Endoscopic vs Open Decompression of the Ulnar Nerve in Cubital Tunnel Syndrome: A Prospective Randomized Double-Blind Study

**BACKGROUND:** Prospective randomized data for comparison of endoscopic and open decompression methods are lacking.

**OBJECTIVE:** To compare the long- and short-term results of endoscopic and open decompression in cubital tunnel syndrome.

**METHODS:** In a prospective randomized double-blind study, 54 patients underwent ulnar nerve decompression for 56 cubital tunnel syndromes from October 2008 to April 2011. All patients presented with typical clinical and neurophysiological findings and underwent preoperative nerve ultrasonography. They were randomized for either endoscopic (n = 29) or open (n = 27) surgery. Both patients and the physician performing the follow-up examinations were blinded. The follow-up took place 3, 6, 12, and 24 months postoperatively. The severity of symptoms was measured by McGowan and Dellon Score, and the clinical outcome by modified Bishop Score. Additionally, the neurophysiological data were evaluated.

**RESULTS:** No differences were found regarding clinical or neurophysiological outcome in both early and late follow-up between both groups. Hematomas were more frequent after endoscopic decompression ($P = .05$). The most frequent constrictions were found at the flexor carpi ulnaris (FCU) arch and the retrocondylar retinaculum. We found no compressing structures more than 4 cm distal from the sulcus in the endoscopic group. The outcome was classified as “good” or “excellent” in 46 out of 56 patients (82.1%). Eight patients did not improve sufficiently or had a relapse and underwent a second surgery.

**CONCLUSION:** The endoscopic technique showed no additional benefits to open surgery. We could not detect relevant compressions distal to the FCU arch. Therefore, an extensive far distal endoscopic decompression is not routinely required. The open decompression remains the procedure of choice at our institution.

**KEY WORDS:** Cubital tunnel, Endoscopic ulnar nerve decompression, Ulnar nerve neuropathy

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Cubital tunnel syndrome is the second most frequent peripheral nerve entrapment syndrome after carpal tunnel syndrome. In an Italian study, the incidence was detected to be 24.7 for every 100 000 patient years in the province of Sienna.1 In a UK database, the ulnar neuropathy was reported with 240 for men and 187 for women (age standardized rate per 100 000 European standard population) in the year 2000.2

If conservative therapy with rest, physical therapy, and splinting in patients with mild symptoms fails, or in patients with more severe symptoms, operative nerve decompression is indicated.3 Throughout the past, many authors have favored the subcutaneous, intra- or submuscular anterior transposition technique or medial epicondylar resection, especially in cases of severe nerve compression or subluxation.4–7

If no ulnar luxation exists, the simple open decompression has been accepted as a standard treatment by many peripheral nerve surgeons.8,9 Comparable results in open decompression and anterior transposition have been analyzed in multiple former studies.10,11

Currently, the endoscopic nerve decompression is considered to be less invasive; thus, it has
been recently investigated and discussed. Some surgeons see no outcome differences between open and endoscopic decompression,\textsuperscript{12,13} while other authors strongly recommend the endoscopic technique as the new standard treatment procedure for cubital tunnel syndrome.\textsuperscript{14-19} Relying on anatomic cadaveric studies,\textsuperscript{18,20} these authors have stressed the existence of significant compressions far distal to the cubital tunnel.\textsuperscript{21} These might be missed with the open decompression technique,\textsuperscript{22} which could be one explanation for the results that are sometimes unsatisfactory and often not as satisfactory as in carpal tunnel release.\textsuperscript{23}

Although some studies report excellent results with the endoscopic decompression technique, it is still unclear whether this technique is really superior to the standard open decompression. To our knowledge, this study is considered to be the first prospective randomized evaluation comparing the open and endoscopic technique.

The objective was to examine both study groups regarding the clinical and neurophysiological outcome. Furthermore, we documented how often distal nerve compressions by fascial bands were found in our study population.

METHODS

Study Population and Randomization

The study was approved by the local ethics committee (Registration-Nr. BB 57/08), and all patients gave their written informed consent. From October 2008 to April 2011, 54 patients with 56 cubital tunnel syndromes, mostly referred to our neurosurgical outpatient clinic by their general practitioners or neurologists, were included in our study. The sample size was determined conservatively, as there were no randomized data available regarding the outcome for calculation of power and sample size. The primary endpoint of our study was the clinical outcome in the early and late follow-up. The secondary endpoint was the percentage of patients with nerve constrictions distal to the proximal flexor carpi ulnaris (FCU) in the endoscopic group.

Eligibility criteria were a cubital tunnel syndrome with symptoms lasting for more than 4 weeks and age older than 18 years. Exclusion criteria were contraindications for general anesthesia, posttraumatic cubital tunnel syndrome with bony deformity of the elbow, previous surgery of the affected ulnar nerve, and severe nerve luxation.

The enrollment was performed by the operating neurosurgeons. The patients were randomized into 2 groups: 1 for the endoscopic procedure...
and 1 for the simple open decompression for a parallel, randomized prospective trial design. The allocation ratio was n = 29 for the endoscopic group and n = 27 for the open procedure (Figure 1). The randomization process was performed as a simple randomization without restrictions by drawing a trial envelope by the surgeon directly before each surgery started.

**Study Parameters**

A cubital tunnel syndrome was defined according to clinical criteria and confirmed by electrodiagnostic tests. We took a systematic medical history including questions regarding presence and duration of symptoms related to cubital tunnel syndrome, handedness, diabetes mellitus, polyneuropathies, radiculopathies from cervical spine, and chronic pain of various causes. Subjective pain perception was documented by numeric analog scale. We also documented profession and work status. The clinical examination tested for elbow deformity, claw hand deformity, palpable nerve luxation, weakness or wasting of abductor minimi and first dorsal interosseous muscle, numbness or paraesthesia in elbow distribution, and presence of Tinel’s sign. Epicondylar sensibility was tested by 2-point-discrimination and vibration sense. Motor function was defined by Janda classification for the ulnar nerve innervated muscles, Froment’s sign, and by use of a hydraulic dynamometer. Severity of the ulnar nerve neuropathy was graded using a modified McGowan Score (Table 1).

The diagnosis of cubital tunnel syndrome was confirmed by electrodiagnostic studies according to current guidelines (ie, the joint guidelines of the German Societies of Hand Surgery, Neurosurgery, Neurology and Orthopedic Surgery23,24 and guidelines of the American Association of Electrodiagnostic Medicine). Patients had to fulfill at least 1 of the following electrodiagnostic criteria for cubital tunnel syndrome: (1) a reduced motor nerve conduction velocity of >16 m/s across the compared to the more distal forearm segment, (2) an absolute motor nerve conduction velocity of less than 50 m/s in the elbow segment, (3) a decrease in compound muscle action potential negative peak amplitude from below elbow to above elbow stimulation greater than 20%, and (4) a significant change in compound muscle action potential configuration at the above elbow site compared to the elbow site. Needle electromyography was performed only if nerve conduction studies were inconclusive to rule out C8 radiculopathy or brachial plexopathy. Electrodiagnostic studies were performed before and 3, 6, 12, and 24 months after surgery. Furthermore, all patients underwent a preoperative ultrasonography examination of the ulnar nerve, in which the full course of the nerve was evaluated in transverse views from the wrist to the axilla in order to localize the most likely site of compression. Criteria for nerve compression were a focal increase of the nerve’s cross sectional area of more than 10 mm² and a normally appearing nerve in more proximally or distally located nerve segments. Seven days postoperatively a neurological examination and control of wound healing was performed. An independent investigator performed the follow-up neurological examinations 3, 6, 12, and 24 months after surgery. The outcome was measured by a modified Bishop Scale (Table 2). We asked for hypoesthesia or paraesthesia around the elbow and palpated for painful neuroma in all of the postoperative examinations in order to detect signs of damage to the medial antebrachial cutaneous nerve. We also recorded the duration of postoperative wound pain and postoperative complications such as visible hematomas and wound complications. The examiner was blinded by using identical incision length and position in both surgical techniques.

### TABLE 1. McGowan Score for the Preoperative Rating of the Severity of Neurological Complaints (Preoperative Pain is Not Represented by This Scoring System)

<table>
<thead>
<tr>
<th>McGowan Score</th>
<th>Sensory Deficit</th>
<th>Motor Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>II</td>
<td>Hypoesthesia</td>
<td>Mild to severe paraesthesia; mild to moderate atrophy</td>
</tr>
<tr>
<td>III</td>
<td>Anesthesia</td>
<td>Complete paralytic; severe muscle atrophy</td>
</tr>
</tbody>
</table>


### Surgical Techniques

Three experienced surgeons performed the surgeries. Intraoperatively, the location of compression was determined by visualization by the surgeon. A pseudoaneuroma formation in front of the constriction was interpreted as an indirect sign. We also gently passed a small Penfield in between the nerve and overlying ligament to get a subjective sense of possible distal constrictions. The length of decompression, the incision to suture time, intraoperative nerve luxation, an epitrochleoanconeus muscle, and any complications were documented.

### TABLE 2. Bishop Classification for the Evaluation of Postoperative Outcome

<table>
<thead>
<tr>
<th>Items</th>
<th>Score</th>
</tr>
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<tbody>
<tr>
<td>Residual symptoms</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Little/Intermitted</td>
<td>2</td>
</tr>
<tr>
<td>Moderate</td>
<td>1</td>
</tr>
<tr>
<td>Severe</td>
<td>0</td>
</tr>
<tr>
<td>Subjective improvement</td>
<td></td>
</tr>
<tr>
<td>Better</td>
<td>2</td>
</tr>
<tr>
<td>Unchanged</td>
<td>1</td>
</tr>
<tr>
<td>Worse</td>
<td>0</td>
</tr>
<tr>
<td>Ability to work</td>
<td></td>
</tr>
<tr>
<td>Working in old job</td>
<td>2</td>
</tr>
<tr>
<td>Changed job due to complaints</td>
<td>1</td>
</tr>
<tr>
<td>Incapable of working</td>
<td>0</td>
</tr>
<tr>
<td>Muscle strength</td>
<td></td>
</tr>
<tr>
<td>Better</td>
<td>1</td>
</tr>
<tr>
<td>Unchanged</td>
<td>0</td>
</tr>
<tr>
<td>Sensory disturbance</td>
<td></td>
</tr>
<tr>
<td>Better</td>
<td>1</td>
</tr>
<tr>
<td>Unchanged</td>
<td>0</td>
</tr>
<tr>
<td>Evaluation</td>
<td></td>
</tr>
<tr>
<td>Excellent</td>
<td>8-9</td>
</tr>
<tr>
<td>Good</td>
<td>6-7</td>
</tr>
<tr>
<td>Fair</td>
<td>4-5</td>
</tr>
<tr>
<td>Poor</td>
<td>≤3</td>
</tr>
</tbody>
</table>

Modified from Kleinman WB, Bishop AT. Anterior intramuscular transposition of the ulnar nerve. J Hand Surg Am. 1989;14(6):972-979.27
To ensure comparable study groups, all surgeries were blinded of patients’ data and performed under general anesthesia and with placement of a pneumatic tourniquet. After sterile scrubbing, the arm was draped in a way that allowed full passive mobility of the arm. The arm was placed on a hand table in shoulder abduction of 90 degrees, slight elbow flexion, and full supination of the hand.

Open Decompression

After an approximately 3 cm longitudinal skin incision had been placed over and distally to the bony sulcus, the ulnar nerve was identified within or proximal to the sulcus. Osborne’s ligament (defined as the distal thickened roof of the bony sulcus) and the proximal fascia of the flexor carpi ulnaris muscle were incised and the nerve was dissected distally in between the 2 heads of the ulnar carpal flexor muscle. In the proximal direction, the nerve was dissected posteriorly to the intermuscular septum. Implementing this technique enabled entire cubital tunnel decompression. When an epitrochleoanconeus muscle was present, it was divided additionally (Figure 2). The nerve was just decompressed without circular 360 degree dissection or mobilization. In order to get a better overview along the course of the ulnar nerve, a Langenbeck’s hook was used to elevate the skin and muscle, so as to follow the nerve approximately 5 to 6 cm distally to the bony sulcus and about 4 cm proximally. After a sufficient decompression had been achieved, the arm was moved in flexion and extension under observation of the nerve to detect possible nerve luxation. After release of the tourniquet and hemostasis, the wound was closed with subcutaneous and intracutaneous sutures (Figure 3).

Endoscopic Decompression

To maintain the double-blinded study design, a skin incision of comparable length and position as in the open decompression study group was performed. The nerve was identified proximal to the bony sulcus and then followed about 2 cm distally and proximally while cutting the fascial structures between olecranon and medial epicondyle as well as the Osborne ligament macroscopically in the visible part and under endoscopic view in the distal part. With blunt scissors, a subcutaneous tunnel was dissected above the antebrachial and brachial fascia distally and proximally to the skin incision, respectively. Then the retractor-integrated endoscope (Karl Storz GmbH & Co. KG, Tuttingen, Germany) was inserted (Figure 4). All fascial and fibrous bands covering the ulnar nerve were cut, exposing approximately 8 to 10 cm of the nerve distal to the bony sulcus. No circumferential dissection was performed. The course of the nerve deep in between the 2 heads of the ulnar carpal flexor muscle was followed and all fascial bands overlying the nerve were divided. After release of the tourniquet and hemostasis, the wound was closed with subcutaneous and intracutaneous sutures.

Postoperative Procedure

Postoperatively, we applied a dressing with a thick layer of cotton wool for slight compression to prevent hematoma formation. A normal bandage replaced this compression dressing on the next day. The patients were instructed to loosen the dressing if any complaints or swelling in the hand occurred.

We asked the patients to immediately move the fingers and the hand. Extensive bending and stretching of the elbow as well as heavy carrying was avoided for 3 weeks. One week later a control of wound healing took place in our outpatient clinic.

Statistical Analysis

The statistical analysis was performed by an independent and blinded investigator and by an independent statistician. For the statistical
comparison (with a confidence interval of 95% and significance defined as \( P < .05 \)) of treatment groups, we used Fisher’s exact test for categorical variables and Mann-Whitney \( U \)-test as well as Spearman correlation coefficient for continuous variables. The Shapiro-Wilk test was used to test for normality. We conducted all analyses using SAS 4.1 (SAS Institute, Cary, North Carolina).

RESULTS

There were 32 men and 22 women with a mean age of 49.2 years (range, 20-74 years) included in the study. The cubital tunnel syndrome was located on the right arm in 21 patients (38.9%), left in 31 patients (57.4%), and on both sides in 2 patients (3.7%).

Preoperatively, there were no statistically significant differences between the groups in terms of age, severity of pain, symptoms, electrophysiological findings, or duration of complaints (Table 3).

The early follow-up took place after a mean of 16 weeks, and the long-term follow-up after a mean of 16.8 months.

Clinical Outcome

Only 1 patient was preoperatively graded as McGowan I, whereas 36 patients (64.3%) were graded as grade II and 19 patients (33.9) as grade III. In both groups, we found a significant improvement in the early as well as in the long-term follow-up. There were no significant differences between both of the methods concerning numeric analog scale (\( P = .84 \)) and Bishop-Score (early follow-up \( P = 1.00 \), long-term follow-up \( P = .47 \)) (Table 4 and Figure 5). Additionally, there was no difference between the methods concerning wound pain (\( P = .56 \)) and the postoperative electrophysiological findings (\( P = .62 \)). A significantly higher rate of postoperative hematomas occurred in the endoscopic group (\( P = .05 \)). Also, we found more patients with disturbance of wound healing in the endoscopic group, although without significance (Table 5).

However, we could not find statistically significant correlations between the occurrence of postoperative hematomas and disturbance of wound healing (\( P = .09 \), Fisher’s exact test) or clinical outcome regarding Bishop Score (\( P = .38 \), Mann-Whitney \( U \)-test).

We did not see signs for damage of the medial cutaneous nerve of the forearm in any of the cases.

Patients with a short history of complaints (less than 6 months before surgery) had a significantly better outcome in the early follow-up (\( P = .03 \)). In the long-term follow-up, this difference was no longer detectable (\( P = .12 \)) (Table 6). Additionally, in patients with a history of complaints longer than 12 months there was no statistically significant difference regarding the clinical outcome neither in early (\( P = .15 \)) nor in long-term follow-up.
However, a further separate analysis of both groups was not possible because of the relative small number of patients. We also investigated the change of 2-point-discrimination in the fourth and fifth finger on the affected arm at the different examination time points (Figure 6). Interestingly the 2-point discrimination, which was defined as “normal” with a range from 3 to 5 mm, “moderately disturbed” with a range from 6 to 10 mm, and “severely disturbed” with values of more than 10 mm, was on average better in the fourth finger and showed constant values here in the course of the follow-up. In contrast to this, the 2-point discrimination in the fifth finger generally showed an immediate and clear improvement in the first postoperative week. We assume that this difference between the fingers is caused by the overlapping innervation of the fourth finger by the median nerve, although we tested the 2-point discrimination on the ulnar side of the fourth finger.

Eight patients underwent a second operation due to persisting or recurrent complaints: 5 underwent open surgery, and 3 of them underwent endoscopic decompression beforehand. Statistics showed no significant difference ($P = .46$).

Of these 8 patients, 4 showed no improvement in the clinical examination, the subjective assessment, and in the

<table>
<thead>
<tr>
<th>TABLE 4. Results in the Early and Long-Term Follow-Up*</th>
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<tbody>
<tr>
<td><strong>Items</strong></td>
</tr>
<tr>
<td>Early Follow-Up</td>
</tr>
<tr>
<td>NAS postoperative: pain at the sulcus or in the supplemented area of the nerve</td>
</tr>
<tr>
<td>Bishop score</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
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</tr>
</tbody>
</table>

*NAS, numeric analog scale.

**Mann-Whitney U-Test.**

**Fisher’s exact test.**

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Of these 8 patients, 4 showed no improvement in the clinical examination, the subjective assessment, and in the
neurophysiological exam. The other 4 patients initially experienced an improvement of symptoms and declined in the later follow-up period. Preoperatively, 6 of the 8 patients already had the most severe ulnar neuropathy with severe muscle atrophy, anesthesia, and muscle plegia. In the later course of the follow-up, 3 of these 8 patients also showed signs of cervical myelopathy, a severe chronic pain syndrome of other reason, and a severe depression. Two other patients developed a palpable, but asymptomatic, subluxation in the long-term follow-up.

Altogether in the long-term follow-up, we found 75.9% excellent and 6.9% good results in the endoscopic group and 70.4% excellent and 11.1% good results in the open decompression group.

**Operation Data**

The length of decompressed nerve was significantly different as expected ($P < .0001$), with 8.65 cm average in the open decompression and 16.03 cm in the endoscopic decompression. The length of decompression distal to the bony sulcus was 5 cm in the open and 10 cm in the endoscopic group. However, longer length of decompressed nerve was not associated with a better outcome (Group A, endoscopic, $P = .51$, correlation coefficient $= -0.13$; Group B, open decompression, $P = .79$, correlation coefficient $= 0.05$) (Table 7).

The incision to suture time showed a significant difference between both groups ($P < .001$). The endoscopic operation took 70.45 minutes, while the open decompression needed 44.63 minutes mean. In the learning curve for the endoscopic operation, the length of surgery continued to shorten with increasing number of operations, with a statistical significance of $P = .02$ (correlation coefficient $= -0.44$). For open decompression, the length of operation was consistent and not significantly correlated to the number of operations ($P = .30$, correlation coefficient $= -0.21$) (Figure 7).

The most common compressing anatomic structure (in 29 cases) was the FCU aponeurosis. We also found 13 compressions by the retrocondylar retinaculum and 6 by an epitrochleoanconeus muscle. Eight times a thickened Osborne ligament (as the distal part of the cubital tunnel retinaculum) was the cause of compression. Sixteen times additional compressions were found proximal to the bony ulnar sulcus.

In 30.4% of the patients (17 cases), we found more than 1 compressing site. In 1 patient, no compression was obviously detected intraoperatively, and the patient improved clinically anyway. No constriction was found more than 4 cm distal to the midpoint of the bony sulcus in the endoscopic group.

**Electrodiagnostics and Ultrasonography**

In the nerve conduction velocity studies, 43 patients (21 endoscopic and 22 open) improved, 8 patients showed unchanged results (4 endoscopic and 4 open), and 2 patients were still impaired (both endoscopic). Three patients were lost upon electrophysiological follow-up, and all had no more complaints and therefore rejected further examination.

The motor nerve conduction velocity significantly improved in comparison to the preoperative values in both groups (Group A, endoscopic $P < .0001$; Group B, open decompression $P = .0003$) in the early follow-up. In the long-term follow-up, there was also significant improvement in both groups (both with $P < .0001$). Between the groups no significant differences could be found ($P = .62$).

The motor conduction velocity difference between the elbow and forearm was pathological in 82.1% preoperatively and decreased below the cut-off value in the late follow-up in 65.3% of all cases.

In the preoperative ultrasonography of the ulnar nerve, most patients had typical signs of nerve compression proximally to the cubital tunnel. In 9 patients, no definite compression was detected in the ultrasound. Ultrasonography could not detect any signs of compression located distal to the FCU arch.

**DISCUSSION**

**Key Results**

In retrospective studies, the comparison of both open and endoscopic surgical techniques has indicated inconsistent results.
Some authors described a better early clinical outcome or less complications for the endoscopic technique,\textsuperscript{14-17} while others saw comparable results, but no significant outcome differences.\textsuperscript{12,13}

In addition, some expert opinions assume that in cubital tunnel syndrome there are compressing bands far distal from the FCU arch deep within the muscle fascia under the flexor carpi ulnaris muscle,\textsuperscript{20,28} and the ulnar nerve needs to be decompressed endoscopically.\textsuperscript{18}

It was also mentioned that shorter distance of nerve decompression in open “simple” surgery might be the most probable cause for failure in this technique.\textsuperscript{21,22} Other surgeons doubted the frequent incidence of far distal compressing structures.\textsuperscript{29}
To date, the theoretical advantages of the endoscopic technique that many authors describe have not been proven in prospective randomized studies. To our knowledge, our study is the first randomized study comparing open and endoscopic decompression in cubital tunnel syndrome. We could not detect any advantages for the endoscopic technique neither in the early nor in the long-term follow-up. Instead we observed a statistically significant higher rate of hematomas compared to our open technique via a small skin incision. Also, we found more patients with disturbance of wound healing in the endoscopic group, which led to the consideration of whether the wound healing disturbance might correlate to the rate of hematoma; although, this could not be proven.

With a success rate of 82.1% (excellent or good outcome in the Bishop Score) in the endoscopic technique and 81.5% in the open decompression group, there were no significant differences between the groups. The results of our study are within the range obtained in multiple former studies, particularly when the high number of patients with a severe cubital tunnel syndrome (33.9% of patients with McGowan III) is taken into account (Yoshida et al: 81.3% “sensory recovery” after endoscopic decompression16; Tsai et al: 87% good to excellent results after endoscopic decompression14; Bartels et al: 49 out of 75 patients = 65.3% with good to excellent recovery after simple decompression8; Gervasio et al: 77% good or excellent results after open decompression11; Ahcan et al: 91% good to excellent results after endoscopic decompression19; Pavelka et al: 80% patient satisfaction after simple decompression11; Düttmann et al: 78% good and excellent results in open decompression and 89% in endoscopic decompression without statistical significance in retrospective analysis17).

Regarding the clinical recovery, no differences could be detected between both study groups. Unexpectedly, more postoperative hematomas were significantly detected in the endoscopic group (*P* = .05). However, in our study population all patients with major postoperative hematomas could be treated conservatively and the hematomas had no effect on wound healing or clinical outcome. In previously published studies, reoperations also have been described (3.6% to 4.3% of operative hematoma evacuation in endoscopic patients).

The supporters of the endoscopic technique often report complications due to damage of the medial cutaneous nerve of the forearm with up to 23.7% in the open decompression.17 However, we have not seen any damages of this branch in our study. None of the patients complained of tingling or pain, hypoesthesia or paraesthesia around the elbow, nor did we find excellent recovery after simple decompression8; Gervasio et al: 77% good or excellent results after open decompression11; Ahcan et al: 91% good to excellent results after endoscopic decompression19; Pavelka et al: 80% patient satisfaction after simple decompression11; Düttmann et al: 78% good and excellent results in open decompression and 89% in endoscopic decompression without statistical significance in retrospective analysis17).

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The supporters of the endoscopic technique often report complications due to damage of the medial cutaneous nerve of the forearm with up to 23.7% in the open decompression.17 However, we have not seen any damages of this branch in our study. None of the patients complained of tingling or pain, hypoesthesia or paraesthesia around the elbow, nor did we find excellent recovery after simple decompression8; Gervasio et al: 77% good or excellent results after open decompression11; Ahcan et al: 91% good to excellent results after endoscopic decompression19; Pavelka et al: 80% patient satisfaction after simple decompression11; Düttmann et al: 78% good and excellent results in open decompression and 89% in endoscopic decompression without statistical significance in retrospective analysis17).
painful pseudoneuroma. According to the literature, the traditional open decompression is often performed via skin incisions of up to 10 cm. However, some recent publications propagate a minimal incision open decompression of the ulnar nerve, as we have been performing in our patients.53-34 Certainly, the short incision itself is no guarantee against injury of the medial antebrachial cutaneous nerve. Nevertheless, these results let us assume a correlation to the absent injuries of the medial antebrachial cutaneous nerve and the minimal incision. This issue should be investigated in further studies.

Another argument of the endoscopy supporting colleagues that has been often repeated and is based on the anatomic study of Siemionow and Hoffmann,20 is that in ulnar nerve transposition the fascial “bands” might cause a kinking of the nerve when not extensively dissected. Apart from the fact that we could not find any relevant constrictions more than 4 cm distally from the bony sulcus in our patients, we couldn’t support any technical relevance in cutting these fascial bands because they do not compress the nerve, but belong to the natural space where the nerve is running. Therefore, these bands are of no relevance when the nerve is not transposed from its natural bed.

In our study, we were also able to demonstrate that the relatively “short” length of decompression in the open decompression technique is not associated with a worse outcome or a higher failure rate than in the endoscopic technique. On the contrary, we could show that the open decompression is faster, safer, and provides the same results regarding nerve decompression. Other advantages of the minimal incision open decompression are a smooth learning curve (the endoscopic technique is also fast to learn, but we still consider the open technique to be much easier to acquire) and the cost effectiveness. Therefore, in our opinion, the open decompression using a small incision is the first choice for the surgical treatment of cubital tunnel syndrome.

Limitations

The number of patients in our study is considered to be relatively small in comparison to the recent retrospective studies. The operations in our study were performed by 3 experienced surgeons, whereby minimal differences in the operating procedure would not be definitely excluded. We started using the endoscopic technique in 2008, and as with any new technique there was a learning curve.

CONCLUSION

As various retrospective studies have shown before, both the endoscopic and the “simple” open decompression yield excellent to good results in more than 80% of patients. Indeed, we could not see any disadvantages in the open technique while using a small incision. No significance difference in the duration of wound pain was detected. Already in the early follow-up we found equal results in both groups. Also, there were no injuries of the medial antebrachial nerve observed in the open decompression group while using a small skin incision.

A nerve compression located distally to the FCU aponeurosis has not been detected in our study, and therefore an endoscopic decompression is not routinely needed in our opinion.

Moreover, in consideration of cost effectiveness and the higher hematoma rate in the endoscopic group, we think that keeping it “simple” with the open decompression via a small skin incision is the best option in cubital tunnel syndrome.

Disclosure

The authors have no personal, financial, or institutional interest in any of the drugs, materials, or devices described in this article.

REFERENCES

COMMENTS

The widespread adoption of new surgical techniques and procedures should be preceded by well planned and executed randomized or cohort clinical trials. The authors of this study did just that when comparing open and endoscopic decompressive procedures. Although the electrodiagnostic criteria used are adequate, my personal preference is that nerve conduction be performed across the elbow in 1 cm intervals rather than just report a below and above the elbow velocity difference or single velocity measurement as done in this study. Ultrasound is also being used with increasing frequency to document abnormalities of nerve configuration. The authors used ultrasound to detect focal enlargement of the ulnar nerve across the elbow. The authors also report on the presence of constrictive bands of tissue or muscle compressing the ulnar nerve. In my experience, the problem is often dynamic pressing the ulnar nerve. In my experience, the problem is often dynamic.

A s the first prospective, randomized, double-blind, controlled trial of endoscopic vs open decompression of the ulnar nerve at the elbow, this is an important study. Although the study is small, it is well-conceived and clearly presented, and the authors are experienced in decompression of the nerve through a small incision. The outcomes are in line with some previously reported results, and agree with the common-sense concept that, in general, simpler is better in surgical procedures, particularly with respect to the rate of complications. As with carpal tunnel syndrome, the purported advantages of the endoscopic technique have not panned out in reality. There is a flaw in the design of this study that can be criticized by proponents of the endoscopic procedure: the authors dissected and explored the ulnar nerve more than twice the distance distally in the forearm in the endoscopic group, in search of the purported distal sites of entrapment (none were found here). It can be argued that the more extensive dissection that was done in the endoscopic group may have been responsible for the longer times of surgery and perhaps for the higher incidence of postoperative hematomas and wound healing issues. So perhaps if the endoscopic group had undergone the same limited dissection as the open group, the results would have been entirely equivalent. Without another study using equal lengths of nerve dissection, this is mere speculation. In any case, the open decompression at this time remains the procedure of choice based on its equivalent efficacy, faster time of surgery, lower complication rate, and cheaper equipment needs.

The result here is reminiscent of the outcomes of randomized trials of simple decompression vs anterior transposition of the ulnar nerve: the simpler procedure wins the day via fewer complications. This should not be a surprising result. This study also lends support for a smaller incision technique, as there were no cases of postoperative paresthesias or traumatic neuromas related to injury to the medial antebrachial cutaneous nerve. A word of caution is appropriate here for the inexperienced nerve surgeon: although the purported advantages of the endoscopic technique have not panned out in reality. There is a flaw in the design of this study that can be criticized by proponents of the endoscopic procedure: the authors dissected and explored the ulnar nerve more than twice the distance distally in the forearm in the endoscopic group, in search of the purported distal sites of entrapment (none were found here). It can be argued that the more extensive dissection that was done in the endoscopic group may have been responsible for the longer times of surgery and perhaps for the higher incidence of postoperative hematomas and wound healing issues. So perhaps if the endoscopic group had undergone the same limited dissection as the open group, the results would have been entirely equivalent. Without another study using equal lengths of nerve dissection, this is mere speculation. In any case, the open decompression at this time remains the procedure of choice based on its equivalent efficacy, faster time of surgery, lower complication rate, and cheaper equipment needs.

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As more authors propose minimally invasive procedures for peripheral nerve surgery, an honest look at comparisons between standard open and minimally invasive techniques has become increasingly important. When a diversity of surgical procedures exist for the same indication, surgeons should be well-equipped to determine which technique may deliver an optimal result, perhaps even with the necessity of learning and adopting new techniques.

In this article, the authors compared results between a minimal-open cubital tunnel decompression and minimal-open plus endoscopic cubital tunnel decompression. It is valuable to note that the surgical procedures both involved open unroofing of the retrocondylar retinaculum (Osborne’s ligament). The comparison between the 2 techniques revealed a substantial increase in operative time and an increase in postoperative hematomas, but no significant difference in outcome measures or reoperation rates for endoscopic surgery. Although this was a small study population, the recorded outcome results were so evenly matched, it would be hard to assume that a larger trial would find a significant difference.

To my thinking, this study does a sufficient job of refuting the assertion posed in an anatomic study by Siemionow et al., which suggested that there were constrictive bands far distal (10 cm) to the medial epicondyle. That anatomic article had been used by proponents of endoscopic techniques as a justification for the superiority of the endoscopic technique. There is no common clinical basis, historical experience, or electrodiagnostic finding (such as so-called inching studies of the elbow) that has suggested the forearm as a source for ulnar neuropathy. The failure of this randomized controlled trial to find benefit from far-distal decompression adds further evidence that nonelbow region fascia is unimportant to tardy ulnar palsy.

This study also demonstrated that a smaller open incision is particularly appropriate in the elbow, as the laxity of the skin in the extended position allows the surgeon to decompress the ulnar nerve a considerable distance beyond the margins of the opening. However, a small incision is not a guard against medial antebrachial cutaneous nerve injury. I routinely find moderately sized branches of the medial antebrachial cutaneous nerve on minimal-open incisions. Without a systematic evaluation for medial antebrachial cutaneous nerve injury, which was absent in this study, it is challenging to argue that a minimal-open incision is sufficient to ward against a painful outcome. Careful dissection and an eye for variability remain the best defense.

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