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The ulnar tunnel: a rare disposition of its contents

The ulnar tunnel is located at the proximal part of the hand radial to the pisiform bone and to the proximal part of the carpal tunnel. Inside it lie the ulnar nerve and artery. Compression of the ulnar nerve in this tunnel is often reported. Cysts, occupational trauma, fractures and muscle variations are among the main causes (Schjelderup, 1964; Kleinert & Hayes, 1971). Damage to the ulnar nerve and artery during the endoscopic decompression of the carpal tunnel has been reported recently (Agee et al. 1992; Nath et al. 1993; De Smets & Fabry, 1995). The structures within the ulnar tunnel are closely related to the medial part of the flexor retinaculum, in particular the ulnar artery which is located lateral to the ulnar nerve. During a study of this region we found a rare disposition of the contents of this tunnel. We believe that knowledge of this variation is important for the surgical anatomy of this region.

The variation in the contents of the ulnar tunnel described in this report was detected in the right hand of a 34-y-old white male. In the forearm, the ulnar nerve divided into 2 branches 50.8 mm proximal to the distal wrist crease. The ulnar artery lay between the 2 branches (Fig. 1). The lateral branch ran lateral to the artery in the distal part of the forearm as well as in the proximal part of the hand and had a smaller calibre than the medial branch. The medial branch corresponded to the ulnar nerve and gave off the deep branch 6.2 mm distal to the distal wrist crease. Near the origin of the deep branch, another branch supplied palmaris brevis and distally gave rise to the proper palmar digital nerve (ulnar side) of the little finger. Initially, the medial branch was ventromedial to the artery and then lay medial to the vessel. Lateral and medial branches rejoined 35.0 mm distal to the distal wrist crease, constituting the common palmar digital nerve of the 4th interosseous space (Fig. 2). In the distal part of the forearm, the ulnar nerve and artery ran lateral to the tendon of flexor carpi ulnaris covered by the antebrachial fascia and skin and by palmaris brevis in the hand. The flexor retinaculum lay dorsal to the contents of the ulnar tunnel and medially there were some anomalous muscle fibres extending between the pisiform bone and the retinaculum.

The distal ulnar tunnel begins at the proximal border of the palmar carpal ligament, extending to the fibrous arch of the hypothenar muscles. This tunnel is 4.4.5 cm long and transmits the ulnar nerve and artery. It comprises 3 zones and the first, 3 cm long, is proximal to the bifurcation of the ulnar nerve which is located 11 mm distal to the proximal border of the pisiform bone (Gross & Gelberman, 1985). The most frequent disposition of the structures inside the ulnar tunnel is for the ulnar nerve to be localised medial and sometimes a little posterior to the ulnar artery; they are covered by skin and the palmar carpal ligament and are located over the flexor retinaculum (Goss, 1976; Moore, 1982).

Cobb et al. (1994) found that the ulnar nerve lay adjacent to the ulnar portion of the hook of the hamate and sometimes directly anterior to this structure, while the ulnar artery was radial to the hook in 5 of 9 samples and directly palmar to it in the other 4. In another study, Cobb et al. (1996) pointed out that the fact that the ulnar artery, and occasionally the sensory component of the ulnar nerve, are radial or palmar to the hook of the hamate, is important during endoscopic release of the carpal tunnel because this procedure is performed on the ulnar aspect of the tunnel, often near the hook of the hamate, to avoid median nerve injuries.

A magnetic resonance imaging study by Netscher et al. (1996) has shown that the ulnar nerve is on average located 3.6 mm ulnar to the hook of the hamate and the ulnar artery 0.7 mm radial to it. In 8 cases the ulnar nerve was medial, in 2 it was lateral, and in 1 it was 5.8 mm lateral to the hook of the hamate. Zeiss et al. (1992) also described the normal anatomy of the ulnar tunnel and its variations in 36 wrists.

Fig. 1. Dissection of ventral aspect of wrist. 1, Ulnar artery; 2, lateral branch of ulnar nerve; 3, medial branch of ulnar nerve; 4, anomalous muscular fibres between the pisiform bone and flexor retinaculum.
Injuries to the ulnar nerve resulting from carpal tunnel surgery bear a risk of injury when this region is approached surgically. Of the structures in the ulnar tunnel and the flexor retinaculum increases the risk of injury to the ring finger (Koig et al., 1994). Also, the ulnar nerve was found to divide into 3 branches radial to the hook of the hamate. Thus when the lateral branch is exposed to surgical injury in procedures involving the flexor retinaculum, it is important that surgeons bear it in mind.

Variations of the ulnar nerve at the level of the ulnar tunnel have been described in some reports, namely an anomalous branch emerging from the dorsal branch of the nerve, 2 cm proximal to the ulnar styloid process, running on the ulnar side of pisiform bone to join the superficial branch of the ulnar nerve distal to this bone (Kaplan, 1963). Also, the ulnar nerve was found to divide into 3 branches before entering the tunnel (3 out of 23 cases) and 1 of these branches ran beneath the flexor retinaculum before innervating the ring finger (Koig et al., 1994).

The close relationship between the neurovascular contents of the ulnar tunnel and the flexor retinaculum increases the risk of injury when this region is approached surgically. Injuries to the ulnar nerve resulting from carpal tunnel endoscopic surgery have been described by Agee et al. (1992), Lee et al. (1992), Nath et al. (1993) and De Smets & Fabry (1995). The disposition of the lateral branch of the ulnar nerve described in this report constitutes a further risk for surgical accidents and increases the importance of knowing thoroughly the anatomical structures associated with the carpal tunnel, in particular their variations, considering the ever increasing use of endoscopic surgical techniques in the carpal tunnel.

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REFERENCES


Fig. 2. Ventral surface of the forearm and hand showing the position of the ulnar nerve. 1, Ulnar artery; 2, lateral branch of ulnar nerve; 3, ulnar nerve; 4, medial branch of ulnar nerve; 5, flexor retinaculum; 6, flexor pollicis brevis; 7, tendon of flexor carpi ulnaris; 8, palmaris brevis; 9, common palmar digital nerve of 4th interosseous space.