

The Comparative Study of the Open Carpal Tunnel Release and the Endoscopic Carpal Tunnel Release

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ABSTRACT

A prospective randomized study was performed on 75 patients (81 hands) who had clinical signs and symptoms consistent with carpal tunnel syndrome. Diagnosis was confirmed with nerve conduction studies. Thirty-seven hands were treated with open carpal tunnel release and the remaining 44 hands by the endoscopic technique. The follow-up periods were 2, 3, 6, and 12 weeks after surgery.

The patients in both groups had significant improvement. Grip strength returned to normal after 12 weeks in the endoscopic group. There were no statistical differences in grip strength, provocative test, relief of pain, return to daily activity or work, or scar pain in either group. Subjective paresthesia was significantly improved in the open group. There was one recurrent case in the endoscopic group.

The endoscopic technique had a significant advantage over the open technique in terms of time to recovery of grip strength, but had a subjectively slower improvement of paresthesia.

Carpal tunnel syndrome (CTS) is the most common entrapment neuropathy seen in general practice¹. Conservative treatment is begun with splintage and local steroid injection. Surgery will be performed after conservative failure. Open carpal tunnel release is the standard surgical technique with excellent results. The endoscopic technique was developed in the past few years. Many studies have shown that patients could return to work sooner, grip strength recovery have been faster, and lower incidences of complication have occurred with this technique^{2,3,4,5}.

The endoscopic technique will likely be widely performed in the future. The results of both techniques were compared in this study.

MATERIALS AND METHODS

Inclusion criteria

A prospective randomized study was performed on outpatients of the Institute of Orthopaedics, Lerdsin General Hospital, during September 1995-October 1996. Patients had signs and symptoms consistent with CTS. Nerve conduction studies of the median nerve were done to confirm the diagnoses. None of the patients had a history of fracture around the wrist joint, rheumatoid arthritis, congenital wrist deformity, peripheral neuropathy, or cervical spondylosis and radiculopathy. Provocative tests and grip strength were examined in all patients preoperatively. Treatments were done using 2 techniques:

1. The open technique was done on 37 patients (35 females and 2 males). The average age was 47.5 years old.

2. The endoscopic technique was done on 44 patients (39 females, 5 males). The average age was 45 years old. Demographic data is in Table 1. There were no statistical differences in terms of age, duration of symptoms, involved hand, nerve conduction studies and grip strength preoperatively between both groups.

Surgical techniques

The anaesthetic technique was Bier's block⁶.

1. Open technique : A longitudinal incision was begun from the lower edge of the transverse carpal ligament to the wrist crease (Fig.1) along the axis of the ring finger. The Palmar fascia and transverse carpal ligament were cut. The incision was closed after exploration of the median nerve⁷.

2. Endoscopic technique : Chow's dual portal technique⁸ was performed with the proximal portal just proximal to the wrist crease and the distal portal at the distal edge of the transverse carpal ligament. The two incisions were in the axis of the ring finger (Fig.2). The volar

Table 1 Demographic data

	Open group	Endoscopic group	P - value
Number of patients	37	44	> 0.5
Male	2 (5.4%)	5 (11.4%)	
Female	35 (91.9%)	39 (88.6%)	
Age (years)	47.5 (22- 69)	45 (28-71)	> 0.5
Duration of symptoms (mo.)			
Paresthesia	25.5 (1- 84)	21.3 (2- 84)	> 0.5
Pain	6 (0- 35)	9.4 (0-91)	> 0.5
Weakness	1.9 (0- 36)	1.1 (0-30)	> 0.5
Atrophy of Abductor Pollicis Brevis	4 (9.1 %)	6 (16.2 %)	> 0.5
Steroid injection	0.7 (0- 2)	0.7 (0- 3)	> 0.5
Dominant hand			
Right	36 (97.3%)	43 (97.7%)	> 0.5
Left	1 (2.7%)	1 (2.3%)	
Surgical hand			
Right	26 (70.3%)	28 (63.6%)	> 0.5
Left	11 (29.7%)	16 (36.4%)	
Nerve conduction studies			
Initial sensory latency	3.56 ms.	3.89 ms.	> 0.5
Peak sensory latency	4.35 ms.	4.68 ms.	> 0.5
Motor latency	6.03 ms.	5.99 ms.	> 0.5
Grip Strength (kg.)	22.4 (8- 46)	22.2 (5- 43)	> 0.5

* Statistical significance $p < 0.05$

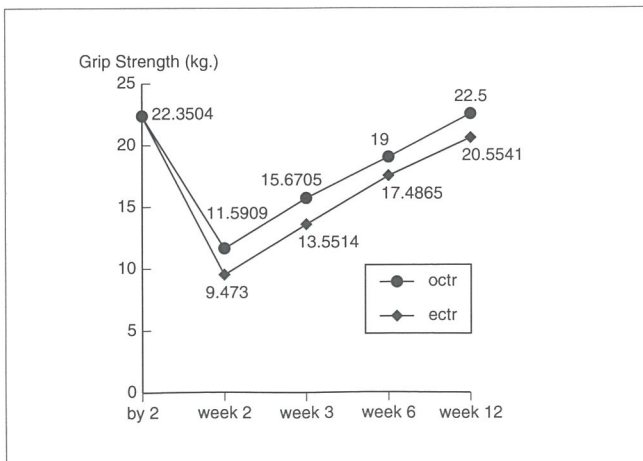


Fig. 1 Grip strength pre and postoperation

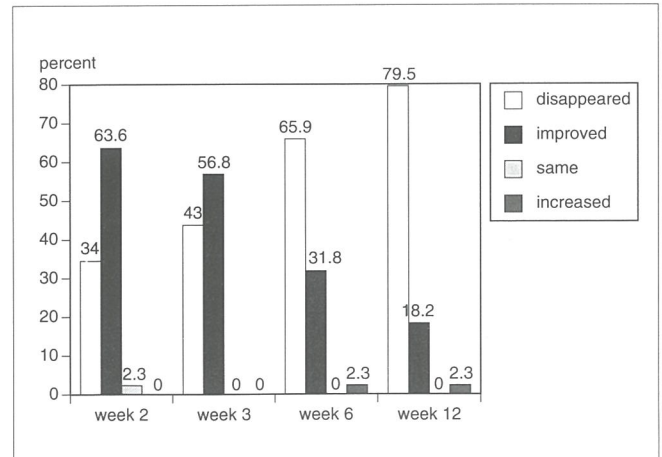


Fig. 2 Paresthesia in endoscopic group

antebrachial fascia was cut and a cannular system was inserted above the flexor tendon bursa. The wrist and fingers were extended over the hand holder. Another cannular system was inserted at the distal portal. A 4 mm. camera, 30 degrees, was inserted at the proximal portal. The transverse carpal ligament was cut with a retrograde blade. The incision was closed.

The removal of suture materials was done after 10 days. All of the patients were advised to do the ADL and go back to work as soon as possible.

Postoperative assessment

All patients were examined at 2,3,6, and 12 weeks postoperatively. They reported their symptoms, return to ADL and work. Grip strength was measured again at 12 weeks.

Nerve conduction studies of the median nerves were repeated at 12 weeks post operatively.

Statistical analysis

The frequency of patients who had paresthesia, positive provocative test, and return to ADL was analysed.

Pre and postoperative grip strength, duration of improvement of pain and paresthesia, return to work and ADL were analysed with Student-t-test.

Nerve conduction studies, pre and postoperatively, were analysed with Student-t-test.

Complications and patient satisfaction were analysed with Chi-square test.

RESULTS

Grip strength

Grip strength was significantly lower immediately after the operations in both groups (Fig.1). They returned to normal after 12 weeks in the endoscopic group, while they were still significantly lower than pre-operatively in the open group (Table 2).

Paresthesia

Paresthesia was the major presenting symptom in all patients. Improvement was reported after the operation. One case in the endoscopic group had a recurrence of paresthesia at 6 weeks follow-up (Fig.3).

Improvement of paresthesia was 8.3 days in the open group and 16 days in the endoscopic group. This was statistically significant ($p=0.03$).

Provocative test: Tinel's sign, Phalen's test

There were 35 positive Tinel's sign (94.6%) and 36 positive Phalen's test (97.3%) in the open group, pre-operatively. In the endoscopic group, there were 36 positive (81.8%) Tinel's sign and 42 positive Phalen's test (95.9%).

Both tests became negative very quickly after the

operation. One case in the endoscopic group had a positive test at 6 weeks though the test was negative at 2 and 3 weeks follow-up (Fig 4,5).

Return to activity of daily living and work

Patients in the endoscopic group returned to ADL after 7.2 days, quicker than the open group (7.9 days), but not significantly different ($p=0.481$). Return to ADL related to pain relief. Pain was improved at 5.2 days in the endoscopic group and 6 days postoperatively in the open group ($p=0.686$).

Return to work in the endoscopic group was also quicker, averaging at 19 days and 19.8 days in the open group. The difference was not significant ($p=0.844$).

Complications

There were scar and pillar pain in both groups. One infected case was found in the endoscopic group. Comparison of scar and pillar pain between the two groups is shown in Table 3.

Nerve conduction study

The improvement of sensory and motor nerve conduction studies were significant postoperatively in both groups (Table 4).

Patient's satisfaction

Patient's satisfaction was assessed as low, moderate, and high (Fig. 7). When compared between the two groups, there was no statistical significance ($p>0.05$).

If the symptoms developed again on the other side, most of the patients in both groups were willing to do the same operation again ($p>0.05$) (Fig.8).

DISCUSSION

The open carpal tunnel release is the standard treatment in indicated cases. The result is satisfactory; pain and paresthesia were relieved in about 80-98%^{4,9,10,11,12,13} of the cases. The most common complication found is scar pain in about 43% of cases. Return of grip strength to normal is usually prolonged by about 3-6 months¹⁴. The endoscopic technique provides the same relief of pain and paresthesia, but less complications and faster return to work^{1,5,15,16}.

In this study, grip strength returned to the pre-operative level at 12 weeks in the endoscopic group. This is the same as in a previous study where grip strength returned to normal at 4-12 weeks¹⁵. In the open group, grip strength was significantly lower than pre-operation at 12 weeks. The important factors were scar pain and the surgical incision which caused uncomfortable grasping.

The provocative test became negative very quickly in the first 2 weeks in both groups. One patient in the endoscopic group had a positive provocative test at week 6 and

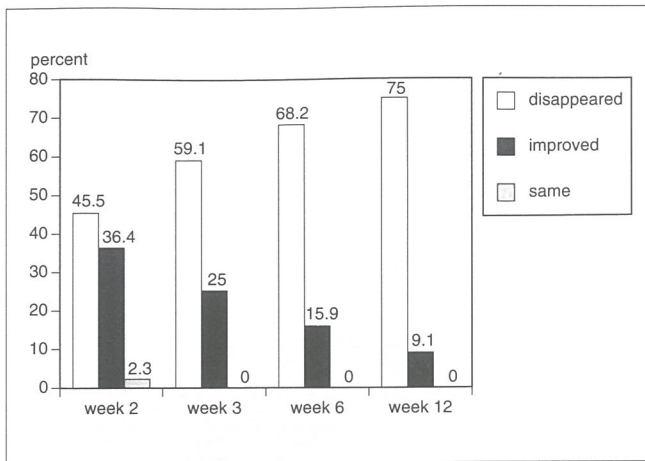


Fig. 3 Paresthesia in the the open group

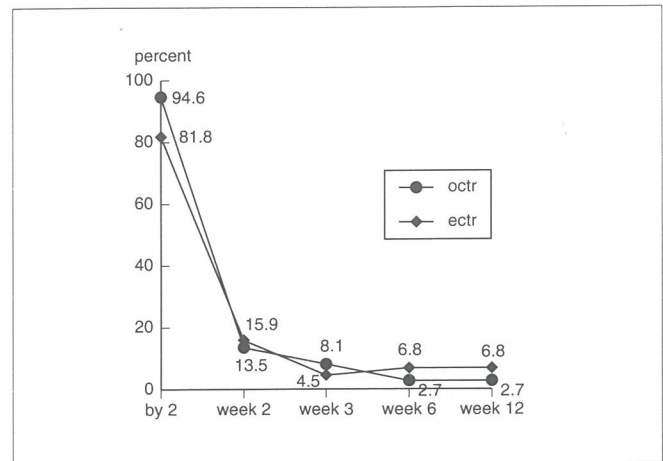


Fig. 4 Positive Tinel's sign pre-and post-operation

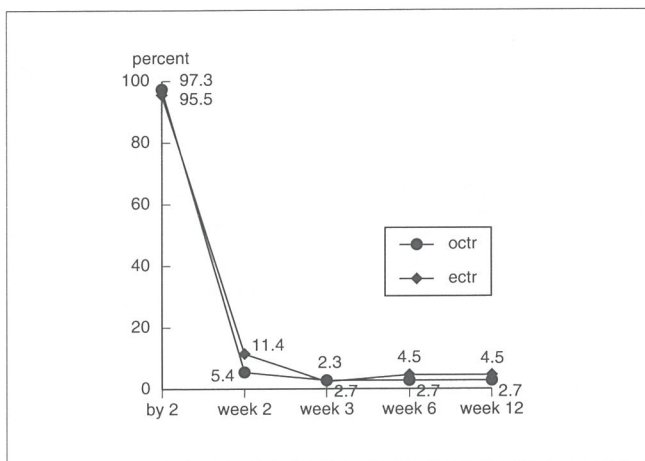


Fig. 5 Positive Phalen's test pre-and post-operation

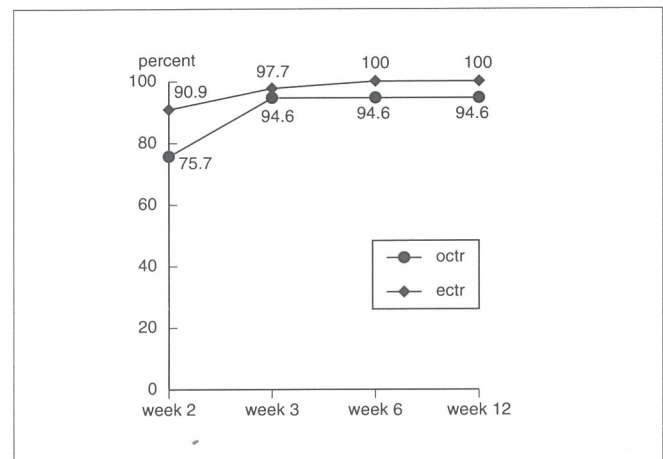


Fig. 6 Return to ADL

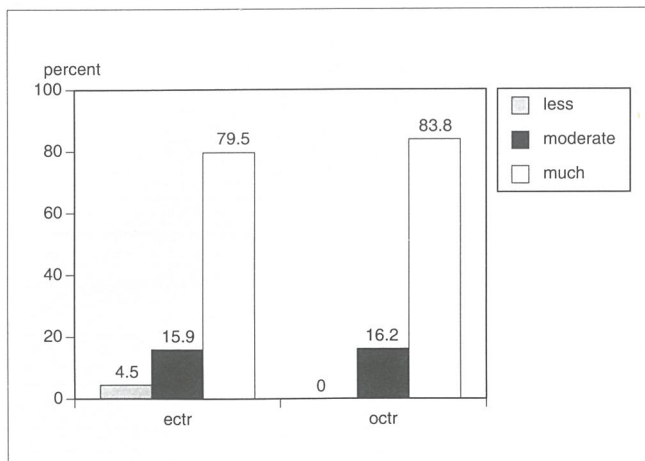


Fig. 7 Patient's satisfaction

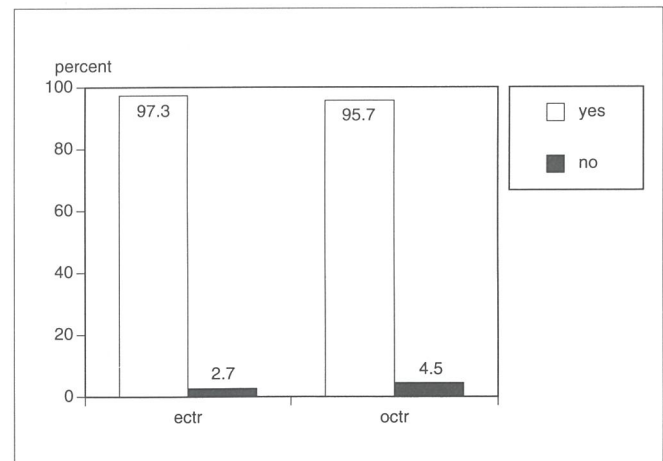


Fig. 8 Willingness to be treated on the other hand

Table 2 Grip strength

Week	Open group		Endoscopic group	
	Grip strength (kg.)	2-tail significance compared with pre-operation	Grip strength (kg.)	2-tail significance compared with pre-operation
Pre-operation	22.3784		22.1519	
2nd week	9.4730	0.000*	11.5909	0.000*
3rd week	13.5514	0.000*	15.6705	0.000*
6th week	17.4865	0.000*	19.0000	0.004*
12th week	20.5541	0.049*	2.5000	0.747

* Statistical significance $p < 0.05$

Table 3 Complications

Week	Open group			Endoscopic group			Chi-Square test
	Scar and pillar pain	Percent		Scar and pillar pain	Percent	Infection Percent	
2	8	21.6		8	18.2	1 2.3	0.865, $p > 0.05$
3	4	10.8		5	11.4	0 0	1.596, $p > 0.05$
6	3	8.1		5	11.4	0 0	0.24, $p > 0.05$
12	3	8.1		2	4.5	0 0	0.44, $p > 0.05$

* Statistical significance $p < 0.05$

Table 4 Median nerve conduction studies

Latency (ms.)	Open group			Endoscopic group			2-tail sig
	Pre-op	Post-op	2-tail sig	Pre-op	Post-op	2-tail sig	
Initial sensory latency	3.56	2.99	.000*	3.89	3.21	.000*	0.201
Peak sensory latency	4.35	3.69	.000*	4.68	3.96	.000*	0.277
Initial motor latency	6.03	4.50	.000*	6.09	4.84	.000*	0.184

* Statistical significance $p < 0.05$

12 after being negative previously. Improvement of paresthesia was significantly faster in the open group. The limitation of the operative field by the endoscopic technique might be the main cause. Fibrosis was found around the median nerve in a recurrent case in the endoscopic group. She had much improvement after the second operation.

Return to ADL was 91% in the first 2 weeks in the endoscopic group compared with 75.7% in the open group. More than 90% of patients in both groups could return to ADL at week 3, 6 and 12. In Chow's report, return to ADL was 58% at the 2nd week, 73% at the 3rd week and 86% at

the 4th week. There was no statistical significance in returning to work between either group based on the questionnaire. The result is the same as Bande's study¹. There was significantly faster return to work from the studies of Brown et al¹² and Agee et al¹⁵. Work compensation was an important factor in those studies. Most of the patients in this study are housewives, so they usually go back to work as soon as they can.

Previous studies have shown that there were less complications in the endoscopic group, especially scar and pillar pain^{1,12,15}. In this study, less complications were found in both groups. The type of operation might not be

the only factor that cause scar and pillar pain. Proper technique could reduce the rate of complications.

Motor and sensory conduction studies showed that both operations could relieve the compression on the median nerve. Paresthesia was significantly improved after both operations. However, it was faster in the open group than in the endoscopic group.

Most of the patients in both groups were satisfied with the result of the operation. They were willing to have an operation on the other hand if they had CTS again.

CONCLUSION

The endoscopic technique is another technique for treatment of CTS. A small incision could reduce pain and improve time till recovery of grip strength. Patients in both groups returned to work quickly.

The fact that most of the patients in both groups are housewives without work compensation might explain why there was no significant difference in terms of time till return to ADL and work between the two groups. However, paresthesia was found to improve slower in the endoscopic group.

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