

A PROSPECTIVE RANDOMIZED STUDY ON THE CLINICO-ELECTROPHYSIOLOGICAL RESULTS OF OPEN AND ENDOSCOPIC CARPAL TUNNEL RELEASE SURGERIESSreejith T. G¹, Althaaf Mohamed A. H²**HOW TO CITE THIS ARTICLE:**

Sreejith T. G, Althaaf Mohamed A. H. "A Prospective Randomized Study on the Clinico-Electrophysiological Results of Open and Endoscopic Carpal Tunnel Release Surgeries". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 78, September 28; Page: 13680-13687, DOI: 10.14260/jemds/2015/1954

ABSTRACT: OBJECTIVE: To compare short term surgical outcome of carpal tunnel syndrome release, against endoscopic approach. **MATERIALS AND METHODS:** A prospective randomized study was conducted on 91 patients with carpal tunnel syndrome, who were treated endoscopically or surgically from 2011 to 2013 at KMCT medical college, Calicut. All the patients were confirmed as a case of carpal tunnel syndrome after correlating sensory nerve conduction studies with clinical findings. None of these cases responded to medical treatment and hence opted surgery. Out of these 91 cases, 71 patients were available for post-surgical follow up. On 35 cases endoscopic CTR was performed and remaining 36 were open CTR. These patients were followed up for 6 months and each patient was evaluated for symptom amelioration, complications, operation time, time needed to resume normal lifestyle and the frequency of revision surgery if needed. **RESULTS:** First few months after surgery, it was observed that endoscopically treated patients were better symptomatically and functionally. Wound scarring, scar tenderness and other local wound problems were significantly more pronounced in patients who underwent open CTR. Return to normal daily activities were more delayed in open CTR patients compared to endoscopically treated wrists. Even then there was no significant symptom amelioration, electromyographic testing and complications at the end of six months between these two methods. **CONCLUSION:** Immediate, short term results were better in endoscopically treated patients due to cosmetic advantages as there is less scar and early return to activities of daily living. On a 6 month review, it was found that both the methods gave comparable results.

KEYWORDS: Carpal tunnel syndrome, Endoscopic carpal tunnel release, Open carpal tunnel release.

INTRODUCTION: Carpal tunnel syndrome is a condition in which the patient feels numbness, loss of dexterity, muscle wasting and decreased functional ability of hand over the course of median nerve, due to its compression at the wrist. The operative procedure of choice remained open release of transverse carpal ligament thereby decompressing the median nerve.¹⁻³ Recent advances in endoscopic procedures and techniques have invaded CTS by way of transverse carpal ligaments release. Endoscopic carpal tunnel release (ECTR) is associated with minimal pain and negligible scarring, thanks to the small incision. A very shortened recovery period and a high level of patient satisfaction is an added advantage.^{4,5} Current literatures suggest that the long-term results of endoscopic CTR are the same as those of an open CTR.⁶ However, there are studies arguing the claims that the endoscopic carpal tunnel release is associated with quicker functional recovery and less postoperative pain.⁷ But endoscopic CTR is still not preferred due to unavailability of expert hands, cost of endoscopic equipments, difficulty of surgery, Incomplete endoscopic release, higher recurrence rate.^{1,8}

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MATERIALS AND METHODS: The study group consisted of patients with CTS who were given conservative line of treatment using splints and Non-steroidal Anti-Inflammatory (NSAIDS) medications, which failed to give any further symptomatic relief over a period of 3 months. The diagnosis was based on at least two relevant findings got through detailed history and clinical examination (Night pain, Median nerve sensory disturbances, Phalen's test, Tinel's sign at the wrist).

Since these tests had very low sensitivity and specificity, diagnosis was further confirmed by nerve conduction velocity studies. Patients who were pregnant, bleeding or coagulation disorders, on anticoagulants, who were on hemodialysis, past history of trauma of the same wrist/hand were all excluded from the study. Grip and pinch strength were recorded along with electrophysiological studies preoperatively to further confirm the diagnosis. Electrophysiological studies were further carried out postoperatively and after 6 months to evaluate the outcome of the surgery.

Electrophysiological confirmation was achieved using the combined sensory index, which is the sum of three latency differences, say median-ulnar across the palm (Palmdiff), median-ulnar to the ring finger (Ringdiff) and median-radial to the thumb (thumbdiff).⁹ All patients included in the study met the American Association of Electrodiagnostic Medicine diagnostic criteria for CRS.^{9,10}

Endoscopic Group: Out of 91 patients, 41 had undergone endoscopic release of carpal tunnel of which 35 were available for follow-up. This group had a mean age of 45.6 yrs. and a female count of 16. Mean duration of symptoms was 6.5 i.e. 3-12 months. Out of this 21 had dominant hand involved. 18 patients had been treated with a splint for 4-6 weeks prior to the surgery, 7 with steroid injection. **Open Release Group:** 50 Wrists were in this group, out of which 36 was available for follow-up. 20 were females, dominant hand involved in 23 patients with a mean age of this entire group being 45.1. Mean duration of symptoms for this set of patients was 5.1 i.e. 4-10 months. 21 patients were treated with splint for 4-6 wks. and 5 with steroid injection prior to surgery.

Surgical Technique: A tourniquet was used in all cases. 100% cases were done under regional anaesthesia. The 1st group of 35 cases was treated with a single portal endoscopic approach while the second group of 36 was had a small incision open carpal tunnel release.

Endoscopic CTR: Transverse incision of 1cm was made at the level of distal crease at the center of the volar aspect of wrist. If Palmaris longus was present, incision was centered to that. It is then retracted radially to protect the palmar cutaneous branch of the median nerve. A flap is then made over the flexor retinaculum and the median nerve is identified which is present deep to the retinaculum. A synovial elevator is inserted to a depth of less than 3 cm only to avoid any possible injury to the superficial palmar arch or the common digital nerve to the fourth web space.

When the trigger is depressed a blade is elevated and then the elevator is withdrawn to release the transverse carpal ligament. Since the carpal ligament is very thick, several attempts will be needed. Finally the incision is closed with sutures.

Open CTR: An incision is made 2mm from the thenar crease to ulnar side, just proximal to Kaplan oblique line. Incision is extended proximally to the distal wrist crease. Palmar aponeurosis, dissected longitudinally after identifying transverse carpal ligaments. Transverse carpal ligament and antebrachial fascia are divided in order to release the median nerve. Tourniquet is deflated and wound

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closed with sutures. Active assisted exercise and normal daily activities were initiated after the suture removal, two wks later.

Follow up

Post-operative Evaluation: These patients were reviewed after one month and at sixth month respectively. Assessment for recovery in terms of early and complete return to daily activities was done. Residual pain and scar tenderness was also noted. Symptomatic improvement, functional stability, electrophysiological reports and intraoperative complications were noted for each patient individually.

Symptoms were evaluated as:

1. Severity of incisional pain.
2. Changes in severity of pain.
3. Tingling sensations.
4. Severity of night time numbness.
5. Hand weakness.

Function was evaluated as:

1. Pinch strength.
2. Grip strength.

Both symptoms and function was compared with preoperative state.

RESULTS

PREOPERATIVE PARAMETERS

PARAMETER		ENDOSCOPIC GROUP (35)	OPEN SURGICAL (36)
Hand involved	R	18	21
	L	17	15
	B/L		
DURATION OF SYMPTOMS	3-6 MONTHS	20	10
	6-9 MONTHS	14	19
	>9 MONTHS	1	7
PAIN SEVERITY	0-3		
	4-6	23	15
	7-10	12	21
NUMBNESS	MILD		
	MODERATE	26	23
	SEVERE	9	13
SENSORY LOSS		24	29
WASTING OF APB		2	6
PREVIOUS TREATMENT	ANALGESIC	35	36

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	LPOCAL STEROIDS	5	11
	SPLINT	7	9
	OPEN SURGERY		
	ARTHROSCOPIC SURGERY		1
INITIAL RESPONSE TO PREVIOUS TREATMENT	EXCELLENT	9	11
	GOOD	18	19
	NO RESPONSE	8	6
	WORSE		
OVERALL RESPONSE TO PREVIOUS T/T	EXCELENT		2
	GOOD	34	33
	NO RESPONSE	1	1
	WORSE		
ADL AFFECTED DUE TO CTS	MILD	13	11
	MODERATE	15	16
	SEVERE	7	9

During the entire duration of study, 91 patients (Wrists underwent endoscopic or open release of median nerve. 71 patients were available for follow up after one month and at 6 months post-surgery for evaluation. The mean duration of symptoms was 6.5 months in endoscopy group and 5.1 months in open surgery group. Nearly all patients had at least moderate degree of paresthesia and sensory loss. Wasting of abductor pollicis brevis was present in 2 patients in endoscopy group and 6 patients in open surgery group.

Post-operative Evaluation at 1 Month:

In 17 out of 35 patients, initiation of symptomatic relief was within three days who underwent endoscopic carpal tunnel release whereas only 12 wrists out of 36 who underwent open carpal tunnel release reported early relief. Following open surgery 3 patients had relief of symptoms 2 weeks later. Out of 35 patients who underwent endoscopic treatment, 19 had nearly complete remission of symptoms while 17 patients out of 36 open surgery patients reported the same. The incidence of local pain and scar tenderness was significantly higher in open surgery patients, where 20 out of 36 reported mild local tenderness and 18 patients reported scar tenderness as compared to only 2 patients who reported local pain in after endoscopic procedure. Local wound hematoma was not seen in endoscopic patients, where as it was noticed in 2 patients after open surgery. Compression dressings applied and local hematoma was resolved within two weeks in both the cases. No patient reported worsening of symptoms or new development of sensory loss, almost all patients had complete relief from night symptoms.

Post-operative Parameters: 6 months:

71 cases out of 91 were available for follow-up at six months postsurgery. 31 out of 35 patients who underwent endoscopic procedure showed near complete relief of symptoms,

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meanwhile 33 out of 36 patients who underwent open surgery had complete relief as well. Local scarring was present in 3 patients and keloid in 1 patient who had open surgical correction. Residual numbness was limited to 3 patients after endoscopy and 5 patients after open surgical management.

Residual motor weakness noted in 2 patients of endoscopy group and 4 patients from open surgery. The higher incidence of residual motor weakness or numbness post open surgical treatment is believed to be due to preexisting neurological deficit in these patients. At the 6th months scar tenderness was persistent in patients who underwent open surgical correction, i.e. in 9 patients. Endoscopic CTR group had no post-surgical incision site complication. The endoscopic CTR patients returned to normal daily activities at a shorter period of time compared to open surgical CTR patients, i.e. 14 days against 20 for the later.

At the 6th month follow-up, grip strength was evaluated and a positive improvement was noted in both set of patients. Endoscopic and open release group showed similar improvement in the grip strength with preoperative value of 19.6 kg to a postoperative value of 22.7 kg in endoscopy CTR and 19.2kg to 22.2kg in open CTR patients

Parameters		Endoscopic group (35)	Open surgical group (36)
Relief in pain (pain scale 0-10)	0-3	31	33
	4-6	4	3
	7-10	-	-
Recurrence of symptoms		-	-
Local scarring			3
Keloid formation			1
Remission	100%	27	24
	>75%	6	8
	50-75%	2	4
	<50%	-	-
Residual numbness		3	5
Residual motor weakness		2	4
Subjective improvement	Excellent	26	28
	Good	9	8
	Worsening	-	-
Scar tenderness		-	9
No of days wasted to daily activities		14	20

Electrophysiological Results: In a 6 months post-surgery evaluation of endoscopic CTR group, both distal latency and conduction velocity parameters improved to an average of 3.7ms and 50m/s from a preoperative value of 4.7ms and 40m/s respectively. On the other hand, Six months post-surgery evaluation of the open carpal tunnel release group, the average distal latency and conduction velocity recorded in preoperative period was 4.8 ms and 40 m/s which improved to an average of 4.0ms and 48m/s respectively.

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Distal latency of the median nerve was observed to be reduced and the nerve conduction velocity was increased in all the patients in both the groups. However, there was no appreciable difference in the pattern of recovery between the two groups.

DISCUSSION: Open CTR has been considered the gold standard operative procedure for decompression of the median nerve at the wrist in patients who have idiopathic CTS.^{2,3} However, some authors point out that after open surgical intervention, persistent weakness, tenderness of the scar and pain in the thenar-hypothenar area is more frequently noted.¹¹⁻¹⁵ as an alternative method, with the aim to reduce the rate of these complications, endoscopic release of the carpal tunnel was introduced.⁸ Endoscopic CTR as claimed is associated with minimal pain and scarring due to minimal incision, a shortened recovery period and a high level of patient satisfaction.⁵ After in depth analysis of the outcomes of our study, it is understood that the patients who had undergone endoscopic release had greater relief of symptoms, improvement in function and satisfaction for the first three months following the surgery. Compared to open release group, they had a faster recovery of in terms of both grip and pinch strength, findings that agree with those in the nonrandomized study performed by Palmer et al.⁷ With the endoscopic technique the palmaris brevis muscle & palmar fascia were not divided, and that could be the reason for it. 1 isolated report focused on the risks involved in endoscopic surgery,¹⁶ these findings were not borne out in larger, prospective, multicenter trials. ^{8,7,17} 93.3% success has been reported in 116 wrists from 84 patients followed for 5 years after endoscopic release surgery and the recurrence rate was only 0.96%.¹⁷

Reported major complications after endoscopic carpal tunnel release include median and ulnar nerve laceration, vessel and tendon lacerations, intense pain over the middle and ring fingers.^{18,19} Even though, apart from the structure injury specified above, recurrent hematoma and infection are the other complications reported after endoscopic carpal tunnel release. But in our study, no complication occurred in endoscopic technique. The factor that we think nullified the complications in our study was a team that had expert hands on experience in fiberoptic-assisted surgery.

CONCLUSIONS: Short-term results were better with the endoscopic method as there was no scar tenderness and results at six months were comparable in both groups. There were no significant complications associated with any of the two methods of carpal tunnel release.

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