Endoscopic Carpal Tunnel Release Using the Biportal Technique

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The clinical study consisted of 27 patients and 30 hands that were operated on with the biportal endoscopic carpal tunnel release technique between 2000 and 2002. The mean follow-up time was 28 months. The time to return to work or complete recovery was found to average 12 days. The rate of functional recovery was 93% (27 hands), and 90% of hands (26 hands) were free of symptoms at the time of publication. According to our study, we conclude that the biportal endoscopic technique is an effective method to attain patient comfort; it is a minimally invasive method with a low complication rate in experienced hands for surgical treatment of carpal tunnel syndrome. Military persons can return to work quickly, without deficits in hand skills, with the use of this technique.

Introduction

With open carpal tunnel releasing procedures, although relief of symptoms is achieved for a high percentage of patients, scar tenderness and pillar pain may lead to delayed regaining of hand skills. The phenomenon of pillar pain is a frequent complication reported after both open and endoscopic surgical techniques, with incidence rates between 6% and 36%.[1,2] It has been characterized as pain or tenderness in the thenar or hypothenar eminence. The cause of pillar pain remains uncertain, but it most commonly originates in the posttriquetral joint, possibly because of alteration of the forces over the joint after releasing of the transverse carpal ligament.[3] Pillar pain can delay return to work and resumption of activities of daily living and potentiate loss of grip strength. Endoscopic carpal tunnel release was developed by Chow[4] in 1989, as a biportal technique to decrease postoperative morbidity. This technique allows rapid return to normal activities and work, with low complication rates.[5] Disadvantages of the endoscopic technique are based mainly on its cost, the difficulty of exploring the carpal tunnel, and higher rates of neurovascular complications in inexperienced hands. In our study, we reviewed data for 27 patients and 30 hands with carpal tunnel syndrome that were treated surgically with the biportal endoscopic method.

Methods

Twenty-seven patients with severe carpal tunnel syndrome were admitted to our clinic between May 2000 and May 2002. All of them underwent surgery with the biportal endoscopic release technique. The mean age of the four men and 23 women was 43 years (range, 29–73 years). Two of the patients were diabetic. Thirty hands (14 right and 16 left) were operated on by the same surgeon. Four men were heavy manual workers, 18 women were light manual workers, and 5 women were housewives in this study.

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The complaints and findings for the patients are summarized in Table I. Predominant postoperative complaints were paresthesia, night pain, and clumsiness. The operation was reserved for patients with pain refractory to medication, severe sensorial deficits, and motor weakness. All patients were diagnosed with electrophysiological studies. Motor weakness was assessed with a dynamometer both preoperatively and postoperatively. Previous surgery was considered a contraindication for the endoscopic technique. All patients had undergone unsuccessful trials of conservative therapy before referral for surgery. If the patient had bilateral carpal tunnel syndrome, then the more symptomatic hand was operated on first.

Chow[4] previously described the technique for biportal endoscopic carpal tunnel release. All operations were performed under local anesthesia, without a tourniquet. The wrist was placed in a free position, and an entrance incision was made just medial to the palmaris longus in the proximal transverse crease of the wrist. The antebrachial fascia was opened via blunt dissection, and the proximal edge of the retinaculum flexorum was seen. Then the wrist was positioned in hyperextension. Hyperextension of the wrist significantly displaces the vital structures both dorsally and distally. A curved dissector was introduced via the posterior face of the ligament, remaining in contact with the hook of hamate and avoiding going radially, where a motor branch of the median nerve passing through the retinaculum could be injured. The distal edge and exit incision were determined with the trampoline effect obtained on palpation of the hand. The half-open working channel was inserted into the carpal tunnel, and the bright transverse fibers were recognized with the endoscope. A special half-circle-shaped blade was inserted into the working channel from the proximal entrance, and an endoscope (30° upside) was introduced into the working channel from the distal entrance. The distal edge of the flexor retinaculum was seen with visual control of the endoscope, and the blade was placed under the ligament. Careful slow cutting of the ligament was achieved. Subcutaneous fatty tissue migration into the half-open working channel was seen. This is an important perioperative observation, to achieve complete releasing of the flexor retinaculum. Another important observation is the increased subcutaneous illumination of the endoscope. Hemorrhage after releasing of the flexor retinaculum was not observed except in one case. Entrance and exit incisions were sutured with 5-0 nylon, and compressive dressings were applied. The total time spent for endoscopic releasing was ~10 minutes. All patients were observed for 2 hours after the operation for early postoperative complications. After surgery, every patient was interviewed and examined every month for the existence of preoperative clinical symptoms. At the first check 3 months after surgery, the patients were asked about symptomatic relief and intervals between the operation and return to their daily activities and work and were examined for scar tenderness and aesthetic outcomes. At the same time, all patients were exam-

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TABLE I

PREOPERATIVE SYMPTOMS AND SIGNS

Symptom	No. of Hands
Paresthesia	29
Motor weakness	6
Tinnel sign	16
Night pain	30
Thenar atrophy	4

ined electrophysiologically; all patients were then regularly examined every 3 months for functional recovery, with a visual analog scale and a dynamometer.

Results

The mean follow-up period for the patients was 28 months (range, 18–42 months). For one patient in the early period of surgical experience, perioperative hemorrhage occurred and the operation was immediately switched to open surgery. For another patient, reflex sympathetic dystrophy was observed but resolved within 1 week after endoscopic carpal tunnel release.

Except for the patient who underwent open surgery, all hands (29 hands) were involved in the study and examined postoperatively. All patients were evaluated with a dynamometer for motor weakness. Twenty-seven hands (93%) showed functionally normal use of the hand during the follow-up period. All patients were evaluated with a visual analog scale, and disappearance of all preoperative symptoms was achieved for 26 hands (90%). Postoperative comparisons of the patients are summarized in Table II. No infectious complications and no recurrences were observed in our series.

All of the women who were light workers or housewives could return to work or daily life within 3 months. Three of the men who were heavy workers could return to their activities, and no complaints related to the surgery were observed. Only one man could not return to work within 3 months, because of pillar pain. That patient could return to work within 6 months after surgery. To the present time, no patient has demonstrated disability attributable to carpal tunnel release.

Discussion

Endoscopic carpal tunnel release is one of the most controversial topics in peripheral nerve surgery. There are various techniques for endoscopic release, including the Chow technique and the Agee and Brown technique. Carpal tunnel release has high rates of success when the open or endoscopic technique is used. The costs of the procedures are similar, and the cost differential is highly dependent on two key variables, i.e., the rate of complications associated with endoscopic surgery and the difference between the two techniques in the duration of postoperative work absence. The time to return to work is a critical variable in the analysis of open versus endoscopic surgery.

TABLE II

POSTOPERATIVE RESULTS

Result	No. of Hands
Disappearance of all preoperative symptoms	26
Normal use of hand	27
Disappearance of paresthesia	27
Pillar pain	3
Normal subjective grip strength	27
Electrophysiological improvement	27
No scar discomfort	26

Patients who underwent endoscopic surgery showed faster functional recovery, less pain, and less scar tenderness than did those who underwent open surgery.[6–9] Brown et al.[10,11] found median times to return to work of 14 days for the endoscopic group and 28 days for the open group. Jimenez et al.[12] reported that endoscopic release resulted in earlier return to work. Agee et al.[13,14] found that endoscopic release yielded a mean time to return to work of 25 days, compared with 47 days for the open technique. Jugovac et al.[15] reported that intervals between the operation and return to daily activities were shorter in the trial group (median, 5 days; range, 2–15 days) than in the control group (median, 10 days; range, 2–21 days; $p < 0.001$). Hallock and Lutz[16] and Jacobsen and Rahme[17] showed slight, statistically insignificant advantages for endoscopic surgery in terms of return to work. Gibbs et al.[18] and Dumontier et al.[19] reported that they were unable to demonstrate any statistically significant difference between the two groups in terms of return to work, return to activities of daily living, or results on a symptom severity scale. Vasen et al.[20] reported that the limited open incision might achieve faster return to work without the associated risk of complications inherent in the endoscopic technique, as suggested by initial reports. In our study, the average time to return to work was 12 days. Scar and pillar tenderness, scar length and width, and aesthetic outcomes were highly satisfactory for our patients who were treated with the biportal endoscopic technique.

Brown et al.[11] showed that pressure measurements in the carpal tunnel compartment after endoscopic release decreased to levels similar to those obtained after open release. The volume of the carpal tunnel measured with magnetic resonance imaging increased after endoscopic release to values similar to those obtained after open release.[21] Uchiyama et al.[22] reported that statistical analyses of nerve conduction showed the same degree of improvement 12 months after open or endoscopic surgery.

Complication rates have been reported in several prospective studies. The procedure is technically demanding but can be performed safely with an understanding of the anatomic structures at risk and strict adherence to surgical methods.[23–26] Bozentka and Osterman[27] reported that the complication rates were comparable when procedures were performed by surgeons well versed in the technique. Chow[4,5] reported only one patient with a temporary 4-week loss of interosseous muscle function and diminished sensibility in the ulnar nerve distribution. Brown et al.[10] reported a 6.0% complication rate for their 149 releases using the one-portal endoscopic technique and a 5.4% complication rate for their 152 releases using the two-portal technique; there was no intraoperative hemorrhage, and one of the complications was reflex sympathetic dystrophy 1 week after the operation. Using the one-portal technique, Agee et al.[14] and Erhard et al.[28] reported that 2 of 82 patients had transient ulnar neurapraxia and 2.5% of endoscopically treated patients had complications, mostly minor, with no confirmed nerve or vascular injuries; they reported one injury to the deep motor branch of the ulnar nerve, one patient with bowstringing of the flexor

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tendons, and two patients with wound dehiscence in the open group. Tsuruta et al.[29] reported that there was a single case of injury to the superficial palmar arch in one hand. Vasen et al.[20] reported that the complication rates for open carpal tunnel release were considerably lower than those for the endoscopic technique. Kuschner and Lane[30] reported that the short-term difference between endoscopic and open carpal tunnel release is an increased likelihood of nerve injury. In contrast, Varitimidis et al.[21] reported that endoscopic release of the flexor retinaculum holds the same risks and complications as the open technique. Concannon et al.[31] reported that the statistically higher incidence of recurrence of carpal tunnel syndrome after endoscopic release was comparable to findings with the traditional open release in their cases. Hanssen et al.[32] reported a deep postoperative wound infection rate of 0.47% for 3,620 carpal tunnel releases. In our cases, we observed perioperative hemorrhage in one case and switched to open surgery during the early period of our surgical experience. In another case, reflex sympathetic dystrophy was observed but resolved spontaneously within 1 week. No major neurovascular injuries, no recurrences, and no infectious complications were observed in our series.

According to our results, patients treated with the biportal carpal tunnel release technique have low complication risks and rapid improvement in symptoms and return to work in a shorter time when the surgery is performed or supervised by experienced surgeons. The learning curve for this technique is not as long as expected if the surgeon is familiar with the open technique and the use of the endoscope.

Although the uniportal technique is recommended because of lack of persistent pain and dysesthesia in the palmar area attributable to the second incision performed in the biportal technique, limited visual information is a disadvantage of this technique. Ulnar neurapraxia and damage of sensible nerves are reported with the uniportal technique but are very rarely reported with the biportal technique.

In summary, we can conclude that both techniques (uniportal and biportal) are efficient and complication rates are low and acceptable. In our opinion and according to our experience, the biportal technique is superior to the uniportal technique, yielding better perioperative visual information and safety. As minimally invasive surgery, this technique provides safe quick return to work for military persons.

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