

# Endoscopic Cubital Tunnel Recurrence Rates

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**Abstract** Cubital tunnel syndrome is the second most common nerve entrapment in the upper extremity. There are no current publications concerning the recurrence rates after endoscopic cubital tunnel release. The purpose of this study is to evaluate the recurrence rate of endoscopic cubital tunnel release compared to published reports of recurrence following open cubital tunnel procedures. We reviewed 134 consecutive cases of endoscopic cubital tunnel release in 117 patients. There were 104 cases in 94 patients with greater than 3 months follow-up. The mean follow-up time was 736 days. They were grouped using Dellon's classification. Two literature control groups were used from published reports of recurrence rate following open cubital tunnel release. A recurrence was identified if the patient was symptom-free following surgery but had symptoms reappear 3 months or more after surgery as defined in the literature. Of the 104 cases, 92.31% had more than a 4-month follow-up. One case (0.96%) met the criteria for recurrence at 4 months postprocedure. Data were then compared to the literature control groups used from published reports of recurrence rates following open cubital tunnel release. Pooled, the combined controls had 22 of 180 cases (12.22%) with recurrences. The percentage of

procedure recurrence varied significantly with  $p$  value equal to 0.0004. It is recognized that there is a lack of common classification and comparative analysis of these studies, but they do classify preoperative grading and recurrence similarly. We are 95% confident that our true recurrence rate is between 0.02% and 5.24% and that endoscopic cubital tunnel release has a recurrence rate, which is not higher than open cubital tunnel release literature controls.

**Keywords** Endoscopic cubital tunnel recurrence rates · Open revision surgery · Recurrent cubital tunnel syndrome

## Introduction

Cubital tunnel syndrome is the second most common nerve entrapment in the upper extremity [7]. Patients complain of numbness or tingling in the little and ring finger. It may be accompanied by medial elbow pain, weakness of grip, and when severe, intrinsic muscle wasting and static numbness. There is no standard for surgical treatment [2, 16]. However, minimally invasive procedures are becoming increasingly popular. Endoscopic release is the newest of the surgical options for cubital tunnel syndrome. It is an emerging technology that is patient-driven. It can be performed through a smaller incision and is less invasive than anterior transposition resulting in less recuperation time [4]. It can be performed quicker and has reported results as effective as more invasive procedures [4–6]. It provides for a limited soft tissue dissection, thereby, allowing a more rapid recovery with minimal scarring. Endoscopic management of cubital tunnel syndrome has been described by several authors using a variety of techniques [1, 11, 17, 20, 21]. The safety and efficacy of endoscopic cubital tunnel release has been shown by multiple studies [1, 4–6, 11, 17, 20, 21]. There

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are no current publications concerning the recurrence rates after endoscopic cubital tunnel release. The purpose of this study is to evaluate the recurrence rate of endoscopic cubital tunnel release compared to published reports of recurrence following open cubital tunnel procedures [14, 18].

## Materials and Methods

After approval of our institutional review board, we reviewed 134 consecutive cases of endoscopic cubital tunnel release in 117 patients. Preoperative variables recorded include five stage grip, chuck and key pinch, 2-point discrimination, range of elbow motion, subluxation of ulnar nerve, presence of Tinel's sign, elbow flexion test, Warternburg sign, atrophy, clawing, static numbness, subjective complaints of numbness or tingling, weakness, pain location, length of symptoms, preoperative treatment, comorbid conditions, type of work, presence of Workman's compensation claim, and results of EMG studies. They were then grouped by Dellon's [8] classification. Postoperative outcome was measured by the modified Bishop [13] classification. Data was recorded at each postoperative visit, including length of time to return to light and usual activities.

A recurrence was defined as a patient who was symptom-free following surgery but who had symptoms reappear 3 months or more after surgery, as described by Seradge [18] et al. in 1998. Two literature control groups were used from published reports of recurrence rate following open cubital tunnel release. Seradge [18] and Owens reported recurrence in 21 of 160 patients undergoing cubital tunnel release with medial epicondylectomy at three or more months with a 3-year follow-up. Lankester and Giddins [14] reported one of 20 patients with recurrence after 10 months with simple decompression with an average follow time of 16 months.

Recurrence rates were compared using the Fisher's exact test with the STATXACT software package. Confidence intervals were calculated with STATXACT for estimate of a binomial probability.

## Surgical Technique for Endoscopic Cubital Tunnel Release

The patient is placed supine on the operating table with the extremity placed on a hand table. A nonsterile tourniquet is placed high on the brachium. A bath blanket is placed under the elbow so as to elevate the elbow sufficiently to allow instrumentation and scope to be placed into the cubital tunnel without difficulty. The medial epicondyle is

marked, and a 2-cm incision is marked over the cubital tunnel, posterior to the medial epicondyle.

An incision is made through the skin with a scalpel. Scissors are utilized to directly dissect down to the medial epicondyle, carefully doing so to protect superficial nerves. Blunt-tipped scissors are then utilized to elevate the subcutaneous tissue and subcutaneous nerves off of the deep fascia proximally and distally over the course of the ulnar nerve. The course of the ulnar nerve proximally can be estimated by palpating the intermuscular septum.

The ulnar nerve is then palpated in the cubital tunnel just posterior to the medial epicondyle. The roof is placed under tension with forceps and opened with a number 15-blade. The ulnar nerve is identified, and scissors are utilized to open the cubital tunnel for several centimeters.

The opening in the cubital tunnel should be sufficient to allow the trocar to be placed within the cubital tunnel without binding. A spatula is placed between the ulnar nerve and the roof of the cubital tunnel proximally and distally. This develops the space between the nerve and the roof. The spatula gives the surgeon orientation relative to the course of the ulnar nerve prior to placing the trocar. The cannula is then placed between the ulnar nerve and the roof. The retractor, which is attached to the cannula, is placed superficial to the deep fascia and deep to the superficial nerves and superficial adipose tissue.

The 4-mm endoscope is then placed between the cannula and the retractor to ensure that there are no intervening superficial nerves in harm's way. The endoscope is then placed within the cannula, and the ulnar nerve is identified through the inferior slots of the cannula. After the ulnar nerve is confirmed to be under the cannula throughout the entire course, a push knife is then utilized to divide the fascia at the superior slot of the cannula. Under no circumstances should the fascia be divided unless the ulnar nerve is clearly visualized through the slotted cannula below. The scope and the cannula are withdrawn. The scope is placed back in to confirm that complete releases have been performed. This release is performed both proximally and distally. The tourniquet is then dropped, and hemostasis is obtained under direct visualization with the use of the endoscope. Hemostasis can normally be obtained within a short period of pressure. However, bipolar cautery under direct vision of the endoscope can be utilized if necessary. An angiocath is placed through the skin and into the surgery site prior to closure. This is utilized for infiltration of marcaine with epinephrine postoperatively to aid in postoperative pain relief and also in hemostasis.

The skin is closed tightly with absorbable subcuticular sutures followed by Steri-Strips. Considerable stress is placed on the incision during the range of motion exercises postoperatively, therefore, tight closure is mandatory.

Soft compressive dressing is applied, and the patient is instructed to begin gentle range of motion and stretching exercises the first day after surgery. They are allowed to work, as tolerated, on the first postoperative day in a clean and dry environment.

The patient is instructed to debulk the dressing as necessary to allow for full range of motion. They are instructed that the expectation is to have full range of motion by the first postoperative visit.

## Results

Of the 134 cases of endoscopic cubital tunnel releases, there were 104 cases in 94 patients with greater than a 3-month postoperative follow-up. The mean follow-up time for the 104 cases was 736 days ranging from 92 to 1,766 days. The 94 patients consisted of 58 males (61.70%) and 36 females (38.3%). Ages ranged from 21 to 89 with a mean of 49 for males and 47 for females.

Seventy-three (70%) had a positive EMG. Of the 73 patients with a positive EMG for cubital tunnel, 18 also had a positive EMG for carpal tunnel, four were positive for Guyon's canal, one was positive for cervical radiculopathy, and seven were positive for peripheral neuropathy.

The average length of preoperative symptoms was 23 months. The average length of preoperative treatment at our site was 4 months. Many of these had conservative treatment prior to referral. Treatment included pillow splinting, steroidal and non steroidal anti-inflammatory medication, and modification of activities [19]. Ninety-nine cases had a positive Tinel and 92 had a positive elbow flexion test. Static numbness was present in 40 cases.

All surgeries were performed by a single surgeon (TKC) using standard endoscopic cubital tunnel release. Elbow range of motion was begun at postoperative day 1. Postoperative regime was the same in all cases.

Comorbidities included 64 carpal tunnel syndrome, 11 diabetes, six cervical radiculopathy, five thoracic outlet syndrome, four hypothyroid and two, each of Lupus and Raynaud's, and one chronic regional pain syndrome (CRPS). Concomitant surgery included 51 endoscopic carpal tunnel releases, two trigger finger releases, and two arthroscopic elbow impingement decompression.

Work type was divided into manual such as carpenters, assemblers, meat cutter, electrician, press operator, painter, welder, or sedentary such as secretary, homemaker, data entry, clerk, or retired.

The 104 cases had preoperative Dellon's classification of seven (7%) mild, 43 (41%) moderate, and 54 (52%) severe. Postoperative modified Bishop's score was 78 (75%) excellent, 20 (19%) good, and six (6%) fair or poor.

There were 52 surgeries involving patients receiving Workman's compensation. Thirty-five males and 17 females fell into this group. The average male age was 44, range 21–65. Dellon's scores were four (11%) mild, 15 (43%) moderate, and 16 (46%) severe. Ninety-four percent (33) of the males were classified as performing manual labor. Postoperative results based on modified Bishop's rating was 27 (77%) excellent, six (17%) good, two (6%) fair and zero (0%) poor. Average follow-up time was 564 days. One recurrence fell into this group.

The female Workman's compensation group's average age was 44, range 31–54. Manual work was performed by nine (53%) and eight (47%) were classified as sedentary work.

Dellon's scores were one (6%) mild, ten (58%) moderate, and six (35%) severe. Modified Bishop's scores were 13 (76%) excellent, three (18%) good, one (6%) fair and zero (0%) poor. Average follow-up was 530 days.

The fifty-two patients in the non-Workman's compensation group consisted of 28 males, average age 55 with a range of 29 to 89 years. Dellon's scores were two (7%) mild, six (21%) moderate, and 20 (72%) severe. Nine (32%) performed manual labor while 19 were retired or were considered to perform sedentary work. Modified Bishop's score was 18 (64%) excellent, nine (32%) good, one (4%) fair, and zero (0%) poor. The average follow-up time for this group was 648 days.

The non-Workman's compensation group of 24 females had an average age of 49, range 34–81. Dellon's scores were zero (0%) mild, 12 (50%) moderate, and 12 (50%) severe. Four (17%) performed manual labor and 20 (83%) sedentary. Postoperative modified Bishop's score was 20 (83%) excellent, two (8.5%) good, two (8.5%) fair, and zero (0%) poor. The average follow-up time was 962 days.

One (0.96%) of the 134 cases met the criteria for recurrence at 4 months postprocedure. His improvement was significant enough to be "Fair" according to the modified Bishop's rating and was, preoperatively, Dellon's class three (severe). He performed manual labor. He had no concomitant surgeries. He had developed CRPS, preoperatively, that required multiple nerve blocks. His CRPS was quiescent prior to endoscopic cubital tunnel release. He returned to modified light duty at 1 week following surgery but never returned to his usual occupation. Subsequent open submuscular transposition of the ulnar nerve also failed to relieve his symptoms. He had recurrence of CRPS once again requiring nerve blocks. He was last seen at 1 year postoperation.

There were two failures requiring open release. Neither of those two had resolution of their symptoms after open release.

Data was compared to the literature control groups used from published reports of recurrence rates [14, 18]

following open cubital tunnel release. We pooled the combined controls resulting in 22 recurrences in 180 cases (12.22%). The recurrence percentage varied significantly with a  $p$  value equal to 0.0004. The 95% confidence interval for our true recurrence rate was between 0.02% and 5.24%.

## Discussion

Jackson and Hotchkiss [12] stated that surgery was a failure if patients had no relief of symptoms or if their symptoms recur shortly after the surgery. We consider failures as a patient who had no improvement or worsening of symptoms immediately after surgery. Like Seradge [18], we consider recurrence as return of symptoms after a 3-month period in a patient that had resolution of their symptoms following surgery. There were two failures in this series that underwent open revision surgery. One was male from the Workman's compensation group who had concomitant carpal tunnel surgery. He previously had the same surgery on the contralateral extremity without recurrence or failure. The other one was a female, nonwork-related, sedentary worker who only had endoscopic cubital tunnel release. Both were in their fifth decade and performed sedentary work. Neither had resolution of symptoms after open revision surgery.

Seradge [18] reported a 13% recurrence rate at 3 months or more, and Lankester and Giddins [14] reported 10% recurrence at 10 months. Caputo and Watson [3] reported recurrence in patients following submuscular transposition as much as 6 years after their procedure. Therefore, it is possible that our recurrence rate could be higher with additional follow-up. With a mean follow-up time of 2 years, endoscopic cubital tunnel release has a low rate of recurrence. Outcome based on the modified Bishop's rating was 75% (78) excellent, 19% (20) good, and 6% (6) fair or poor results.

The average age of fourth decade compared with Seradge's patients but was less than the average age from Lankester's group at 59 years, except for the non-Workman's compensation group which averaged 55 years.

Lankester and Giddins [14] stated that recurrence was felt to be the result of subluxation of the nerve over the epicondyle. In our experience, subluxation of the nerve did occur in eight patients but did not affect recurrence or outcome. Seradge [18] noted a higher recurrence rate in patients that did not return to work within 3 months, which was similar to our finding. The patient in our series who had the recurrence did not have resolution of symptoms after open revision surgery. Surgical findings at reoperation did not reveal any new sites of compression, scarring of the nerve, or injury to the medial antebrachial cutaneous nerve [15].

It is recognized that there is a lack of common classification and comparative analysis of these studies, but they do classify preoperative grading and recurrence, similarly. We define recurrence as patients having a symptom-free period following surgery with recurrence of symptoms 3 months or more after surgery. To the extent that comorbidities influenced recurrence rate, the conclusion remains valid. This is true because comorbidities are not going to lessen the recurrence rate but rather increase in the perceived recurrence rate if there was any affect at all. The two studies we used for the literature controls are the only two studies with sufficient data to allow data analysis. Direct comparison with our data with recurrence defined as recurrence of symptom after 3 months is lacking in other reports.

Furthermore, strict definitions relative to recurrence versus failure is lacking in the majority of the reports. Filippi [9] outlined the results of treatment of recurrent cubital tunnel syndrome. However, these cases were referred in from outside sources, and the denominator is not known. Therefore, the rate is not available from this study, which is true of many other studies concerning recurrent cubital tunnel. Gabel and Amadio [10] reported on 32 patients who had revision of a failed decompression of the ulnar nerve. Ten of their patients had some initial relief with symptoms recurring at an average of 5 months.

Without the denominator, statistical analysis of the data and true rate cannot be obtained. There are no reports in the literature evaluating recurrence following endoscopic cubital tunnel release. The authors chose to focus on this variable, which provides for a clean hypothesis, statistical analysis and conclusion. We are 95% confident that our true recurrence rate is between 0.02% and 5.24%. We conclude that endoscopic cubital tunnel release has a recurrence rate, which is not higher than open cubital tunnel release based on literature controls.

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