High level branching and very superficial course of radial artery in the anatomical snuffbox: its clinical and surgical implications

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Abstract

Introduction
Variation in the origin of radial artery is one of the common anomalies in the upper limb. However, distal part of its course shows a constant pattern. The knowledge of variations of the radial artery is of importance in vascular and reconstructive surgeries. Here, we report the unusual superficial course and branching of the radial artery in the forearm and the dorsum of the hand.

Case report
The radial artery gave its superficial palmar branch 8 cm above the proximal border of the flexor retinaculum. After giving the superficial branch, it passed on to the dorsal aspect of the hand, by winding round the lateral aspect of the wrist superficial to the tendons forming the boundaries of anatomical snuff box and reached the first interosseous space. It passed between the two heads of the first dorsal interosseous muscle to enter the palm.

Conclusion
The knowledge of this variation of the radial artery is important while performing intravenous cannulations and plastic surgeries. It is also important to cardiothoracic surgeons as the radial artery is increasingly being used for the coronary bypass graft in place of the great saphenous vein.

Introduction
The radial artery (RA) is the smaller terminal branch of the brachial artery. It begins 1 cm distal to the elbow joint, at the level of neck of radius. It runs medial to the brachioradialis throughout its course in the forearm. Just above the wrist, it is palpable between the flexor carpi radialis medially and anterior border of radius laterally. It then turns posterolaterally round the wrist superficial to the lateral ligament of the wrist and deep to the abductor pollicis longus and extensor pollicis brevis muscles. It crosses the scaphoid and trapezium bones and just before it passes between the heads of the first dorsal interosseous it is crossed by the tendon of the extensor pollicis longus muscle. Between the extensor muscles of the thumb, it is crossed by the cephalic vein and digital branches of the radial nerve which supply the thumb and index finger. It passes between the two heads of the first dorsal interosseous muscle and enters the palm. ‘The common mode of termination of the RA is by forming the deep palmar arch. Although variations in the origin of the RA are common, with an incidence of 15%6; variations in the course are rare, with an incidence of only 0.52%5. For radiological, surgical and routine patient care purpose, precise knowledge of the course of the RA and its relation to adjacent structures in the distal part of the forearm and wrist is of great importance. We present a rare case of ‘very superficial course’ of the RA and discuss its clinical and surgical importance.

Case report
During routine dissection classes for medical undergraduates, we found the following variations of the RA in the right upper limb of an adult male cadaver aged approximately 65 years old. The RA had its origin from the brachial artery in the cubital fossa. The proximal part of its course in the forearm was normal. It gave its superficial palmar branch, 8 cm above the proximal border of the flexor retinaculum (Figure 1). The superficial palmar branch passed through the thenar eminence muscles before completing the superficial palmar arch. After giving the superficial palmar arch, the RA turned laterally and passed superficial to the abductor pollicis longus, extensor pollicis brevis and extensor pollicis longus tendons (Figure 2). After crossing these tendons, it passed between the two heads of the first dorsal interosseous muscle and entered the palm. Its course and distribution in the palm were normal.

Discussion
The variations in the origin and proximal course of the RA are more common than its distal course and termination. RA may originate from the axillary artery4,5, thoracoacromial trunk6 or brachial artery7,8. Manners-Smith3 classified the variations in the course of the RA into two classes according to its relation to the tendons forming the anatomical snuff box. In the first class, the RA is single and is entirely superficial to the tendons of the anatomical snuff box, also known as the superficial dorsal arterial artery of the forearm. In the second class, the RA divides into superficial and deep branches, documented as duplication of the RA3. The current case belongs to the first class of Manners-Smith classification. In one
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Figure 1: Dissection of the distal part of the front of the right forearm showing the variation of the radial artery (RA). Note its course superficial to the tendon of abductor pollicis longus (APL) and the high origin of its superficial palmar branch (SBRA). Branches of the radial nerve (RN) along with cephalic vein and flexor carpi radialis tendon (FCR) can also be seen.

Figure 2: Dissection of the lateral side of the right hand showing the anatomical snuff box. Note the superficial relationship of the radial artery (RA) to the extensor pollicis brevis (EPB) and extensor pollicis longus (EPL) tendons. First dorsal interosseous (FDI), dorsal venous arch (DVA), branches of the radial nerve (RN) and cephalic vein (CV) can also be seen.

The superficial arteries of the upper extremity may be mistaken for veins, which may become a basis for intraarterial injections instead of intended intravenous injections11,12. They may also be encountered during elevation of the forearm flaps13-16 or misinterpreted in contrast radiographs17. Harvesting of the RA is one of the common surgical procedures. Patients with anatomical variations of the RA have a significantly lower puncture and success rate in such procedures18. The RA is being used for coronary artery bypass grafting19 and it has been shown to have a superior perioperative and post-operative course than the saphenous vein grafts20. In the current case, the superficial palmar branch of the RA took its origin 8 cm above the proximal border of the flexor retinaculum and ran just undercover of the skin in the distal third of the forearm. Awareness of this variation is very important as the artery is liable to get injured in skin incisions in the distal third of the forearm. The very superficial course of the RA in the anatomical snuff box and its close relation to the cephalic vein is also a predisposing factor for its inadvertent injuries. It might get punctured instead of the cephalic vein while setting an intravenous line. Superficial cuts in the anatomical snuffbox might result in significant bleeding when the artery is very superficial as the one being reported here.

Conclusion
The knowledge of this variation of the radial artery is important during intravenous cannulations and plastic surgeries. It is also important to cardiothoracic surgeons as the radial artery is increasingly being used for the coronary bypass graft in place of the great saphenous vein. The knowledge of high origin of superficial palmar branch and very superficial course of the RA in the anatomical snuffbox may be important for the plastic surgeons, cardiologists and radiologists.

References

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