

An atypical superficial radial artery

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SUMMARY

Harvesting of the radial artery has become a common surgical procedure. Variations in the radial artery may affect its origin or its course. Variations in the course are rare and classified in 2 classes (1 & 2) according to the tendons forming the anatomical snuff box or radial fossa of the hand. In a study of seventy randomly selected cadavers assigned to medical students for dissection, an atypical case of class 2 was found and is described here.

Key words: Upper limb – Arterial variations – Atypical superficial radial artery

INTRODUCTION

The radial artery originates as one of the terminal branches of the brachial artery, and lies under the antebrachial fascia between the brachioradialis and the flexor carpi radialis muscles. In the proximal third of the forearm it is situated in a medial position relative to the biceps brachii tendon, passes deep to the muscular belly of the brachioradialis, and the remainder of its course in the forearm is medial to the brachioradialis tendon. In the distal forearm, the radial artery can be located using

the flexor carpi radialis muscle as a landmark, and it passes deep to the tendons of the abductor pollicis longus, the extensor pollicis longus and brevis across the anatomical snuff-box (Standring et al., 2005).

Harvesting of the radial artery has become a common surgical procedure. Patients with anatomical variations of the radial artery have a significantly lower puncture and procedural success rate (Valesecchi et al., 2006). Variations of the radial artery may affect its origin or its course. Although the variations in the origin are common, with an incidence of 15% (McCormack et al., 1953; Tountas and Bergman, 1993), variations in the course are rare, with an incidence of only 0.52% (Rodríguez-Niedenführ et al., 2001). Manners-Smith (1910) classified the radial artery course variations in two classes according to its relation to the tendons forming the anatomical snuff box. In the first class, the radial artery is single and is entirely superficial to the tendons of the anatomical snuff box, also known as the superficial dorsal artery of the forearm (Morris et al., 2005). In the second class, the radial artery divides into superficial and deep branches, also documented as partial duplication of the radial artery (McCormack et al., 1953), or duplication of the radial artery (Bumbasirevic et al., 2005).

MATERIALS AND METHODS

Seventy randomly selected cadavers assigned to medical students for dissection were studied. All had been embalmed soon after death with a mixture of 10% formaldehyde, glycerol, methylated spirits, and 10% phenol in water. The topography of the upper limb arteries of all the cadavers were examined during dissection and those showing anomalies were recorded and described. The diameters of the arteries were also measured using Vernier calipers.

RESULTS

In the right upper limb of a Caucasian male cadaver, aged 65, the radial artery originated from the brachial artery and descended normally until it reached the lower third of the forearm 5.5 cm from the styloid process of the radius, where it divided into two branches of

equal diameter: palmar and dorsal, of 3 mm each. The dorsal branch descended superficially to the tendons of the abductor pollicis longus, extensor pollicis brevis and extensor pollicis longus muscles, and ended by perforating the first dorsal interosseous muscle. The palmar branch passed superficial to the flexor retinaculum, the origin of the flexor pollicis brevis muscle, but deep to the origin of the abductor pollicis brevis and anastomoses with the ulnar artery to form the superficial palmar arch. 1.5 cm proximal to the styloid process of the radius, the palmar branch off gave a slender artery, which passed deep to the flexor tendons of the thumb in the anatomical snuff box and formed the dorsal carpal arch (Figs. 1, 2).

DISCUSSION

A superficial radial artery is a rare variation and is defined as a radial artery of nor-

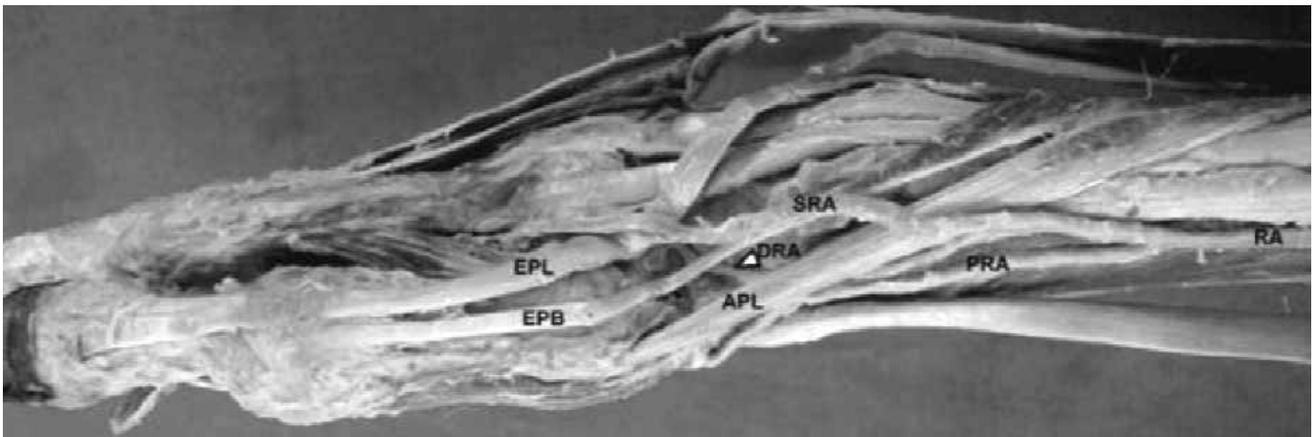


Fig. 1. A right hand showing atypical superficial radial artery; RA: radial artery; PRA: palmar radial artery; SRA: superficial radial artery; DRA: deep radial artery; EPL: extensor pollicis longus; EPB: extensor pollicis brevis; APL: abductor pollicis longus.

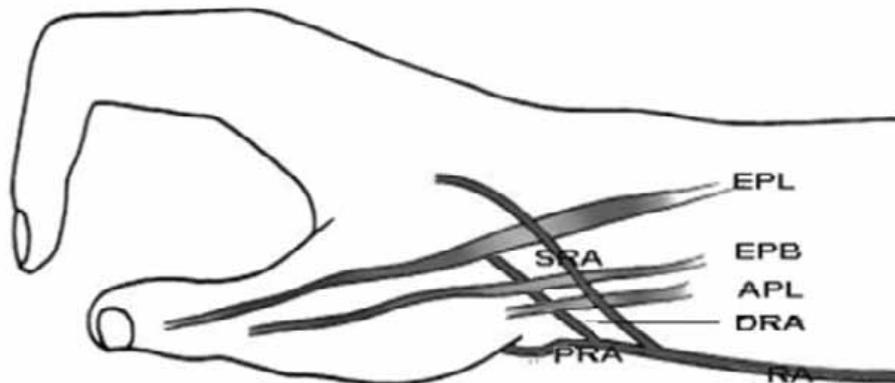


Fig. 2. Diagrammatic representation of figure 1.

mal origin, but at the wrist crosses superficially to the tendons that outline the anatomical snuffbox (Rodríguez-Niedenführ et al., 2001) and its incidence ranges between 0.52% - 1% (McCormack et al., 1953; Keen, 1961; Rodríguez-Niedenführ et al., 2001). Cadaveric studies reveal that this variation of the artery is usually unilateral (McCormack et al., 1953; Rodríguez-Niedenführ et al., 2001).

If present, a superficial radial artery usually originates at the distal third of the forearm (McCormack et al., 1953; Heden and Gylbert, 1990; Woods et al., 1997; Rodríguez-Niedenführ et al., 2001), less commonly from the proximal third of the forearm (Martin-Granzio et al., 2002; Sasaki et al., 1999), and in a single case it arose above the elbow level (McCormack et al., 1953).

In class 2, the superficial branch of the radial artery is usually larger than the deep branch, which courses in the normal anatomical location of the radial artery (Woods et al., 1997; Sasaki et al., 1999; Drizenko et al., 2000; Bumbasirevic et al., 2005).

With regard to the contribution of the radial artery to the formation of the superficial palmar arch, most authors have not described a palmar branch from the radial artery during its variant course. McCormack et al. (1953) described a case in which a median artery replaced the radial artery in the formation of the superficial palmar arch. Similarly, in a single report it was described that the palmar branch arose from the slender deep branch of the radial artery (Woods et al., 1997).

There is no embryological explanation for this variation. In primates the radial artery divides into a volar branch, which in the human is represented by a radiopalmar branch, and a dorsal branch, which is represented by the normal radial artery, which further divides into superficial and deep branches in relation to the tendons in the anatomical snuff box (Manners-Smith, 1910). In the present case, the radial artery divided into palmar and dorsal branches, where the dorsal branch descended superficially to the tendon, but the deep one was a slender branch from the palmar radial artery. This finding cannot be explained by comparative anatomy, and there are no previous reports of such a branching pattern of the radial artery.

The existence of a superficial radial artery implies the possible absence of a normal radial pulse at the wrist and may produce prob-

lems in cannulation (Diz et al., 1998). It therefore poses a hazard for inadvertent intra-arterial drug administration owing to its proximity to the cephalic vein (Morris et al., 2005), and may produce symptoms that require surgical treatment (Brown et al., 1999).

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