Acta Neurochirurgica (2018) 160:2011–2017
https://doi.org/10.1007/s00701-018-3647-0

ORIGINAL ARTICLE - PERIPHERAL NERVES

Comparing endoscopic and open decompression of the ulnar nerve in cubital tunnel syndrome: a prospective randomized study

T. Krejčí[1,2] · Z. Večeřa[1,2] · O. Krejčí[1] · D. Šalounová[3] · M. Houdek[2] · Radim Lipina[1,2]

Received: 20 June 2018 / Accepted: 31 July 2018 / Published online: 15 August 2018

Abstract

Background Prospective randomized data is currently lacking which compares endoscopically assisted surgery with open surgical techniques in the treatment of cubital tunnel syndrome (CUTS). The aim of this study is to compare patient outcome in both techniques.

Method This prospective study comprised of 45 patients who, between October 2014 and February 2017, were randomly assigned to undergo either endoscopic or open surgery (22 and 23 patients respectively) for decompression of the ulnar nerve. Patients were followed up at 3 and 12 months postoperation. McGowan classification was used to determine the severity of symptoms. Surgical outcome was evaluated by Bishop classification. Pain levels were monitored according to gender from 0 to 10 days postoperation. Other factors investigated were chronic scar pain, working status, operation duration, and patient satisfaction regarding postoperative scarring and the procedure itself.

Results Both methods are equally effective in the treatment of CUTS (Bishop score excellent or good 90% vs 96%). Postoperative pain is significant particularly in the first few days following surgery, but with no significant difference depending on procedure. In the open group, postoperative pain was significantly higher in women than in men; pain did not differ between the sexes in the endoscopic group. The tendency to lower levels of pain among endoscopically operated women in comparison with women in the open group was not statistically notable. Patients who underwent open decompression experienced notably higher levels of postoperative chronic scar pain. Although working status and satisfaction with the surgical outcome were the same in both groups, satisfaction with scarring was higher in the endoscopy group. Operation time was significantly longer by endoscopy.

Conclusions Both studied methods produced equal satisfactory outcomes in the treatment of CUTS. Endoscopy has the potential to minimize chronic scar pain and improve scarring esthetics, at the expense of longer operating time.

Clinical trial registration number Supported by Ministry of Health, Czech Republic—conceptual development of research organization (FNOs/2014, project number 20).

Keywords Cubital tunnel · Endoscopic ulnar nerve decompression · Ulnar nerve neuropathy · Minimally invasive surgery

Introduction

Cubital tunnel syndrome (CUTS) is the second most common compression neuropathy after carpal tunnel syndrome. An Italian study determined its incidence at a rate of 24.7 cases per 100,000 inhabitants per year [13]. The pathophysiology of this condition involves both static and dynamic factors. The most common site of ulnar nerve entrapment is distal in the canal in the area known as the Osborne ligament or the fascia of the flexor carpi ulnaris (FCU). Entrapment can also be attributed to the arcade of Struthers in some cases [4].

This article is part of the Topical Collection on *Peripheral Nerves*

✉ Radim Lipina
radim.lipina@fno.cz

[1] Department of Neurosurgery, University Hospital Ostrava, 17. listopadu 1790/5, 70852 Ostrava, Czech Republic

[2] Faculty of Medicine, University of Ostrava, Ostrava, Czech Republic

[3] Department of Mathematical Methods in Economy, VSB—Technical University of Ostrava, Ostrava, Czech Republic

During elbow flexion, the tunnel flattens as the ligament stretches, causing pressure which may lead to nerve injury [8]. Excessive strain on the forearms or chronic pressure in the region of the cubital canal can also lead to CUTS. Failure of conservative treatment, involving rest, short-term immobilization, or ulnar nerve infiltration indicates surgical treatment: a wide range of approaches may be employed, chiefly subcutaneous and submuscular transposition or simple decompression of the nerve [9]. Recent discussions concerning endoscopic decompression as a treatment for CUTS are part of a wider trend in the surgical world towards developing procedures involving minimal incision, although the available literature is contradictory as to whether such efforts lead to improved outcomes; according to some researchers, the approach utilized does not affect surgical outcome [3, 4, 6], while others attribute improved clinical outcomes and lower rates of complications to the endoscopic approach [10, 11, 18, 19]. Worldwide, there is only one prospective randomized study comparing endoscopy with simple decompression for the treatment of CUTS [16]. Taking into account clinical outcomes and rate of complications, this study could not determine any advantage to endoscopy compared with conventional decompression [16]. Therefore, the aim of this work is to compare the results of endoscopic (ED) and open decompression (OD) methods in the treatment of CUTS.

Patient group and methodology

The study was approved by the local ethics board, and all patients signed consent forms. Forty-five patients (22 men and 23 women, from 22 to 74 years of age) receiving treatment for CUTS were inducted into the study between October 2014 and February 2017. The average age of the study group was 54.7 years with a median age of 56 years. All patients had clinical symptoms of CUTS confirmed by electromyography and had been referred by a neurologist or general practitioner to neurosurgeon. Patients were over 18 years of age and had been experiencing clinical symptoms for longer than 6 weeks. The study did not include patients who had injury or severe deformity of the elbow, were showing signs of ulnar nerve subluxation, had already undergone nerve decompression or medial epicondylectomy for CUTS in the affected area, or were those in which general anesthetic was contraindicated. Neuropathological severity was determined with a modified McGowan score [5, 12]. Patients were then randomly assigned between two groups: one to undergo endoscopically assisted decompression, the other open decompression. Randomization was carried out shortly before surgery by drawing study envelopes, which placed the patient into one of the groups. Twenty-two patients were randomly selected for endoscopy and 23 for simple decompression. There was no difference between the groups regarding age, sex, and McGowan score, and operation duration was noted in all cases. All patients evaluated postoperative pain using a visual analog scale (VAS) from 0 (i.e., the day of operation) to 10 days postoperation. They were requested to complete this evaluation, as far as possible, at the same time of day and before taking any analgesics. Pain levels were recorded on a questionnaire, which was submitted at follow-up appointments or by email to the study administrator. Patients were followed up at 3 and 12 months postoperation: surgical outcome was measured using the Bishop score, and any chronic scar pain was measured by VAS. At 12 months, patients were surveyed on the procedure itself, and the esthetics of scarring with a questionnaire comprising four grades from "unsatisfactory," "somewhat unsatisfactory," "satisfactory," and "very satisfactory". Working status, i.e., return to employment, or resumption of normal activities in the case of the retired, was noted at the 3-month follow-up, along with any complications, such as numbness in the region of scarring or hematoma or infection of the surgical wound. Follow-up at 3 and 12 months postoperation was carried out by electromyography. Any differences in surgical outcome according to sex were noted, especially in the evaluation of postoperative pain. The IBM program SPSS statistics (version 24) was used for statistical data analysis.

Surgical technique

Operations were carried out by one of two experienced neurosurgeons (T.K. and O.K.). For simple decompression, an incision of about 8 cm long was made over the medial epicondyle. The incision was then taken deep enough to visualize the ulnar nerve at the entrance to the medial epicondyle, where it was dissected approximately 5 cm both proximally and distally through the medial epicondyle itself. In both open and endoscopic approaches discussed here, nerve decompression was attained without 360-degree dissection; in cases where the epitrochleoanconeus muscle was observed, the muscle was detached beyond the ulnar nerve. In both techniques, incision was performed to a visible extent into the superficial fascia of the flexor carpi ulnaris beyond the ulnar nerve, after which a dissector was passed along the nerve to rule out any further distal or proximal compression. We always explore the medial intermuscular septum to check for any compression in the region known as the arcade of Struthers. Throughout decompression, we make every effort to avoid injury to the posterior branch of the medial antebrachial cutaneous nerve, which courses in proximity to medial epicondyle. After there was judged to be sufficient decompression of the nerve, flexion, and extension in the elbow was examined in order to rule out subluxation through the medial humeral epicondyle. The endoscopic approach was performed with the use of the Krishnan retractor (Karl Storz GmbH & Co. KG, Tuttlingen, Germany) (Fig. 1). After using a tourniquet

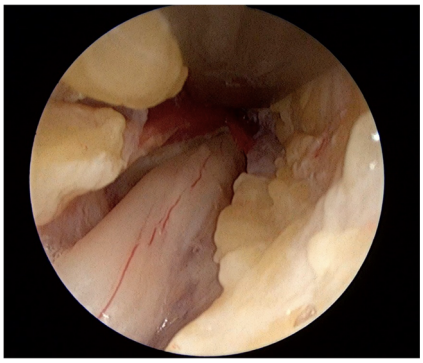

Fig. 1 Perioperative view of the endoscopically decompressed ulnar nerve (below), with the Krishnan retractor visible at the top of the picture

for a bloodless operative field, an incision of 1.5–2 cm was made above the medial epicondyle (Fig. 2) in which the endoscopic retractor was inserted with which, or with the aid of dissecting scissors, a cavity was created above the course of the nerve, which was gradually decompressed under constant endoscopic monitoring from a "bird's eye" perspective. The surgeon holds the endoscope in one hand while performing dissection and decompression with the other. An assistant holds the arm in place and changes the degree of flexion in the ulnar as necessary. The nerve was first observed at the head of the ulnar groove and subsequently dissected roughly 5 cm proximally and distally through it. Nerve subluxation was ruled out at the conclusion of decompression. At the end of the operation, hemostasis was confirmed by visual examination of the wound, or (if necessary) endoscopically and by coagulation of visible sources of bleeding. In both procedures, hemostasis was aided by coating the wound with hydrogen peroxide for several minutes, followed by manual compression before suturing. The wound was then covered and lightly bandaged. Pain levels were recorded in the evening of the operating day before the patient took analgesics. Checkup of wounds was carried out on the first morning postoperation, and the patient was discharged to domestic care. Patients were advised to keep the wound covered to the 5th postoperative day and were provided with forms for recording any postoperative discomfort.

Fig. 2 Scar after endoscopic decompression

Results

Of the 45 patients, CUTS was localized in the upper right arm of 25 of them (55.6%) and in the upper left arm in 20 (44.4%). The most common site of compression, occurring in 25 patients, was found to be the FCU aponeurosis, followed by the Osborne ligament in 19 cases. The epitrochleoanconeus muscle was observed in four cases; in three cases compression was observed proximal to the medial epicondyle, i.e., the arcade of Struthers. There were multiple compression sites in five cases. Twenty-two patients (11 men and 11 women) were randomly selected to the endoscopy group. The average age of this group was 52.4 years, with a median of 52.5 years, and ranging from 22 to 72 years. The average McGowan score was 2.5. It proved unable to follow-up with two patients from this group, so the only data available for statistical analysis was that which had been collected upon admission and the operation duration. The remaining patients were monitored for 12 months postoperation, as were all 23 patients in the group randomly selected for open in situ decompression. This group comprised of 11 women and 12 men with an average age of 56.9, a median age of 59 ranging from 44 to 74 years. Their McGowan score was an average of 2.74. Between groups, there was no statistically significant difference with regard to sex, age, or McGowan score (Table 1).

Postoperative and chronic pain

After evaluating discomfort from 0–10 days postoperation, we discovered that, as determined by VAS, pain levels were greater than 2 up to postoperative day two among the ED group and up to day four in the OD group (see Table 2 for a summary of postoperative pain in both groups). In the days following, discomfort was evaluated to be marginal and was lower than VAS 1 from day 7 postoperation. Statistical analysis discovered no significant difference in postoperative pain between the groups. After evaluating pain levels according to gender over the entire study group, we found that pain levels were significantly higher among women at 0- then 2 to 5- and 8 to 10 days postoperation. This was especially apparent in the OD group, where pain among women was significantly higher at 0

Table 1 Study group characteristics

	Sex/n	Age (average/median)	McGowan score (average/median)
Endoscopy group	F /11 M/11	52.4/52.5	2.5/3
Open decompression group	F /11 M/12	56.9/58	2.74/3
p value	0.385 (*t* test)	0.887 (χ^2 test)	0.411 (exact test)

Table 2 Comparison of postoperative pain in the endoscopic (ED) and open decompression (OD) study groups

	Day 0 (Average/median of pain)	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Endoscopic	3/3	2.8/3	2.2/2	1.8/1.5	1.5/1.5	1.4/1	1.2/0.5	1/0	0.9/0	0/0	0/0
Open	4.7/4	2.6/3	2.7/2	2.4/1	2/1	1.6/1	1.4/1	0.8/0	0.7/0	0/0	0/0
p value	0.063	0.207	0.711	0.870	0.870	0.994	0.971	0.937	0.799	0.760	0.760

to 6 and 8 to 10 days compared to men (Table 3). The analysis of postoperative pain among ED patients found no statistically significant difference between the sexes. In comparison with surgical technique, we found that pain levels among women in the ED group were significantly lower on postoperative day 4; on other days, there was no statistical difference despite average pain values tending to be lower in this group. Among women in the OD group, greater average pain levels were observed, exceeding VAS 2 up to 6 days postoperation whereas women in the ED group experienced wound pain exceeding VAS 2 until the 3rd day (Table 4). Among men, no correlation was found between surgical technique and subsequent pain levels; in the OD group, average pain values exceeded VAS 2 only on day 0 postoperation and from 0 to 2 days postoperation in the ED group. Postoperative pain is summarized in Graph 1. Chronic pain from scarring was noted in 8 OD patients (and no ED patients) at the first follow-up 3-months postoperation. In these 8 patients (5 women and 3 men), scar pain was recorded to be an average of VAS 3.13, with a median of 2.5 in the range 2–5. Chronic pain persisted in 5 of these patients (4 women and 1 man) at the 12-month follow-up, with an average VAS of 2.8 and a median of 2 in the range 2–5. Incidence of chronic pain from scarring was significantly higher in the OD group than the ED group 3-months postoperation (p 0.011, median test), although there was no statistical difference between them at 12 months (p 0.082, median test). There were no findings at both 3 and 12-month monitoring which suggested any correlation between chronic pain and sex (p 0.642 and 0.314 respectively, median test) (Table 5).

Clinical outcome

As determined by Bishop classification, no differences of any consequence were found regarding clinical outcome between the groups at 3 and 12-months postoperation (p values 0.176 and 0.191 respectively, Mann-Whitney U test) (Table 6), neither was there any difference, statistically speaking, regarding working status (p 0.061, exact test) (Table 7). At 3-months postoperation, 90% of patients in the ED group had returned to work, while a further 5% were able to work but with some functional restrictions or a change of duties due to residual symptoms. The final 5% had not returned to work. Among the OD patients, 65.2% had returned to their existing employment, 30.4% were working on a limited basis due to residual symptoms, and 4.4% had not returned to work. Regarding the appearance of scarring, 95.3% of the study cohort judged it to be either satisfactory or very satisfactory: in the ED group 70% of patients judged it to be very satisfactory, while 91.3% of OD patients said they were satisfied. While only a very small number of patients were unsatisfied, patients in the ED group were found to be more satisfied ($p < 0.0005$, exact test) (Fig. 3). Having said that, overall satisfaction with surgery at 12-months postoperation was found to be broadly the same in both groups (p 0.140, exact test): 90% of ED patients were very satisfied or satisfied, as were 91.3% of OD patients.

OD surgery ranged from 12 to 44 min in duration (i.e., incision to suture time) with an average and median duration of 29.6 and 30 min respectively. ED operations lasted from 20 to 60 min, averaging 36.4 min long with the median operating time being 35 min—the ED procedure was, statistically, significantly longer (p 0.011, t test). However, as experienced was gained with the endoscopic technique, operating time was shortened from an average of 43 min (median 40 min) in the first half of cases to an average of 29.7 min (median 30 min) with the latter half. However, it is necessary to mention that setup time was 2.8 times longer with ED and is not possible to significantly shorten even with experience. The average OD setup took 6.5 min compared to 18.2 for ED. Complications, such as hematoma in the surgical field, injury

Table 3 Comparison of postoperative pain in the study cohort by sex

	Day 0 (Average/median of pain)	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Female	7.4/8	6.1/7	4.9/5	4.3/5	3.7/3	3/3	2.5/3	1.5/1	1.2/1	1.2/1	1.2/1
Male	2.3/2	1.8/1.5	0.8/0.5	0.6/0	0.5/0	0.3/0	0.4/0	0/0	0/0	0/0	0/0
p value	0.003	0.003	< 0.0005	0.003	< 0.0005	< 0.0005	0.036	0.1	0.036	0.009	0.036

Table 4 Comparison of postoperative pain in women according to surgical technique

	Day 0 (Average/median of pain)	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Female (endoscopic)	3.4/3.5	3.1/3	2.3/2.5	2/2	1.7/2	1.5/1	1.4/1	1.2/0.5	1.1/0.5	1.2/0.5	0.9/0
Female (open)	7.4/8	6.1/7	4.9/5	4.3/5	3.7/3	3/3	2.5/3	1.5/1	1.2/1	1.2/1	1.2/1
p value	0.063	0.063	0.080	0.080	0.030	0.080	0.063	0.635	1.000	1.000	1.000

to the medial cutaneous nerves of the forearm, or injury to the ulnar nerve itself, were not noted. Reoperation, for persistent or recurrent CUTS, was also not recorded.

Discussion

Currently, the overriding trend is to adopt a mini-invasive surgical approach wherever possible. The advantage of mini-incision techniques are widely known—minimizing trauma to surrounding tissue which is not the subject of the procedure leads to shorter time to recuperation and, for example, lower postoperative pain. Endoscopically assisted peripheral nerve operations are among those procedures considered to be minimally invasive. However, definitive data is thus far lacking from prospective studies, which confirms the expected benefits of these kinds of procedures over existing conventional approaches: some authors ascribed fewer complications and improved clinical outcome to the use of endoscopy [10, 11, 18, 19], while others found broadly similar outcomes regardless of the technique used [3, 4, 6, 16]. Apart from the work of Schmidt et al., our study is the only prospective, randomized study comparing endoscopic and simple decompression of the ulnar nerve in the sulcus [16], although their work differs from ours in that the simple decompression approach is performed with a smaller incision [16]. As with Schmidt et al., we found no short- or long-term difference in clinical outcome as measured by Bishop classification—success rates (i.e., Bishop score of excellent or good) exceeded 90% in both groups. Similar results have been obtained in other endoscopically operated patients: Tsai et al. and Ahcan et al. achieved success rates of 87% [18] and 91.6% [2] respectively using the same assessment criteria. Although similar levels of patient satisfaction were replicated in our study—not only in the ED group but also the OD group—satisfaction with scarring was greater in the ED group, thus confirming one of the expected benefits of endoscopy. Considering that another frequently mentioned benefit of this technique is that it results in quicker recuperation and return to work [6], our study assessed working status 3-months postoperation. Although 90% of ED patients had returned to their previous employment compared to 65.2% of OD patients, this difference was not statistically significant. At 3 months, 95% of patients in both study groups were working, even if with restrictions in some. Here of course we have to consider the subjective nature of these findings: while a higher (but statistically marginal) proportion of OD patients reported restricted working, we believe this is due to the fact that at the time, this group was recording higher levels of postoperative discomfort (as will be discussed further). Overall, patient satisfaction was the same at 12-months postoperation in both groups. With this in mind, we believe it would be more advantageous to assess working status with a shorter postoperative interval, but there is insufficient data from our study group to conduct this assessment.

In this study, we focused primarily on the comparison of early postoperative pain of both groups, as well as chronic wound pain, which we often encounter. In their randomized study, Schmidt et al. determined the persistence of pain up to approximately 6 days postoperation, although they did not assess this quantitatively [16]. Bolster et al. describe equal levels of postoperative pain in both groups [4]. In our study, we observed pain exceeding VAS 2 from 0 to 2 days postoperation in the ED group and from 0 to 4 days in the OD group, although no statistical difference regarding pain was discovered between the groups. After comparing postoperative pain by gender across the whole cohort, we found that it

Table 5 Summary of chronic pain occurrence according to surgical technique used

	Follow-up at 3 months		Follow-up at 12 months	
Group	Endoscopic	Open decompression	Endoscopic	Open decompression
n patients (F/M)	0	8 (5/3)	0	5 (4/1)
Mean/median of VAS	0	3.13/2.5	0	2.8/2
p value	0.011		0.082	
Correlation between chronic pain and sex (*p* value)	0.642		0.314	

Table 6 Bishop score at 3 and 12 month intervals postoperation

Bishop score	Endoscopy group ($n = 20$)		Open decompression group ($n = 23$)		p value (Mann-Whitney U test)
	Preliminary checkup	12-month follow-up	Preliminary checkup	12-month follow-up	
Excellent + good	18	18	21	22	0.176
Fair + poor	2	2	2	1	0.191

was higher among women, especially among those who had undergone OD—pain levels of both sexes in the ED group were not found to significantly differ. Among men, no relationship was found between surgical technique and postoperative pain; in women, average pain levels exceeding VAS 2 were recorded in the ED group up to 2 days postoperation and up to 6 days in the OD group. While there is a tendency to lower postoperative pain among women of the ED group, this was significant only on the fourth postoperative day. Considering our findings though, it appears that women would benefit from undergoing endoscopically assisted surgery due to the reduced persistence and intensity of postoperative pain.

Chronic scar pain was assessed at the first follow-up 3-months postoperation and noted in 8 patients of the OD group (and in none from the ED group). At 12 months, it was found to have regressed in all those patients, although it persisted in 5. At 3 months, the incidence of chronic pain from scarring in our study was found to be significantly higher in the OD group than in the ED group, and while Schmidt et al. also determined persistent postoperative pain at 16 weeks and 16.8-months postoperation (ranging from VAS 0.64–0.97), between groups no difference was noted [16]. The absence of chronic postoperative pain in our ED group, as opposed to the experience of Schmidt et al., could be attributed to the higher incidence of hematoma in their case [16], as well as the lower patient numbers in our study.

One disadvantage of the simple in situ approach, as presented by several authors, is that the ulnar nerve is insufficiently decompressed in the case of far-distal compression sites [7, 17]. Meanwhile, other authors contest the existence of far compression [14, 16]. No signs of distal compression were detected in our cohort, and we consider it only in isolated cases, although we cannot rule it out as a contributing factor in persistent or recurrent CUTS. An alternative to endoscopy could be simple decompression performed from a reduced incision, as advocated by several authors in recent years [1, 15, 16]. According to Schmidt et al., this technique is comparable to endoscopy as far as success rates are concerned [16]. It would be interesting to compare pain levels of both these techniques, as we did in our study. With this open but mini-invasive approach, patient satisfaction with the esthetics of scarring could be expected to be similar to endoscopy.

Longer operating time is generally regarded as one of the disadvantages of endoscopy in peripheral nerve operations [4, 16], and operating duration was significantly longer compared to the open technique in our study. While operating duration, i.e., incision to suture time, can be reduced with experience, we still have to account for the additional time required for instrument preparation; therefore, endoscopy will always be longer. In our study, setup time was 2.8 times longer for endoscopy than for simple open decompression. Both techniques are comparable concerning the rate of complications [4, 16]. Schmidt et al. described significantly higher rates of conservative treatment for hematoma in their endoscopic group (24.14% vs 3.70%) [16]. In our study, there were no incidences of postoperative hematoma or any other complications, which could be attributed to our technique for hemostasis.

Table 7 Working status of study group patients' 3-months postoperation

Work status	Endoscopic group (n/%)	Open decompression group (n/%)
Returned to previous employment	18/90	15/65.2
Working but with partially impaired motor/sensory function	1/5	7/30.4
Inactive	1/5	1/4.4
p value	0.061	

Fig. 3 Healed scar following endoscopy

Conclusion

Both studied methods produce equally satisfactory outcomes in the treatment of CUTS. Endoscopy has the potential to minimize chronic scar pain and improves scarring esthetics at the expense of longer operating time. The other indicated benefits of endoscopy were not definitively confirmed. Given the inherent limitations of the relatively low number of patients in our study, a more extensive randomized study is required to corroborate these findings.

Funding Ministry of Health of Czech Republic—conceptual development of research organization (FNOs/2014, project number 20) provided financial support in the form of new endoscopic equipment funding. The sponsor has no role in the design or conduct of this research.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee (name of institute/committee) and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

References

1. Adkinson JM, Chung KC (2014) Minimal-incision in situ ulnar nerve decompression at the elbow. Hand Clin 30(1):63–70
2. Ahčan U, Zorman P (2007) Endoscopic decompression of the ulnar nerve at the elbow. J Hand Surg Am 32(8):1171–1176
3. Bacle G, Marteau E, Freslon M et al (2014) Cubital tunnel syndrome: comparative results of a multicenter study of 4 surgical techniques with a mean follow-up of 92 months. Orthop Traumatol Surg Res 100(4 Suppl):S205–S208
4. Bolster MAJ, Zöphel OT, van den Heuvel ER, Ruettermann M (2014) Cubital tunnel syndrome: a comparison of an endoscopic technique with a minimal invasive open technique. J Hand Surg (European) 39(6):621–625
5. Dellon AL (1989) Review of treatment results for ulnar nerve entrapment at the elbow. J Hand Surg Am 14(4):688–700
6. Flores LP (2010) Endoscopically assisted release of the ulnar nerve for cubital tunnel syndrome. Acta Neurochir 152(4):619–625
7. Gabel GT, Amadio PC (1990) Reoperation for failed decompression of the ulnar nerve in the region of the elbow. J Bone Joint Surg Am 72(2):213–219
8. Gelberman RH, Yamaguchi K, Hollstien SB, Winn SS, Heidenreich FP, Bindra RR, Hsieh P, Silva MJ (1998) Changes in interstitial pressure and cross-sectional area of the cubital tunnel and of the ulnar nerve with flexion of the elbow. An experimental study in human cadavera. J Bone Joint Surg Am 80(4):492–501
9. Humhej I (2010) Syndrom útlaku ulnárního nervu v oblasti lokte – přehled operačních technik a srovnání jejich výsledků Cubital Tunnel Syndrome – a Review of Surgical Treatments and Comparison of their Outcomes. Cesk Slov Neurol N 106(5):510–516
10. Krishnan KG, Pinzer T, Schackert G (2006) A novel endoscopic technique in treating single nerve entrapment syndromes with special attention to ulnar nerve transposition and tarsal tunnel release: clinical application. Neurosurgery 59(1 Suppl 1):ONS89–ON100 discussion ONS89-100
11. Martin KD, Dützmann S, Sobottka SB, Rambow S, Mellerowicz HA, Pinzer T, Schackert G, Krishnan KG (2014) Retractor-endoscopic nerve decompression in carpal and cubital tunnel syndromes: outcomes in a small series. World Neurosurg 82(1–2): e361–e370
12. McGowan AJ (1950) The results of transposition of the ulnar nerve for traumatic ulnar neuritis. J Bone Joint Surg Br 32–B(3):293–301
13. Mondelli M, Giannini F, Ballerini M, Ginanneschi F, Martorelli E (2005) Incidence of ulnar neuropathy at the elbow in the province of Siena (Italy). J Neurol Sci 234(1–2):5–10
14. Nagle DJ, Patel RM, Paisley S (2012) Endoscopic detection of compressing fascial bands around the ulnar nerve within the FCU. Hand (N Y) 7(1):103–107
15. Sener S, Menovsky T, Kloet A (2014) Open ulnar nerve decompression using small incision and alternate positioning. Neurosurgery 74(2):E230–E232
16. Schmidt S, Welch-Guerra WK, Matthes M, Baldauf J, Schminke U, Schroeder HWS (2015) Endoscopic vs open decompression of the ulnar nerve in cubital tunnel syndrome: a prospective randomized double-blind study. Neurosurgery 77(6):960–970
17. Siemionow M, Agaoglu G, Hoffmann R (2007) Anatomic characteristics of a fascia and its bands overlying the ulnar nerve in the proximal forearm: a cadaver study. J Hand Surg (European) 32(3): 302–307
18. Tsai TM, Chen IC, Majd ME, Lim BH (1999) Cubital tunnel release with endoscopic assistance: results of a new technique. J Hand Surg Am 24(1):21–29
19. Watts AC, Bain GI (2009) Patient-rated outcome of ulnar nerve decompression: a comparison of endoscopic and open in situ decompression. J Hand Surg Am 34(8):1492–1498

Comments

T. Krejci et al. performed a prospective randomized trial comparing endoscopic and open decompression of the ulnar nerve for the treatment of cubital tunnel syndrome. They found that patients undergoing an open operation had significantly more postoperative pain that precluded their returning to full employment. It was interesting to note that the majority of the patients who had the prolonged pain were female. I am not aware of such a gender related finding in other peripheral nerve surgery series. The authors did find that the endoscopic procedure took longer to perform. They also found that the setup time for the endoscopic procedure was significantly longer than the open procedure.

The author's findings are similar to those comparing open to endoscopic release of the carpal tunnel. In the case of carpal tunnel release, it has been shown that the postoperative pain from the open carpal tunnel decompression could be decreased by working through a smaller incision. The authors use an 8 cm incision for their open procedure. I believe that an adequate decompression could be performed through a smaller skin incision.

Allan Friedman, NC, USA