The superficial dorsal artery of the forearm. MR angiographic depiction of a rare anatomic variant of the radial artery.

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Patient: 50 years, male

Clinical History:

MR angiographic demonstration of an atypical radial artery in a 50 year old man complaining of a pulsatile mass in the distal forearm.

Imaging Findings:

A 55 year old patient complained of a pulsating mass on the dorsal aspect of his right distal forearm. A vascular malformation was suspected by his family physician who referred him for MR angiography. On palpation, the normal pulse in the radial groove was absent, the ulnar and brachial artery pulses were normal. Radial pulse on the other limb was normal, too. Multiphase contrast-enhanced MRA was performed on a 1.5T multichannel MR scanner (Signa Hdx, GE Healthcare, Milwaukee WI, USA) using an 8-channel neurovascular coil. Post-processing on an Advantage Windows workstation (GE Healthcare) included volume rendering (VRT) with auto-segmentation of the radial artery, transverse MPRs of the forearm and digitally subtracted whole-volume MIPs. The VRT images clearly demonstrated the superficial course of the abnormal vessel, which deviated from the normal course of the radial artery about 6 cm proximal to the radial styloid process (Fig 1) and adopted a dorsal position between the brachioradialis and the extensor carpi radialis tendons. At the wrist, its branches crossed over the snuffbox instead of emerging from it (Fig 2). The main blood supply of the digital arteries originated from the deep palmar arch (Fig 3). The patient was reassured that the pulsating vessel was in fact a normal vascular variant that should be protected from injury.

Discussion:

Although the arterial blood supply of the hands is quite variable, the anatomy of the distal radial artery is not. However, rare variants are occasionally encountered. In a systematic review of cadaver studies on the blood supply of 2698 upper limbs, including 384 cases of their own, Rodriguez-Niedenführ and co-workers found the superficial course of the distal radial artery to be the least common variant, with an incidence of 0.74% [1]. The superficial radial or dorsal antebrachial artery (SRA, SDA) is defined as a radial artery with a normal origin, which at the wrist level crosses over the tendons forming the snuffbox. Before embryologic studies became available, the anomalous superficial artery had been explained by comparative anatomy. In primates other than man, the radial artery divides into a volar branch corresponding to the human radiopalmar branch, and a dorsal branch that represents the normal radial artery in those species [2]. More recent studies in human embryos have shown that vascular variations arise during normal development through enlargement and differentiation of parts of the initial capillary network, which accompanies skeletal formation. Those parts later fail to regress, giving rise to vascular variants [3]. Apart from
cadaver dissection studies, there are few case reports on anomalies of the distal radial artery, mostly from plastic surgeons dealing with the hazards of myocutaneous flap harvesting in the forearm [4]. The radiological literature remains relatively silent about this type of anomaly. Only one single case has been reported in a series of upper limb arteriographies [5]. Non-uniform terminology further impedes the understanding of this vascular variant. We prefer the denomination "superficial dorsal artery" (SDA) because it has been shown that a rudimentary original radial artery may also be present in this type of anomaly [1]. However, this was not the case with our patient, in whom the SDA was the only vessel contributing to the radial supply territory.

The clinical significance of the SDA is generally low, for it rarely becomes symptomatic [6]. Due to its superficial position, the artery is prone to traumatic injury and may be confused with the cephalic vein, which entails the risk of inadvertent intra-arterial injection of potentially harmful pharmaceuticals. The SDA has also been described as a "hidden trap" in myocutaneous flap harvesting for reconstructive maxillofacial or ENT surgery [7]. Moreover, the radial artery is becoming increasingly popular as a cardiac by-pass graft. The awareness of possible variants is therefore more important than ever. MR angiography has proved extremely valuable for the detection of vascular variants in the upper limb arteries and has a low risk versus benefit profile [8], which makes it preferable especially in patients with a low probability of disease. Color-Doppler ultrasound has also a very low risk but is more operator-dependent and less comprehensive in depicting the vascular anatomy. CT angiography, on modern equipment, may also be used to detect anomalies and calcifications in candidates for by-pass grafting [9]. Intra-arterial DSA should be reserved for patients, who require endovascular or surgical interventions.

**Differential Diagnosis List:** Superficial dorsal artery of the forearm sive Superficial radial artery.

**Final Diagnosis:** Superficial dorsal artery of the forearm sive Superficial radial artery.

**References:**

Description: Auto-segmentation of the superficial dorsal artery and its main branches using volume rendering technique. The arrow points to the onset of the anomaly. sda = superficial dorsal antebrachial artery, pp = princeps pollicis artery, dp = deep palmar branch, mc1 = first metacarpal artery, sp = superficial palmar branch. Origin:
Description: Ce-MRA of the right forearm and hand, transverse MPRs from the distal radius shaft to the level of the middle hand (a - f). R = radius, SP = styloid process, N = navicular bone, M1, 2 = first, second metacarpal bones, ra = radial artery, sda = superficial dorsal artery, pp = princeps pollicis artery, dp = deep palmar branch, dpa = deep palmar arch, s = superficial branch. The open circles show the expected position of the radial artery and its branchings according to Meals et al. [10].

Origin:
Description: Oblique and dorso-volar early (a,b) and late phase (b,c) maximum intensity projections of ce-MRA in a case of a superficial dorsal antebrachial artery showing the relations with the ulnar territory. The complete deep palmar arch supplies dig. II-V. Origin: