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Endoscopic carpal tunnel release

We have performed 149 consecutive one-portal and 152 consecutive two-portal endoscopic carpal tunnel release operations. Average time to cessation of preoperative symptoms was 15 days in both the one-portal group and 17 days in the two-portal group. The complication rate in the one-portal group was 6%, and in the two-portal group it was 5%. In our opinion, the one-portal release technique is much more difficult and inherently more dangerous than the two-portal technique, and we recommend the latter for endoscopic carpal tunnel release. (J. Hand Surg. 1991;17A:1009-11)

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Division of tissue overlying the transverse carpal ligament (TCL) is inherent in the open carpal tunnel operation.^{1,2} The healing of these superficial tissues may result in wound tenderness for some time after the procedure. This tenderness of the wound and later of the scar may inhibit application of palmar pressure and delay a return to maximum postoperative hand function. Complications of open carpal tunnel release have been described previously.^{3,4}

With the advent of new endoscopic instruments, it is now possible to release the ligament through one or two small incisions proximal and distal to the carpal tunnel, avoiding incision of the major portion of the overlying skin, fascia, muscle tissue, and possible fine nerve fibers.

Material and methods

Our first group included 149 patients who had endoscopic carpal tunnel release with the original Agee Inside Job instrument before its redesign and reintroduction. The second group of 152 patients had a two portal release with a technique of our devising, which differs significantly from that of Chow^{5,6} and other.^{7,8} Before performing endoscopic carpal tunnel release on patients, the surgeon performed each procedure on twelve cadaver hands. This was followed by open dissections, which showed the complete division of the transverse carpal ligament and the absence of any injury to neurovascular structures.

Indications. In all patients carpal tunnel syndrome was diagnosed on the basis of history and physical examination with confirmatory nerve-conduction studies. In each case conservative treatment with splinting and anti-inflammatory medicines failed. All patients had normal x-ray views of the carpal tunnel. None of the patients were pregnant, and none had clinical evidence of thyroid disease. Three patients in the one-portal group had concomitant ulnar nerve entrapment in Guyon's canal and were advised that endoscopic release might not solve their entire problem. Both open and closed procedures were carefully explained to each patient, and patients were allowed to choose between the procedures or to opt for continued non-operative therapy. One-portal technique. For each of the techniques, patients were under general or intravenous regional block anesthesia and tourniquet control. The instrument (3M Agee Inside Job) was carefully checked, and marks were placed inside the channel to assist in proper positioning of the blade assembly. With the patient's hand resting on a rolled towel, a 1.5-cm incision was made in the distal wrist crease ulnar to the palmaris longus. The anterior forearm fascia was exposed and an L-shaped incision was made in it. An elevator was used to push the synovium away from the under side of the TCL, and the "harmate finder" was used to confirm proper positioning. The instrument was then passed beneath the ligament until its distal edge was identified. The end of the channel was aligned with the distal edge of the ligament, a reference point on the ligament was noted relative to a channel mark, and the instrument was withdrawn about 0.5 cm until the end of the channel (extent of view through the endoscope) was aligned with the reference mark on the ligament. This was necessary so that the blade would not elevate distal to the ligament margin,

possibly injuring a nerve or a vessel. The cutting blade cannot be viewed from the endoscope. The TCL was found to extend 3 cm ± 0.5 cm distal to the distal wrist crease in both living and cadaver hands. The blade was elevated and the instrument was withdrawn, dividing the ligament. Subsequent passes could have been made but with greater difficulty in positioning. Division was considered complete when fibers of the palmaris brevis muscle were seen. An anterior forearm fasciotomy was then performed under direct vision from the same incision for a distance of 4 cm.

With the instrument back in the carpal tunnel, the tourniquet was released. If no bleeding was seen, the instrument was withdrawn and the wound was closed. Five to 10 ml of 0.5% bupivacaine was placed in the tissues, and the wound was dressed and splinted in 30 degrees of extension with the digits free for about 10 days.

Table I. Comparative results of endoscopic carpal tunnel release techniques

Postoperative week	One-portal endoscopic carpal tunnel release (149 patients)				Two-portal endoscopic carpal tunnel release (152 patients)			
	% of patients returning to work		% of patients asymptomatic		% of patients returning to work		% of patients asymptomatic	
	%	Cumulative	%	Cumulative	%	Cumulative	%	Cumulative
1	49	49	53	53	53	53	50	50
2	18	67	18	71	17	70	17	67
3	8	75	3	74	4	74	2	69
4	17	92	16	90	19	93	19	88
6	3	95	4	94	2	95	7	95
8	3	98	4	98	3	98	4	98
78	2	100	2	100	2	100	2	100

Table II. Other comparisons

Category	One-portal endoscopic carpal tunnel release (149 patients)*	Two-portal endoscopic carpal tunnel release (152 patients)†
Average days until return to work	16	15
Average days until asymptomatic	15	17
Complications:		
Symptoms not affected	2 patients	2 patients
Reflex sympathetic dystrophy	1, mild	1, mild
Converted to open	2 patients	None
Iatrogenic nerve or vascular injury	None	None
Other	2 patients	5 transient paresthesias‡
Recurrence	2 patients	None
Overall complications‡	6%	5%

*The authors believe that their experience of no iatrogenic one-portal system injuries was due to exhaustive cadaver training with instrument modification and the one-portal system nonetheless is inherently dangerous.

†The authors believe that the two-portal system is inherently safer.

‡Transient paresthesias were not seen after customized instrumentation was used.

Two-portal technique. A 1 cm skin incision ulnar to the palmaris longus and 0.5 to 1.5 cm proximal the distal wrist crease (but in the proximal wrist crease) was marked. Points 3 and 4 cm distal to the distal wrist crease and in line with the right finger were marked. The proximal incision was made and scissors were used to dissect subcutaneous tissue bluntly. The scissors were gently spread as the fascia was entered, creating the proximal portal.

The synovial elevator was then used to clear synovium from the TCL. The slotted cannula with the obturator in place was passed beneath the TCL, with the operator's dominant hand holding the obturator and the operator's nondominant thumb palpating the obturator tip as it passed beneath the distal edge of the TCL. The assistant then extended the patient's fingers and rolled the wrist into 10 degrees of extension while the operator incised directly over the obturator as it lay between the skin marks. The instrument was then passed out through the distal incision. The obturator was removed, and the endoscope was passed from distal to proximal to ensure a clear path. Under direct endoscopic vision, the hooked knife was put into the cannula (through the proximal wound) and hooked around the distal TCL. The knife was then withdrawn from distal to proximal under continuing direct vision, cutting the TCL in one steady, progressive motion. Rarely was a subsequent pass required. The confirmatory division view and other steps to conclude the procedure were the same as for the one-portal technique. Postoperatively, the patients were encouraged to move the digits within the limits of the dressing. Dressings and sutures were removed at 10 days, at which time the patients were instructed in wound massage and were allowed to resume normal activities as dictated by their symptoms or lack thereof.

Results

The results, summarized in Tables I and II⁴ are comparable for each of the techniques. Follow-up time was 1 to 10 months. Evaluation was largely subjective. The time of return to work was noted, as was the time at which the patient indicated that the preoperative symptoms were gone. In the one-portal group, two patients had concomitant ulnar nerve compression in Guyon's canal, which required an open operation for relief. There were two failures in the on-portal group. In one patient an open epineurotomy and flexor tenosynovectomy resulted in improvement. The other did not benefit from an open operation, presumably because of a long-standing diabetic neuropathy. In each of these cases it was noted that division of the TCL was complete.

Discussion

In a report before the American Society for Surgery of the Hand in Toronto in 1990, John Agee reported the results of a double-blind multicenter prospective randomized clinical study of the one-portal carpal tunnel release. These results indicate that there is less morbidity with a closed endoscopic carpal tunnel release than with an open operation. We now offer endoscopic carpal tunnel release to all patients who meet the generally accepted criteria for carpal tunnel release and in whom there is no contraindication to this procedure. Contraindications include (1) concomitant ulnar nerve entrapment in Guyon's canal, (2) a markedly thickened epineurium, (3) marked proliferative tenosynovitis, and (4) anatomic abnormalities. With either procedure patients may have residual numbness after the surgery.

We found that the on-portal technique is more difficult to perform. We have found the two-portal technique to be technically much easier, but instruction in its use is still necessary. Instruments for the two-portal technique are available from Instratek, Incorporated, Houston, Texas. Because of the small diameter of the cannula now used, occasional paresthesias due to nerve bruising, which was seen with larger instruments, no longer appears to be a problem.

References

1. Denman EE. The anatomy of the incision of carpal tunnel decompression. *Hand* 1981;3:17-28.
2. Ariyan S, Watson HK. The palmar approach for the visualization and release of the carpal tunnel. *Plast Reconst Surg* 1977;60:539-47.
3. Kessler FB. Complications of the management of carpal tunnel syndrome. *Hand Clin* 1986;2:401-6. MacDonald RI, Lichtman DM, Hanlon JJ, Wilson JN. Complications of surgical release for carpal tunnel syndrome. *J Hand Surg* 1978;3:70-6.
4. Chow JLY. Endoscopic release of the carpal ligament: a new technique for carpal tunnel syndrome. *Arthroscopy* 1989;5(4):19-24.
5. Chow JLY. Endoscopic release of the carpal ligament for carpal tunnel syndrome: 22 month clinical report. *Arthroscopy* 1990;6:288-96.
6. Okutsu I, Ninomiya S, Takatori Y, Ugawa Y. Endoscopic management of carpal tunnel syndrome. *Arthroscopy* 1989;5:11-8.
7. Resnick C, Miller B. Endoscopic carpal tunnel release using the subligamentous two-portal technique. *Contemp Surg* 1991;22: