

A rare case of superficial median artery of high brachial origin: anatomical and clinical considerations of the superficial brachiomedian artery

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Abstract

A rare case of median artery with unusually high origin and superficial course, also termed superficial brachiomedian artery, was observed during routine anatomical dissection of the right upper extremity of a 63-year-old Caucasian female cadaver. The aberrant artery arose from the initial part of the brachial artery. In the arm region it followed a superficial course and at the elbow passed beneath the bicipital aponeurosis. In the upper third of the forearm, the variant artery passed under the muscular belly of the palmaris longus and flexor digitorum superficialis muscle. Accompanying the median nerve, the unusual median artery passed through the carpal tunnel and participated in the formation of the superficial palmar arch. Due to its variant course and location, the superficial brachiomedian artery may cause compression on the nerve within the carpal tunnel or nerve ischemia may result from an accidental arterial injury.

Key words: human; superficial brachiomedian artery; variation

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Introduction

In the early embryonic life an arterial vessel appears running through the long axis of the anterior forearm that accompanies and supplies with blood large part of the median nerve. In adults, this artery can be nearly always found as a small vessel close to the median nerve and usually ending before it reaches the wrist. In such cases the artery is called “a. comitans nervi mediani” or according to others this is a “median artery of antebrachial type” (76-100% of the individuals).^[1-4] Sometimes, when a vessel of significant size is present accompanying the median nerve and reaching the hand to participate in the fingers’ blood supply, this is called “median artery of palmar type” (1.5-12% of the individuals).^[1-4] Dissection studies^[5-10] reveal that commonly the median artery arises from the arteries in the elbow region and is located deep below the superficial flexor

group of the anterior antebrachial region in close proximity to the median nerve. In some instances either the median artery course or origin or both may have significant variations.^[11,12]

Such a rare case of variant median artery is described here that could present some diagnostic and therapeutic challenges in the field of hand surgery.

Case Report

An intriguing case of unusual origin and course of the median artery was observed during routine anatomical dissection of the right upper extremity of a 63-year-old Caucasian female cadaver (**Figures 1 and 2**). A small variant superficial artery was found starting from the initial part of the brachial artery. In the arm region (**Figure 1**), this artery, accompanied by a pair of small veins, was located below the brachial fascia on the antero-medial

side of the median nerve. At the elbow region, the superficial artery passed beneath the bicipital aponeurosis anterior to the medial epicondyle of the humerus. In the upper third of the forearm, the variant artery coursed between the palmaris longus and flexor carpi radialis just before gaining the lateral border and deep surface of the flexor digitorum superficialis and descended accompanying the median nerve. In the lower third of the forearm, the aberrant artery once again appeared superficially within the median nerve sheath and coursing through the carpal tunnel it entered the palmar region. After completing the dissection in that region it was revealed that the variant artery participated in the formation of the superficial palmar arch (**Figure 2**). Along the course through the extremity, the diameter of the artery diminished from 2.1 mm at the origin to 1.3 mm in the palmar region. Because of the origin, course and termination pattern, the so described artery was considered to be a “superficial” median artery of high brachial origin or a “superficial” brachiomedian artery according to the terms proposed by Rodríguez-Niedenführ et al.^[2]

In the anterior cubital region, the brachial artery divided as usual into the ulnar and radial arteries. The latter, however, had a superficial antebrachial course and descended in the furrow between the brachioradialis and flexor carpi ulnaris muscles covered by the antebrachial fascia. In the hand region, there was a complete superficial palmar arch composed of the ulnar artery, small superficial branch of the radial artery and the additional superficial median artery.

Discussion

The origin and course of the median artery in the forearm region have been largely investigated and thus well-known.^[1-4,13-15] The anterior interosseous, common interosseous, ulnar arteries or the caudal angle between the ulnar and common interosseous arteries have been described as common origins of the median artery.^[2,16] Rarely, the median artery can arise from the radial artery.^[2] All of the authors have described the same course of the median artery in the forearm – between the anterior surface of the median nerve and the deep surface

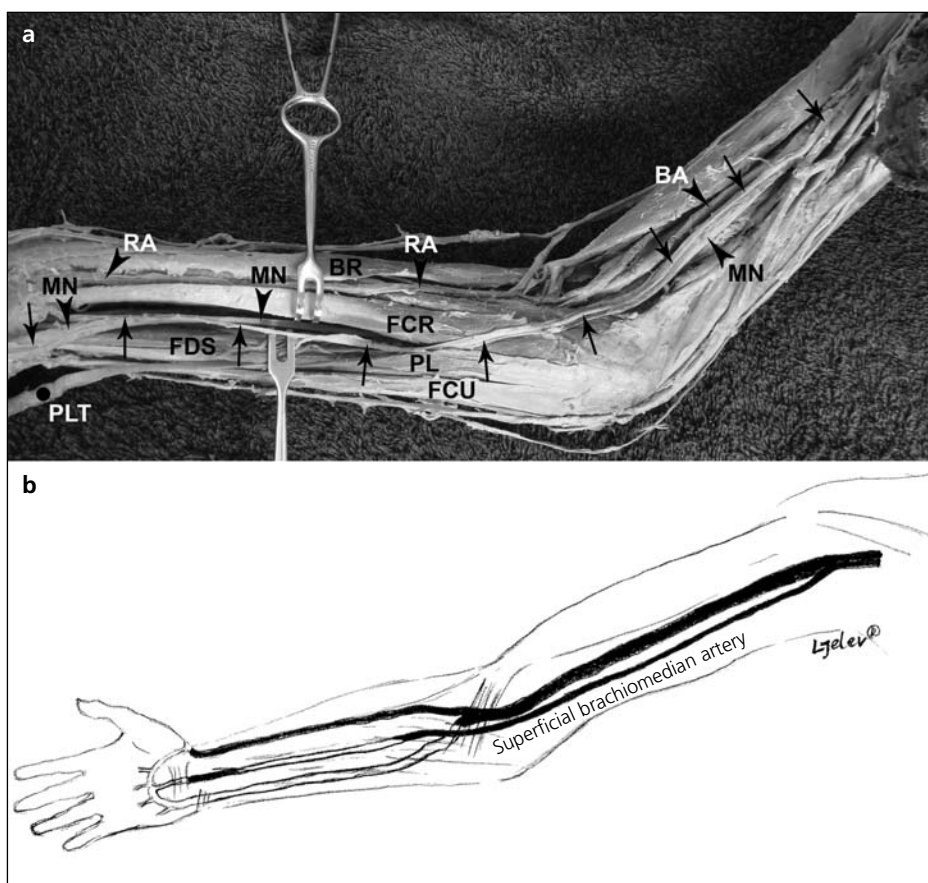
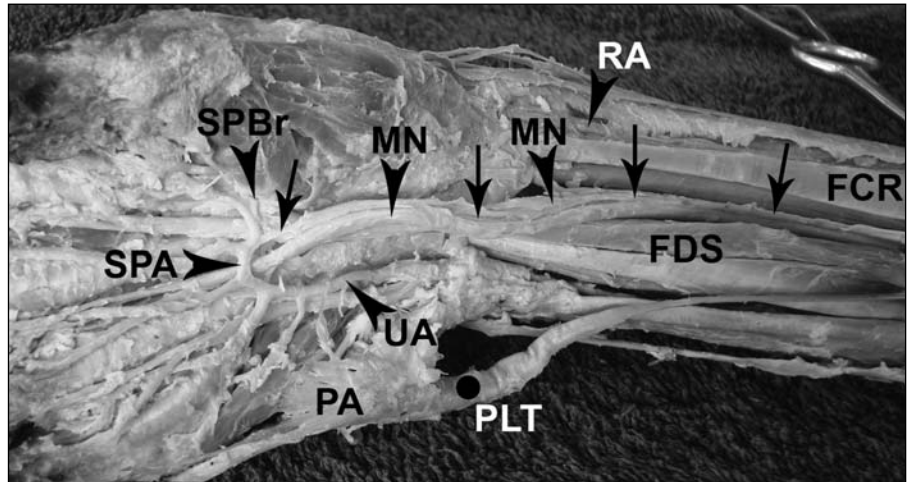


Figure 1. Photograph (a) and scheme (b) of the dissected right upper extremity, showing the entire course of the superficial median artery (arrows). BA: brachial artery; RA: radial artery; BR: brachioradialis muscle; MN: median nerve; FCR: flexor carpi radialis muscle; FDS: flexor digitorum superficialis muscle; PL: palmaris longus tendon; FCU: flexor carpi ulnaris muscle.

Figure 2. Photograph of the dissected right hand, showing the palmar course of the superficial median artery (arrows). The flexor retinaculum was cut and the content of the carpal tunnel shown. RA: radial artery; SPBr: superficial palmar branch of the radial artery; UA: ulnar artery; SPA: superficial palmar arch; MN: median nerve; FCR: flexor carpi radialis muscle; FDS: flexor digitorum superficialis muscle; PLT: palmaris longus tendon; PA: palmar aponeurosis.



of the flexor digitorum superficialis.² In some rare cases (1%)^[14,17] a median artery originating at the elbow may course anterior to the antebrachial flexor muscles^[13,14,17,18] and then it is called “superficial” median artery. The rarest variation concerning the median artery, however, is a combination of superficial course and origin above the elbow. Such an artery, found in approximately 0.5% of the cases,² arising from the axillary or brachial arteries and having superficial course through the extremity is termed “superficial” median artery of high origin or “superficial” brachio median artery.^[2,13,17,19] It could be regarded as the rarest type of superficial below-the-elbow continuations of a superficial brachial artery along with the superficial brachio ulnar (0.7-7%), superficial brachioradial (0.13-0.67%) and superficial brachio ulno-radial arteries (0.14-1.3%).^[2]

The embryological origin and development of the median artery is not completely understood and deserves further studies.^[10] According to numerous authors, the median artery is a transitory vessel that represents the arterial axis of the forearm during early embryonic life. It normally regresses in the second embryonic month.^[20,21] Based on the differences in incidence of the median artery between the neonates and adults, Kopuz et al.^[10] have raised the possibility that the median artery can regress at a much later stage, possibly during the perinatal period and early infancy. Persisting median artery in adults has been considered as retention of a primitive arterial pattern.^[20-22] Rodríguez-Niedenführ et al.^[11] proposed that the palmar pattern of the median artery is a remnant of the embryonic model while the antebrachial pattern represents its partial regression. Recently, the prenatal formation of the upper limb arteries, including the median artery, was rather described as a gradual tran-

sition between the capillary network and definite vessels, than progression and regression of some parts of a preliminary common arterial model.^[23]

Several clinical disorders can result from the presence of a strongly developed median artery and its variable relation to the median nerve.^[3] In the upper forearm region a variant course of the median artery through the median nerve or some of its branches could be a cause of “pronator teres syndrome”^[24] and “anterior interosseous nerve syndrome”.^[25] In the carpal tunnel, a median artery of palmar type, especially with an external diameter more than 2.0 mm,^[26] can increase the pressure on the median nerve and thus to be blamed as a cause of carpal tunnel syndrome^[3,4,27] described in a number of surgical case reports.^[28-31] Sometimes, median artery injuries such as thrombosis,^[25,32-35] aneurysm,^[36] calcification^[37] and traumatic rupture^[38] have been identified as causes of carpal tunnel syndrome. In all of these cases, the excision of the median artery within the carpal canal is curative, but first, the presence of sufficient anastomotic blood supply of the hand should be confirmed by ultrasonographic, color Doppler ultrasonographic and magnetic resonance imaging modalities.^[39,40] According to Natsis et al.^[4] the median artery may also cause damage to the median nerve by ischaemia. The pathogenesis of the latter is observed especially when the anastomotic branches between the median and the radial and ulnar arteries, as well as the superficial palmar arch are poor.

The variant artery described here accompanies the median nerve in the carpal tunnel and may cause compression effect on it. The superficial location of the artery may impose some other challenges. A superficial wound along the brachial and elbow course of the aber-

rant artery may cause sudden decrease of the blood supply of the median nerve, resulting in motor and sensory losses in the nerve distribution area. Accidental injection into the superficial brachiomedian artery, instead of a vein, is possible or the artery can be ligated instead of the vein when radial artery flap is prepared.^[17]

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