Concomitant endoscopic carpal and cubital tunnel release: safety and efficacy

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Abstract

Background When performed alone, endoscopic carpal tunnel release and endoscopic cubital tunnel release are safe and effective surgical options for the treatment of carpal and cubital tunnel syndromes, respectively. However, there is currently no literature that describes the performance of both procedures concomitantly. We describe the results of 17 cases in which dual endoscopic carpal and cubital tunnel releases were performed for the treatment of concurrent carpal and cubital tunnel syndromes.

Methods A retrospective review of all patients in a single surgeon practice that presented with concomitant ipsilateral carpal and cubital tunnel syndromes was performed. Within an 8-month period, 17 patients had undergone 19 concomitant ipsilateral endoscopic carpal and cubital tunnel releases after failing conservative treatment. Pre- and postoperative measurements included subjective numbness/tingling; subjective pain; manual muscle testing of the abductor pollicis brevis (APB), intrinsics, and flexor digitorum profundus (FDP); static two-point discrimination; quick-DASH (Disabilities of the Arm, Shoulder and Hand) scores; grip strength; chuck pinch strength; and key pinch strength. Complete data are available for 15 patients and 17 total procedures.

Results Thirteen male and four female patients (average age of 50.5) underwent dual endoscopic cubital and carpal tunnel release. Two patients were lost to follow-up and eliminated from data analysis. Pre- and postoperative comparisons were completed for median DASH scores, grip strength, chuck pinch strength, and key pinch strength at their preoperative visit and at 12 weeks. DASH scores improved significantly from a median of 67.5 to 16 ($p=0.002$), grip strengths

improved from 42 to 55.0 lbs ($p=0.30$), chuck pinch strengths improved significantly from 11 to 15.5 lbs ($p=0.02$), and key pinch strengths increased significantly from 13 to 18 lbs ($p=0.003$). Average static two-point discrimination decreased from 5.9 to 4.8 mm. In terms of pain, 82 % of patients had complete resolution of pain, and the remaining 18 % experienced pain only with strenuous activity. In terms of numbness/tingling, 100 % of patients had complete resolution of median nerve symptoms; 88 % of patients had substantial improvement of numbness and tingling symptoms, and 12 % had residual ulnar nerve symptoms. In terms of muscle strength, 92 % of patients had improvement to 5/5 APB strength, while 100 % of patients had improvement to 5/5 intrinsic and FDP strengths. Two minor complications occurred, including one superficial hematoma and one superficial cellulitis.

Conclusions Preliminary data demonstrate that dual endoscopic carpal and cubital tunnel release is a safe and effective treatment option for patients who present with concurrent cubital and carpal tunnel syndromes recalcitrant to non-surgical management. Postoperative results and complications are comparable to endoscopic carpal and cubital tunnel releases performed alone.

Keywords Carpal tunnel syndrome · Cubital tunnel syndrome · Endoscopic carpal tunnel release · Endoscopic cubital tunnel release

Introduction

The incidence of patients who present with concomitant cubital and carpal tunnel syndromes is unknown, and the ideal surgical procedure to address both syndromes concurrently has not been well established. Historically, open surgical release with in situ decompression of the median nerve and open release with transposition of the ulnar nerve have been the standard of treatment for carpal and cubital tunnel syndromes, respectively. However, recent trends have seen an

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increase in a more minimally invasive approach for both carpal and cubital tunnel syndromes. Although the literature has been somewhat controversial, the potential advantages of endoscopic release of the median nerve include a smaller and less tender scar, decreased postoperative pain, earlier return of function and strength, and earlier return to work [1, 2, 10, 11]. Likewise, when considering endoscopic vs. open release of the ulnar nerve at the elbow, potential advantages to the endoscopic approach include decreased scar tenderness, less postoperative pain, higher patient satisfaction, and decreased risk of numbness in the medial antebrachial cutaneous nerve distribution [3, 19, 26, 28].

Despite the amount of literature that exists for individual carpal or cubital tunnel syndrome, there are very little data to describe the incidence, history, and treatment options for patients who present with concomitant carpal and cubital tunnel syndromes. However, the combination can occur simultaneously with 20–25 % of patients with cubital tunnel syndrome having concomitant carpal tunnel syndrome [14, 24]. The purpose of the current study is to describe the safety and efficacy of dual endoscopic cubital and carpal tunnel release.

Methods and Materials

After approval by the local institutional review board (IRB), a retrospective analysis was performed on patients who underwent dual endoscopic cubital and carpal tunnel release by a single surgeon (KM) at a single institution during the period of August 2010 to April 2011. Patients were at least 18 years of age and were excluded if they had evidence of previous surgery to the median or ulnar nerve, injury to the median or ulnar nerve, previous elbow or wrist trauma, brachial plexus injury, cervical radiculopathy, or advanced arthritic changes at the wrist or elbow.

The diagnosis of concomitant cubital and carpal tunnel syndromes was determined by both subjective and objective measurements. Subjective complaints of pain or numbness within the palmar aspect of all five fingers, dorsal numbness of the ring and small fingers, weakness or clumsiness of grasp and pinch, nocturnal symptoms, symptoms worsening with elbow and wrist flexion, and relief with elbow extension and shaking of the hand were obtained. Objectively, Tinel's test at the carpal and cubital tunnels, Phalen's test, Derkin's carpal tunnel compression test, elbow flexion–compression test, scratch collapse test at the cubital and carpal tunnels, and grading of the strength of the abductor pollicis brevis (APB) muscle, dorsal hand intrinsic (DI) muscles, first dorsal interosseous (FDI) muscle, and flexor digitorum profundus (FDP) muscles to the ring and small fingers were performed. All patients obtained electromyographic studies with nerve conduction velocities (EMG/NCV) to evaluate nerve

entrapment at the cubital and carpal tunnels. All patients failed conservative treatment including ergonomic education, activity modification, nocturnal splinting, as well as nerve and tendon gliding exercises.

All patients underwent dual endoscopic carpal and cubital tunnel release by the senior author (KM) in a formal operating room suite. All procedures were done supine under general anesthesia with a pneumatic tourniquet to improve visualization of the structures. The carpal tunnel release was performed with an ECTR set (Smith and Nephew, Memphis, TN, USA) utilizing a modified two-incision technique as described by Chow and Hantes [12]. However, the release of the transverse carpal ligament was completed only with a retrograde cutting knife instead of utilizing all three knives as originally described. Endoscopic release of the cubital tunnel was performed utilizing the EndoRelease (Integra Life Sciences, Plainsboro, NJ, USA) as originally described by Cobb [13]. In this method, the patient is supine and a small 2-cm incision is made just posterior to the medial epicondyle. The skin and subcutaneous tissues are divided until the cubital tunnel ligament is visualized. The ligament is opened longitudinally for approximately 1 cm. A dissector is placed superior to the nerve and inferior to the fascia both proximally and distally. A trochar is then introduced with a protective metal attachment. This metal attachment keeps the subcutaneous tissues away from the fascia during the release. The camera is introduced into the trochar, and the fascia and ulnar nerve are visualized and crossing vessels are noted. Using an antegrade cutting knife, the fascia is released proximally and distally approximately 3 cm in each direction.

Postoperatively, the operative site is placed in a bulky dressing that is removed at postoperative day 5 by the patient. At that time, the patient is allowed to get the incision wet but is told to refrain from lifting objects greater than 10 lbs until the sutures are removed at 10–14 days. Therapy is prescribed only if the patient has not regained full or near-full range of motion at the first postoperative visit.

Patients were seen preoperatively and at 2, 6, and 12 weeks postoperatively. Subjective symptoms of numbness/tingling and pain were recorded preoperatively and graded as “resolved,” “residual symptoms,” or “no improvement” postoperatively. Subjective measurements of APB, intrinsic, and FDP strengths were recorded preoperatively and at all postoperative visits, while Disabilities of the Arm, Shoulder, and Hand (DASH) scores, grip strength measured using the JAMAR dynamometer (Lafayette Instruments, Lafayette, IN, USA), key pinch and chuck pinch strengths (Lafayette Instruments, Lafayette, IN, USA), and static two-point discrimination were obtained preoperatively and at 12 weeks postoperatively by the senior author or a trained office hand therapist.

Results are based on separate Wilcoxon signed rank tests, due to the small sample size and skewed distributions. $p < 0.05$

denotes statistical significance, with no adjustment for the multiple comparisons due to the exploratory nature of this study.

Results

Nineteen total procedures were performed on 17 patients, 13 males and 4 females, with an average age of 50.5 years. Two patients were excluded due to incomplete follow-up of only 2 weeks, leaving 15 patients and 17 total procedures (2 patients had bilateral releases) available for analysis. Intraoperatively, all patients were found to have compression of the median nerve at the carpal tunnel and the ulnar nerve at the cubital tunnel under Osbourne's ligament. There were no patients with ulnar nerve subluxation after release.

All patients had subjective preoperative complaints of pain and numbness/tingling, although these preoperative symptoms were not graded in terms of severity. All patients had improvement in their pain complaints with 82 % (14/17) of patients having complete resolution of pain symptoms, while the remaining 18 % (3/17) having only occasional pain with heavier lifting activity within the ulnar nerve distribution.

Subjective numbness and tingling resolved in the median nerve distribution in all patients (17/17), while 88 % (15/17) had improvement within the ulnar nerve distribution with 59 % (10/17) having complete resolution while 29 % (5/17) experienced occasional residual symptoms. APB strength was available for 12 patients and demonstrated that 92 % of patients had improvement to 5/5 strength postoperatively. Likewise, intrinsic strength was available for 11 patients, and 100 % had improvement from 4/5 to 5/5 strength. Ring and small finger FDP strength was available for 12 patients, and all had subjective improvement from 4/5 to 5/5 strength. All patients were McGowan stage 2 with regard to their cubital tunnel syndrome. Table 1 summarizes the results of the subjective data.

Average pre- and postoperative DASH scores improved from 67.5 to 16 ($p=0.001$). Grip strength improved from a

preoperative value of 42 to 55 lbs ($p=0.30$). Key pinch strength improved from 13 to 18 lbs ($p=0.003$), while chuck pinch strength improved from 11 to 15.5 lbs ($p=0.02$). Table 2 summarizes the results of the objective data.

Discussion

Surgical treatment options to address concomitant cubital and carpal tunnel syndromes have not been well defined as there is limited literature to describe the incidence, history, and treatment of concurrent disease. Traditionally, surgical treatment options for ulnar nerve entrapment include in situ decompression, subcutaneous anterior transposition, intramuscular transposition, submuscular transposition, and medial epicondylectomy [13, 15, 22, 23, 28]. Current studies suggest that in situ decompression demonstrates similar results when compared to nerve transposition and carries a lower risk of complications [20, 29]. The endoscopic technique for ulnar nerve decompression was first described by Tsai et al. [26] and has become more popular as a surgical treatment option as it offers a smaller skin incision, minimal soft tissue dissection, and potentially a lower risk to nearby neurovascular structures. Watts and Bain compared endoscopic vs. in situ decompression and were able to demonstrate similar functional and subjective outcomes, but higher patient satisfaction scores and fewer complications in the endoscopic group compared with the open release group [28]. Good to excellent results are generally achieved in roughly 92 % of patients, with residual symptoms in the remainder of patients [3]. Common complications include hematoma formation, wound dehiscence, superficial infection, and decreased sensation in the medial antebrachial cutaneous nerve distribution, which occur with 2–5 % frequency [26].

When discussing carpal tunnel syndrome, surgical treatment options include both open and endoscopic release of the median nerve at the carpal tunnel. Results of endoscopic vs. open carpal tunnel release are similar with regard to pain, function, grip strength, and pinch strength [6, 7, 16, 21, 27].

Table 1 Subjective data results

Variable	Preoperative	Postoperative
Numbness/tingling	100 % had both ulnar and median nerve symptoms	100 % had resolution of median nerve symptoms 88 % had substantial improvement overall in median and ulnar symptoms 12 % had residual ulnar-sided numbness
Pain	100 % had pain in both ulnar and median nerve distributions	82 % had complete resolution of pain 18 % had residual pain with activity
Two-point discrimination	5.9 mm	4.8 mm
APB, FDP, and intrinsic strengths	Average 4/5 strength throughout	92 % had improvement to 5/5 APB strength 100 % had improvement to 5/5 FDP/intrinsic strength

Table 2 Objective data results

Variable	Preoperative Median (IQR) [raw range]	Postoperative Median (IQR) [raw range]	<i>p</i> value
DASH	67 (57–79.50) [29–93]	16 (7–27) [0–77]	0.002
Grip	43 (22–77.50) [4–113]	52.50 (35.50–91.75) [3–115]	0.50 (ns)
Key pinch	12.50 (7–17.75) [2–23]	18 (13–23) [0–24]	0.03
Chuck pinch	11 (5.25–13.75) [1–20]	15 (10–17) [0–20]	0.004

IQR interquartile range, *ns* not significant

The risk of major complications (nerve, artery, and/or tendon lacerations) is generally <1 %, while the risk of minor complications (hematoma, local infection, and/or wound dehiscence) ranges between 0 and 5 % [1, 5, 8–10, 17, 18, 21, 25].

However, for patients who demonstrate clinical and nerve conduction evidence of both median and ulnar nerve entrapment and who fail non-surgical management, there are limited data to suggest an ideal surgical option. In the current study, we describe a single surgical procedure that combines endoscopic release of both the cubital and carpal tunnels to address both syndromes simultaneously. This is the first study, to our knowledge, that describes the combination of these two previously well-described and efficacious procedures.

Preliminary results demonstrate successful outcomes. At 3 months postoperatively, 100 % of patients had complete resolution of numbness/tingling in the median nerve distribution, while 88 % had resolution or symptom improvement in the ulnar nerve distribution. In terms of pain, 100 % of patients had at least some improvement in symptoms: 82 % of patients had complete resolution of pain, while 18 % had marked improvement and pain only with strenuous activity.

A significant difference was found between pre- and postoperative measurements with DASH scores, indicating improvement in daily function of these patients. Furthermore, this finding suggests that despite some residual pain and numbness, patients experienced significant improvement with regard to their disability. Additionally, significant differences were found between pre- and postoperative key pinch and chuck pinch strengths, and while a not significant trend towards improvement was found for grip strength. These results demonstrate improvement in muscle function after decompression of both median and ulnar nerve entrapment. Thus, the current study is consistent with patient satisfaction scores and outcomes when compared to studies looking at individual endoscopic cubital or carpal tunnel release [1–3, 10, 11, 19, 26]. Two minor complications were encountered at the elbow incision: one patient experienced a superficial hematoma treated conservatively, and one patient developed a superficial

cellulitis, which was treated successfully with a course of oral antibiotics. There were no major complications (nerve, tendon, or vascular injury) and no reoperations. The complication rate of a dual endoscopic carpal and cubital tunnel release is similar to those described by either method alone [1, 4, 5, 8–10, 17, 18, 21, 25, 26, 28].

This study is not without limitations. The retrospective nature of the study leads to incomplete data collection and recall bias. The sample size was small and is likely a result of the short collection time frame and perhaps is a reflection of the minimal incidence of concomitant symptomatic cubital and carpal tunnel syndromes requiring operative intervention. Additionally, outcomes were not followed past a 3-month period, possibly limiting significance or conversely not allowing for possible reversal of subjective improvements. Outcome measures were not blinded and some were subjective, although only measured by the senior investigator (KM). Future studies will be needed to compare the dual technique in a prospective manner. Nonetheless, even with the limitations above, the current study demonstrates that dual endoscopic cubital and carpal tunnel release is a safe and effective procedure for addressing concomitant cubital and carpal tunnel syndromes.

Animal Rights Statement This article does not contain any studies with animal subjects.

Conflict of interest Both authors declare that they have no conflicts of interest. The coauthor is a consultant for Synthes Inc.

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