

Superficial median artery arises from the brachioradial artery: a rare variation

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SUMMARY

Arterial variations in the upper limb are numerous and may occur at the level of the axillary, brachial, radial, and ulnar arteries and in the palmar arch as well. Two arterial variations in a single upper limb, a brachioradial artery and a superficial median artery were found during the routine dissection of the right upper limb of a 65 years old white male cadaver. The variant upper limb was dissected carefully and the preparation steps were documented. Although brachioradial artery and superficial median artery have been reported in the literature, but superficial median artery arises from the brachioradial artery is extremely rare.

Key words: Upper limb – Brachioradial artery – Superficial median artery

INTRODUCTION

Arterial variations of the upper limb have long received the attention of surgeons, radiologists and anatomists. Normally the brachial artery is the continuation of the axillary artery at the distal border of the tendon of teres major muscle and ends about a centimeter distal to the elbow joint at the level of the

neck of the radius by dividing into two terminal branches. The larger of the two is ulnar artery and the smaller is radial artery (Williams et al., 1995). Brachioradial artery is defined as a high origin of the radial artery coexisting in the whole arterial pattern of the limb with a brachial or superficial brachial artery that branch into ulnar and common interosseous trunk. Its incidence is 13.8% (Rodriguez-Niedenfuhr et al., 2001b).

The median artery is described as the axis artery of the forearm that mainly supplies the hand of the embryo (Singer, 1933). Median artery arises from the beginning of the anterior interosseous, accompanies and supplies the median nerve, sometimes much enlarged, reaching the palm with the nerve where it may join the superficial palmar arch or ends as one or two palmar digital arteries (Williams et al., 1995).

The superficial median artery is described as the origin of median artery above the elbow level and had a superficial course in the forearm (Rodriguez-Niedenfuhr et al., 2001a). Its incidence was established as being close to 0.5% (Rodriguez-Niedenfuhr et al., 2001b).

We come across two arterial variations in a single cadaver, a brachioradial artery and a superficial median artery during the routine dissection of the right upper limb of a 65 years old white male cadaver.

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Submitted: December 6, 2007
Accepted: April 23, 2008

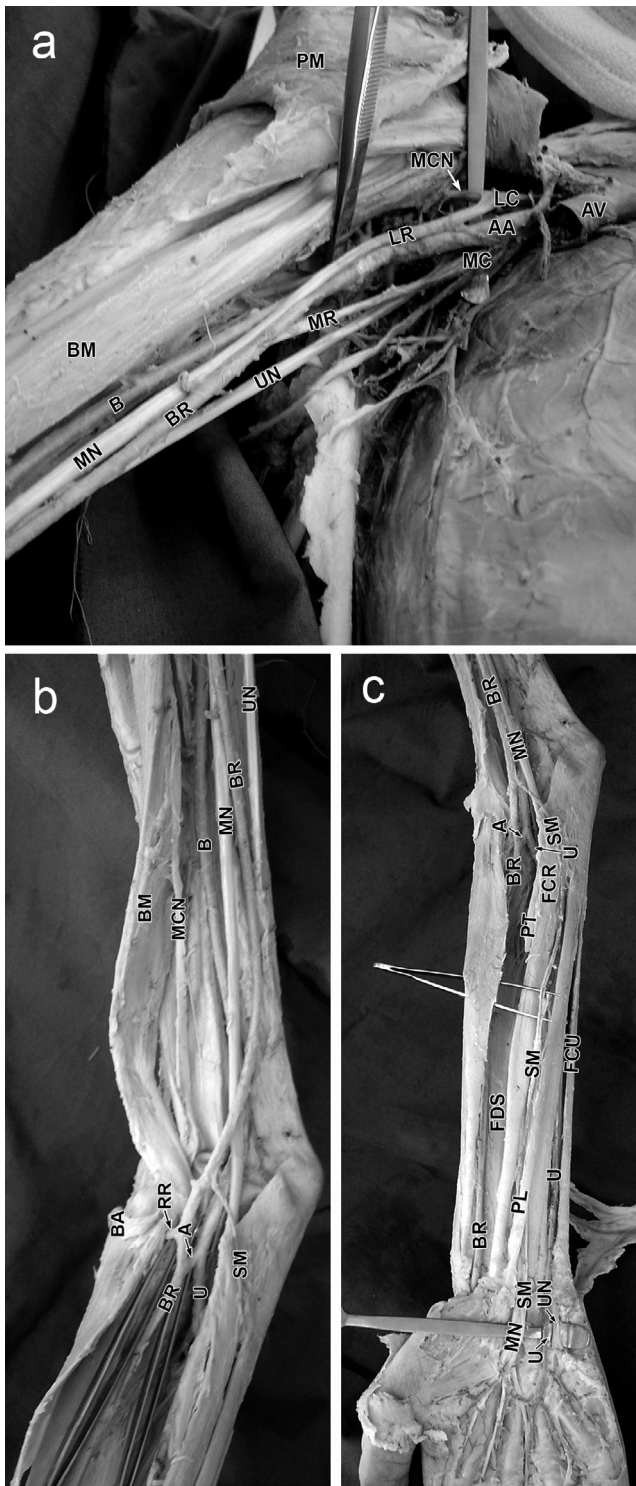


Fig. 1. a) Right axilla showing division of axillary artery into deep and accessory brachial arteries. AV: axillary vein; AA: axillary artery; BR: brachioradial artery; B: deep brachial artery; LC: lateral cord; MC: median cord; MCN: musculocutaneous nerve; LR lateral root; MR: medial root; MN: median nerve; PM: pectoralis major; BM brachialis muscle; UN: ulnar nerve.
 b) Right cubital fossa with the slightly flexed elbow, showing the origin of superficial median artery from the accessory brachial artery and an anastomosis between deep brachial and accessory brachial arteries. UN: ulnar nerve; BR: brachioradial artery; B: deep brachial artery; MN: median nerve; MCN: musculocutaneous nerve; BM: biceps muscle; BA: bicipital aponeurosis; RR: recurrent radial artery; A: anastomosis; SM: superficial median artery; U: ulnar artery.
 c) Right hand and palm showing the superficial median artery forming the superficial palmar arch with the ulnar artery. BR: brachioradial artery; MN: median nerve; B: deep brachial artery; A: anastomosis; SM: superficial median artery; U: ulnar artery; FCR: flexor carpi radialis; PT: Pronator teres; FCU: flexor carpi ulnaris; FDS: flexor digitorum superficialis; PL: palmaris longus; UN: ulnar nerve.

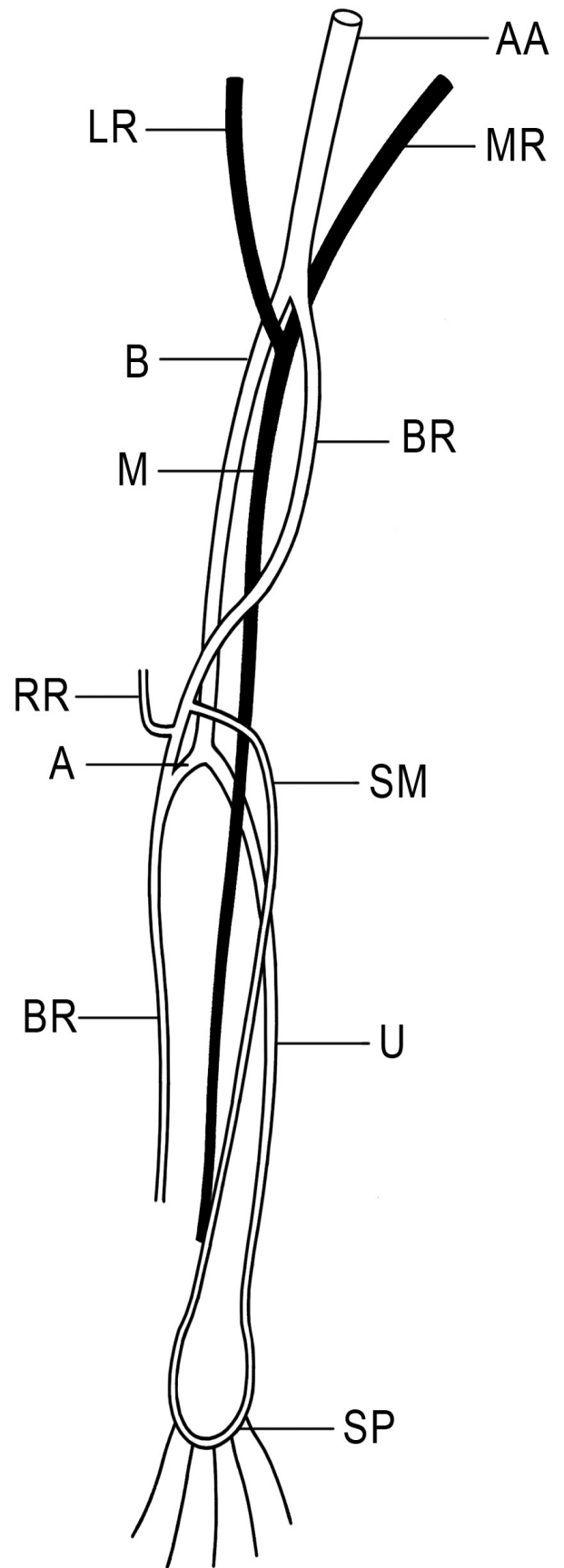


Fig. 2. Schematic drawing showing a variant arterial pattern of the right hand. AA: axillary artery; MR: medial root; LR: lateral root; B: deep brachial artery; BR: brachioradial artery; M: median nerve; RR: recurrent radial artery; A: anastomosis; SM: superficial median artery; U: ulnar artery; SP: superficial palmar arch.

CASE STUDY

In the present arterial variations, we found that the axillary artery ended at the lower border of teres major muscle by dividing into two equal sized arteries, one superficial and another deep to the median nerve. The superficial artery passes between the two roots of the median nerve and continues medial to the median nerve till the mid arm where it comes lateral by crossing anterior to the median nerve (Fig. 1a). In the distal third of the arm, it crosses the deep brachial artery from medial to lateral, continues in the cubital fossa, deep to the bicipital aponeurosis, continue as a normal radial artery (Fig. 1b).

The brachioradial artery originated from the axillary artery and at the level of the elbow fossa it gave off first the superficial median artery and then the radial recurrent artery before receiving a short thick rectilinear anastomosis from the normal brachial artery (Fig. 1b).

The superficial median artery passes medially, anterior to the deep brachial artery and the median nerve, superficial to the bicipital aponeurosis. It runs superficial to the common flexor origin of pronator teres and flexor carpi radialis muscles and continues between the flexor carpi radialis and palmaris longus, anterior to the radial head of flexor digitorum superficialis. In the distal third of the forearm, it joins the median nerve under cover of the palmaris longus tendon (Fig. 1c). At the wrist, it passes deep to the flexor retinaculum. In the hand, the artery ended by forming the superficial palmar arch with the ulnar artery deep to the palmar aponeurosis (Fig. 1c). The artery gives multiple small branches supplying brachioradialis, palmaris longus, flexor digitorum superficialis and the median nerve.

The deep branch of the axillary artery continues as normal brachial artery posterior and lateral to the median nerve, giving away the usual branches, the profunda brachii, nutrient, muscular branches, the superior and inferior ulnar collateral arteries. In the cubital fossa, the brachial artery sends off a short, large and rectilinear anastomosis to the brachioradial artery before continuing as the ulno-interosseous trunk that then divides into the normal ulnar and the interosseous trunk (Fig. 1b).

DISCUSSION

Brachioradial artery is the commonest arterial variation of the upper limb (Rodriguez-Niedenfuhr et al., 2003). It is due to the persistence of the superficial brachial artery

(Singer, 1933; Rodriguez-Baeza et al., 1995) and its incidence is 13.8% (Rodriguez-Niedenfuhr et al., 2001b). In all joints where there is a considerable angulation is permitted and consequently compression of the blood vessels within the angle is inevitable, arterial anastomosis are provided to ensure the blood flow to the distal segment (Arnold, 1968). Anastomosis between the superficial and deep brachial arteries at the elbow level described during the embryonic development (Singer, 1933; Rodriguez-Baeza et al., 1995; Melling et al., 2000; Rodriguez-Niedenfuhr et al., 2001a). Anastomosis at the elbow joint connecting the deep or normal brachial artery with major arterial variations of the upper limb showed different patterns based on its length, caliber and form. Anastomosis also adopted two different relationships with the bicipital aponeurosis passing either in front or behind to it (Rodriguez-Niedenfuhr et al., 2000). In present case it is short, large, rectilinear, and behind the bicipital aponeurosis (Fig. 1b, c).

There has been no study for the embryological origin of the radial recurrent artery. Also origin of the radial recurrent artery in the presence of brachioradial artery has not been reported so far by authors of large samples (Rodriguez-Niedenfuhr et al., 2001b). It is a branch from radial artery just distal to the elbow joint (Williams et al., 1995). It commonly originated from the brachioradial artery followed by brachial and finally from the anastomosis between the two vessels (Rodriguez-Niedenfuhr et al., 2001b).

Median artery is the persistence of an earlier developmental artery that maintains the superficial palmar arch while the radial and ulnar arteries are developing (Singer, 1933). Its incidence is 27.1%-27.4% (Henneberg and George, 1992 a, b). Two types of median artery were previously described, palmar type with the incidence of 20% of the cadavers and antebrachial type with the incidence of 76% (Rodriguez-Niedenfuhr et al., 1999), and due to the high incidence, it is considered as a normal feature rather than a variant (Rodriguez-Niedenfuhr et al., 2001a) compared with the superficial median which is a rare finding with an incidence of only 0.5% (Rodriguez-Niedenfuhr et al., 2001b) with few earlier reports (Hoskins, 1914; Schwyzer and De Garis, 1935; Nakatani et al., 1999). Origin of the superficial median artery has been found to be either from the axillary artery or brachial artery (Rodriguez-Niedenfuhr et al., 2001b). The persistence of the arteria antebrachii (superfi-

cialis volaris artery) may give rise to anomalous superficial median or superficial ulnar arteries in humans (Manners-Smith, 1910). A case of bilateral superficial brachial artery and superficial ulnar artery with median artery has been previously reported (Pabst and Lippert, 1968) while in our case, a normal ulnar artery is found with the superficial median artery. A detailed description of bilateral superficial median arteries was reported previously (Nakatani et al., 1999), in the right upper limb the superficial artery arises from the superficial radial artery at the level of a line between the medial and lateral epicondyles. In the left hand it arises from the superficial brachial artery in the cubital fossa. They also stated that muscular branches are not found from superficial arteries of either side.

In our case, the superficial median artery arises from the brachioradial artery at the base of the cubital fossa and gives away multiple small muscular branches (Figs. 1b, c).

Carpel tunnel syndrome has been detected in 3.4% of hands with the presence of a notable median artery (Sheila et al., 2003). Vascular anomalies occurring in common surgical sites tend to increase the likelihood of damage during surgical procedures (Fadel and Amonoo-Kuofi, 1996). Superficial vessels are vulnerable to lacerations and if drugs are injected into the aberrant artery, the results could be disastrous (Moore and Dalley, 1999). Variant arteries are liable to iatrogenic pseudoaneurysms (Noguchi et al., 2004). In the present subject the superficial median artery was immediately subjacent to the median cubital vein. This would predispose the vessel to inadvertent penetration during attempts at venipuncture of the median cubital vein.

ACKNOWLEDGEMENTS

The authors are thankful to Mr. S. Akram Husain for processing the images and Mr. V. Salvador for his drawing the illustrations.

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