SCIENTIFIC ARTICLE

An Anatomical Basis for Endoscopic Cubital Tunnel Release and Associated Clinical Outcomes

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Purpose To study the ulnar nerve in fresh-frozen cadavers as related to endoscopic release of the cubital tunnel and to present a retrospective review of patients treated with decompression via endoscopic visualization.

Methods To further our understanding of relevant anatomy, we dissected 26 cadaver limbs. We paid special attention to fascial membranes as potential sites of constriction as well as the position of nerves, vessels, and aberrant anatomy. These findings facilitated our understanding of the extent of release in 80 patients (92 cases) with endoscopic cubital tunnel simple decompression. Outcome measures included Disabilities of the Arm, Shoulder, and Hand score, Gabel and Amadio score, and grip and pinch strengths.

Results We noted fascial bands proximal to the medial epicondyle in 12 of 26 cadaver specimens, 2 of which could be the so-called arcade of Struthers. We observed a high degree of variability in the anatomy of the flexor pronator aponeurosis distal to the medial epicondyle. Where present (n = 10), medial antebrachial cutaneous nerve branches crossed the ulnar nerve at an average distance of 2.9 cm from the medial epicondyle (range, 1.0–4.5 cm). Aberrant structures were noted in 8 of the 26 specimens, including an anconeus epitrochlearis muscle in 2 specimens, a basilic vein crossing the ulnar nerve in 4 specimens, and an accessory origin of the medial head of the triceps from the medial intermuscular septum in 2 specimens. In the clinical portion of this study, the average Disabilities of the Arm, Shoulder, and Hand score before surgery was 49 (n = 34) and after surgery was 25 (n = 56). The Gabel and Amadio outcome scores were 24 excellent, 40 good, 25 fair, and 3 poor (n = 92). Average follow-up was 8.2 months (range, 0.1–35 mo).

Conclusions Cadaveric dissections shed light on vulnerable anatomical structures during release, including branches of the medial antebrachial cutaneous nerve, ulnar nerve, brachial artery, fascial bands, and basilic vein. The high degree of anatomical variability in this study highlights the advantage of endoscopic visualization in allowing surgeons to minimize surgical trauma. *(J Hand Surg Am. 2014;39(7):1363–1369. Copyright © 2014 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Therapeutic IV.

Key words Cubital tunnel syndrome, ulnar nerve, endoscopic release, fascial bands.

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Several techniques have been developed over the years to alleviate cubital tunnel syndrome, similar in both efficacy and complications.[1–7] Despite the variety of these techniques, no accepted standard has been established for surgical treatment.[6]

A desire for less morbidity, shorter operative time, ease of performance, fewer complications, and earlier resumption of usual activities has driven the development of endoscopic techniques to resolve nerve compression. We believe that improvements in endoscopic instrumentation and technique, along with awareness of vulnerable local anatomy, will result in minimal dissection, reduced nerve devascularization, decreased potential for iatrogenic trauma, minimal manipulation of the nerve, and a cosmetically appealing scar. Mobilization within the first week prevents elbow flexion contracture and postoperative perineural fibrosis, which is one of the most common reasons for revision of cubital tunnel decompression.[8,9]

In a prospective, multicenter study, Agee et al[10] found return-to-work times to be substantially quicker via endoscopic carpal tunnel release as opposed to the traditional open procedure. Owing to the similarity of these nerve entrapment syndromes, we believe that there may be comparable results in the cubital tunnel. We present a retrospective study that evaluates outcomes of 92 cases (80 patients) treated with endoscopic decompression of the ulnar nerve at the elbow in conjunction with a cadaveric study of the relevant anatomy and pitfalls thereof.

MATERIALS AND METHODS

All participants involved in the study signed informed consent prior to participation, and record keeping was in compliance with the Health Insurance Portability and Accountability Act. There was no external source of funding for this study.

Anatomical study

To record vulnerable anatomical structures and improve upon the surgical approach, 26 fresh-frozen cadaver limbs were dissected between December 2008 and June 2013 with measurements taken on the position of nerves, vessels, and aberrant anatomy, with a special reference to the endoscopic technique.

Clinical study

Between May 2007 and November 2011, in 80 patients who consented to participate in this study we performed 92 consecutive endoscopic cubital tunnel releases. Information that was recorded anonymously from individual patient medical records into a database were age, sex, type of insurance, type of career/lifestyle (active/sedentary), mechanism of injury, concomitant diagnoses/surgeries, findings of weakness, atrophy, pain, preoperative electrodiagnostic studies, grip/precision pinch/lateral pinch strength, 2-point discrimination, elbow range of motion, and time to return to work. The Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire was filled out by patients before and after surgery to assess physical function.[11] The Gabel and Amadio classification[12] was used to measure pre- and postoperative motor and sensory abnormalities and pain. Patients were eliminated from Gabel and Amadio assessment if they had comorbidities or other surgeries that would affect muscle strength, sensation, or pain, such as tendon transfers or trigger finger. Using the Dellon and MacKinnon classification,[13] we were able to calculate differential success rates of the procedure, based on severity of ulnar nerve compression.

The mean age of patients was 52 years (range, 22–85 y), with 38 men and 42 women receiving treatment. There were 48 right and 44 left, 45 dominant, 42 nondominant, and 5 mixed-dominant limbs treated. Thirty-five cases had some history of trauma (of these, 19 were related to motor vehicle accidents), 31 were occupational, and 26 were idiopathic.

Seventy-four of the 92 cases also had ipsilateral carpal tunnel syndrome. Forty-five patients had other comorbidities including DeQuervain syndrome, scapholunate ligament rupture, preoperative complex regional pain syndrome, Guyon canal syndrome, cervical radiculopathy, herniated disk, double crush syndrome, ulnar impaction syndrome, thumb basal joint osteoarthritis, and medial and lateral epicondylitis. One patient who had brachial plexus double crush syndrome was eliminated. Eleven patients had cervical radiculopathy, and they were classified as double crush; however, they all had positive outcomes.

Electrodiagnostic studies were conducted before surgery to assess denervation of ulnar-innervated muscles or prolonged conduction velocities of the ulnar nerve across the elbow. Positive electrodiagnostic studies were found in 89 of the 92 cases. In 2 patients, electrodiagnostic studies were not obtained, and 1 patient had a negative study. In these 3 cases, surgical intervention was based on clinical findings, and all of these patients had favorable outcomes. After surgery, all patients were conservatively treated with an ulnar nerve sleeve and nerve gliding exercises.

Surgical technique

The chosen technique was indicated for patients who have Dellon and MacKinnon classifications[13] of mild, moderate, or severe cubital tunnel syndrome. Severe