14.27% in dissection material and 9.75% in angiographic examination. In the present study an unusual course of the radial artery and its relation with the median nerve has been evaluated. During embryological development the radial artery sprouts from two arterial buds arising from the lateral side of the brachial artery and coalescing with each other. The artery lies in the forearm and is overlapped by the brachioradial muscle. In this particular case the radial artery originated from the medial side of the brachial artery and crossed the median nerve twice in an unusual manner 8 cm below the point at which the deep brachial artery arose and 12 cm above the intercondylar line. These results will enhance anatomical knowledge of the region and reduce complication in surgical approaches.

Key words: radial artery, embryological, median nerve, variation, flap surgery, neuropathy

INTRODUCTION

Variations in the arterial pattern of the upper limbs are fairly common and have long received attention from anatomists and clinicians. A number of authors have published detailed descriptions of major and minor variations of the arteries of the upper limb and hand [2, 12]. Rodriguez-Baeza et al. [18] presented a critical review of the published data on the arterial variations of the human upper limbs, as well as the prevailing viewpoints concerning the embryological bases for their appearance. Alongside other arterial variations of the upper extremity, variations of the radial artery are of importance, especially for angiographic examinations and surgical approaches [2, 7, 9, 17].

Normally the brachial artery divides into the radial and ulnar branches at the mid-point of the intercondylar line of the humerus. The radial artery

arises as a terminal branch from the brachial artery in the cubital fossa. Although it is smaller than the ulnar artery, it appears as a more direct continuation of the brachial artery. In the forearm it descends from the medial side of the neck of the radius to the front of its styloid process [20]. Proximally the artery lies on the medial side of the radius overlapped by the brachioradialis muscle, while distally it lies on the anterior surface of the radius, covered only by skin and fascia [13]. The common tendon of the biceps brachii, supinator, pronator teres and flexor digitorum superficialis muscles and the distal part of the radius course beneath the artery [13, 19, 20].

The radial artery arises comparatively late in embryological development as a new vessel off the brachial artery [7]. Explanations for these variations are valuable in evaluating anatomical and embryological correlations [5]. It is well known that a high

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origin of the radial artery is the most commonly observed variation in the arterial pattern of the upper limb [9, 20].

In the present case it is not the high origin of the radial artery but its unusual origin and course in the arm and its abnormal relation with the median nerve that are of anatomical importance.

CASE REPORT

During a routine dissection of the upper limbs of a 55-year-old male cadaver a variation of the radial artery was encountered on the right side. In this particular case the radial artery originated from the medial side of the brachial artery 8 cm below the point at which the deep brachial artery arose and 12 cm above the intercondylar line in an unusual manner. It was also observed that the artery crossed the median nerve at the same level posteriorly. In the cubital fossa the artery descended in front of the anterior surface of the median nerve. Moreover, just after passing the intercondylar line the artery crossed the median nerve anteriorly and descended in its normal anatomical course in the anterior aspect of the forearm (Fig. 1). Finally, the ulnar artery took on the appearance of a continuation of the brachial artery in the forearm.

DISCUSSION

Variations in the arterial pattern of the upper limb have frequently been observed both in routine dissections and in clinical practice [10, 18] and are found even in traditional anatomical textbooks [20]. In the present study the aim is to emphasise the unusual course of the radial artery in the forearm and its relation to the median nerve. Departures from the anatomical norm with respect to the origin and course of the arteries of the upper extremities occur in 18.54% of cases [12]. The high origin radial artery is the most common arterial variation observed in the upper limb, showing an incidence of 14.27% in dissection material [5] and 9.75% in angiographic exploration [5, 8]. Keller et al. [9] reported that the radial artery originated from the axillary artery in 2.13%, from the brachial artery over 20 cm above the intercondylar line in 1.20% and 10–20 cm above this line in 9.47% of the samples.

In another study high origin of radial artery was found in eight patients, in one with the origin from the distal part of the axillary artery, in five from the proximal third of the brachial artery and in two from the middle third of the brachial artery [8]. In the present study the radial artery was observed arising from the

brachial artery 8 cm below the deep brachial artery. In most of the literature anomalies of brachial artery branching are reported as 1.2 times more frequent on the right side [9]. It is worth drawing attention to the high division of the radial artery presented in this study and also its unusual course on the right side.

During embryological development the primary axial artery develops from the seventh cervical and first and second thoracic intersegmental arteries and continues as the brachial artery in the arm and common interosseous artery in the forearm [14]. The ulnar and radial arteries are terminal branches of the brachial artery. The ulnar artery develops from a new arterial bud just above the point at which the median artery arises. The radial artery sprouts from two other arterial buds arising from the lateral side of the brachial artery and coalescing with each other [14]. According to Rodriguez et al. [18], a high origin of the radial artery also bifurcated into two groups, depending on whether the median artery was present or not. Several variations of the radial artery have been reported because of disorders in its development, but in none of them was the radial artery observed sprouting from the medial side of the brachial artery and crossing the median nerve twice as seen in this case. Such a case is of importance for orthopaedic and reconstructive surgery, especially in view of its unusual course and relationship with adjacent structures [5, 11].

Various authors have claimed that anomalies or anatomical vascular variations have been encountered during radial forearm flap surgery [6, 11, 15]. The radial artery is used in harvesting by-pass graft in the case of arterial vasospasm [3, 16, 21]. As well as being important in surgical approaches, arterial variations could pose problems in positioning the catheter in angiographic approaches during arterial grafting or while evaluating angiographic images [9]. Arterial thrombosis, producing ischaemia after radial artery cannulation, may be related to a high risk of tissue gangrene or amputation [21].

The variation presented has clinical significance not only in for surgical approaches but also because of its relationship to the median nerve. Median nerve compression caused by the artery could easily be confused with more common causes such as radiculopathy and neuropathies [1, 4].

In conclusion, it may be emphasised that detailed information about the arterial variations of this region is of importance in ensuring competency and removing deficiency and ambiguity during diagnostic interventions and surgical procedures.

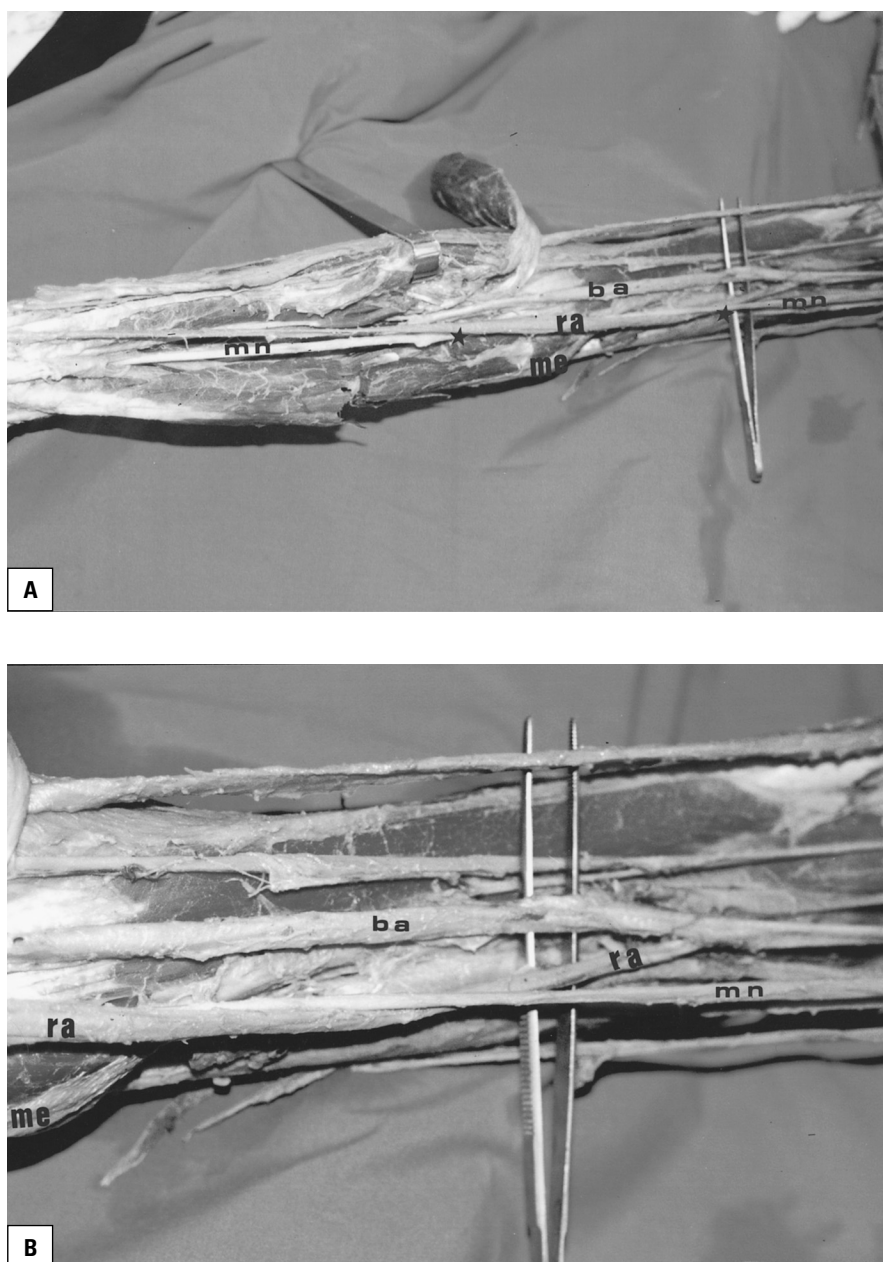


Figure 1. Radial artery arising from the medial side of the brachial artery and crossing the median nerve twice; **A.** ra — radial artery, ba — brachial artery, mn — median nerve; me — medial epicondyle; *crossing points of the radial artery on the median nerve; **B.** ra — radial artery, ba — brachial artery, mn — median nerve, me — medial epicondyle.

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