Cubital Tunnel Release Using Local Anesthesia

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KEYWORDS

• Cubital tunnel syndrome • Cubital tunnel release • Local anesthesia • Ulnar nerve
• Decompression surgery • Nerve entrapment

KEY POINTS

- The procedure results in an anterior transposition of the ulnar nerve in the subcutaneous plane while still under local anesthesia.
- Patients benefit from walking in and out of a minor procedure suite without any exposure to the risks of general anesthesia.
- There is no difference in our patient outcomes between performing cubital tunnel release under local anesthesia in a minor operating setting compared with the results obtained under general anesthesia in a main operating room.

INTRODUCTION

Cubital tunnel syndrome is one of the most common nerve entrapment syndromes, second only to carpal tunnel syndrome.[1] It often results in such symptoms as complaints of numbness and tingling in the ulnar half of the hand, and can extend to more severe symptoms, such as wasting of intrinsic muscles. In many cases, treatment of cubital tunnel syndrome requires surgical intervention. Today, the most recognized surgical interventions are in situ decompression, medical epicondylectomy, subcutaneous anterior transposition, and submuscular transposition. Most of these procedures require general anesthesia and an operating room environment.[2]

CUBITAL TUNNEL RELEASE WITH LOCAL ANESTHESIA

Cubital tunnel syndrome can be treated in many ways including conservative measures, in situ decompression, medial epicondylectomy, direct release with subcutaneous anterior transposition, and submuscular anterior transposition.[2] Cubital tunnel release, with or without anterior transposition, can easily be performed under local anesthesia without the need for intravenous sedation.

Although carpal tunnel decompression is one of the most common operations performed in the world, the cubital tunnel release is much less common because of the belief held by many surgeons that general anesthesia is required. The surgery can be performed with a brachial plexus block or even an intravenous Bier block; however, it is difficult to obtain a complete release proximally, if two blood pressure cuffs are applied to the arm.

The ulnar nerve originates in the brachial plexus and passes through the cubital tunnel. The elbow joint is very dynamic, with a range of approximately 150 degrees.[3] The ligaments over the ulnar nerve stretch and move with elbow motion.[4] Vanderpool and colleagues[4] indicated that there is a significant stretch of the aponeurosis around the

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elbow with flexion. In full flexion, the cubital tunnel has been shown to be compressed and narrowed by approximately 55%.[5] It is thought that this decreased volume predisposes the ulnar nerve to compression.[4,6,7]

Flexion at the elbow results in the ulnar nerve having to travel a greater distance as opposed to extension of the elbow (**Figs. 1** and **2**). With elbow flexion, intraneuronal pressure of the ulnar nerve increases significantly.[8–10] It has also been shown that excursion of the ulnar nerve around the elbow occurs with shoulder and elbow motion.[11,12] Repetitive motion or dynamic traction and excursion may cause some inflammation around the nerve, which has been validated with histology and imaging studies.[11,12] Blood flow and axoplasmic flow is affected by compression of the ulnar nerve at the elbow.[13] The ulnar nerve is located superficially at the elbow and mechanical compression may be common when there is very little soft tissue for padding over the nerve.[12] Of course, directly leaning on the elbow and the cubital tunnel can produce a direct mechanical compression on the ulnar nerve. Other sources include soft tissue masses, such as ganglions or lipomas, and direct bony abnormalities, such as cubitus valgus or fractures.[11,12] Rheumatoid disease, diabetes, and hypothyroidism have all been associated with peripheral neuropathies.[11]

ULNAR NERVE ANATOMY AND SITES OF COMPRESSION

The ulnar nerve originates in the brachial plexus from C8 and T1 nerve roots. The ulnar nerve containing sensory and motor nerve fibers exits the brachial plexus as a branch of the medial cord and travels from the axillary region to the medial arm.

Fig. 1. Many people do not appreciate the greater distance the ulnar nerve must travel when the elbow is flexed as opposed to extended. Illustration by the computer represents the elbow and the string represents the ulnar nerve. Markings shown are 1 cm apart.

Fig. 2. Illustration by the computer represents flexion of the elbow resulting in the ulnar nerve traveling an extra 1 to 2 cm in length represented by the string. Markings shown are 1 cm apart.

The first site of compression of the ulnar nerve occurs as it passes posterior to the medial intermuscular septum of the arm. Continuing on its path, the ulnar nerve then passes through the arcade of Struthers, approximately 8 to 10 cm proximal to the medial epicondyle.[14] This arcade lies just anterior to the ulnar nerve and is almost 5 cm in length.[12]

The second site of potential entrapment of the ulnar nerve at the elbow is the medial intermuscular septum. This potential site of compression exists only if there is an anterior transposition of the ulnar nerve or if the ulnar naturally subluxes anterior to the medial epicondyle. As the ulnar nerve approaches the medial epicondyle, it may be entrapped under an anomalous anconeus epitrochlearis muscle, which has been identified as a cause of ulnar compression.[15,16]

The senior author has performed more than 200 cubital tunnel release procedures and has found that approximately 20% of these patients have had a prominent anconeus epitrochlearis. It is therefore suspected that patients who are symptomatic with ulnar compression at the elbow are more likely to have this anomalous muscle than the general population.

The ulnar nerve then continues toward the elbow and passes underneath the cubital tunnel retinaculum or Osborne ligament. The nerve travels beyond the deep fascia, which is also known as Osborne fascia. The third site of frequent ulnar compression lies deep to Osborne fascia, at the distal aspect of the cubital tunnel.[12,17]

The ulnar nerve then passes between the ulnar and radial heads of the flexor carpi ulnaris (FCU) muscle. Approximately 5 cm beyond the medial epicondyle, the ulnar nerve penetrates deep to the fascia to lie between the FCU and the flexor digitorum profundus (FDP) muscle bellies. The