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ORIGINAL ARTICLE

Comparative Study Between Open and Endoscopic Carpal Tunnel release

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ABSTRACT

Background: Carpal tunnel syndrome (CTS) is a nerve entrapment disorder characterized by pain, paraesthesia and hand muscle wasting. Appropriate treatment used to avoid permanent disability development. Conservative treatment could be enough, although some patients need surgery. Surgical treatment includes open or endoscopic technique. **Objectives:** This study was aimed to compare the endoscopic carpal tunnel release (CTR) results of open CTR in patients having idiopathic Carpal tunnel syndrome (CTS). **Patients and Methods:** This study carried out in the Department of Orthopedic Surgery in the Faculty of Medicine, Zagazig University Hospital (Egypt) and Misurata Medical Centre (Libya) on 48 patients subjected to surgical and endoscopic approach (24 Cases for each). **Results:** Endoscopic group was significantly better than open group regard **Boston Carpal Tunnel Syndrome Questionnaire (BCTQ) and Boston Carpal Tunnel Syndrome Questionnaire (BCTQ)**. There was no statistical significant difference in the studied groups regard any score and both groups were nearly matched both group were significantly improved from pre to early and also late post operative. There was no statistical significant difference between studied groups regarding general distribution of complication between groups but infection and pillar pain was significantly higher in open but recurrence significantly higher in endoscopic group. **Conclusions:** Short-term outcomes were better in the endoscopic method according to the absence of scar tenderness and the comparable results at six months in the surgical and endoscopic approach. There were no statistical significant difference regarding complications in the carpal tunnel release by the two methods in the studied groups.

Keywords Endoscopic Carpal syndrome(CTS), carpal tunnel, carpal tunnel release (CTR)

INTRODUCTION

Surgical treatment of carpal tunnel syndrome (CTS) is performed in case of symptoms severity or fail of conservative management. The traditional open carpal tunnel release (OCTR) considered the standard method for CTS [1].

The endoscopic carpal tunnel release was introduced to reduce the morbidity and expediting recovery of early surgery,

Endoscopic carpal tunnel release has widely adopted as open release with advantages of postoperative pain reduction, fast grip power return, early return for work and return to work activities and less wound complications related to OCTR such as hypothenar pain, thenar pillar pain and scar tenderness [2].

The common disadvantage of this technique is the occurrence of hypertrophic scars in the thenar and hypothenar eminences

with pain , which require more technically demand, cost and additional tools comparing to the OCTR [3].

There is no general acceptance for proper surgical management of idiopathic CTS regarding the efficacy and safety of ECTR and OCTR, especially the complications such as tendon, nerve and vascular injuries, postoperative hand function, wound infections and the return to work [4].

AIM OF WORK

The aim of this study was to compare the endoscopic carpal tunnel release (CTR) results of open CTR in patients having idiopathic Carpal tunnel syndrome (CTS).

PATIENTS AND METHODS

This study carried out in the Department of Orthopedic Surgery in the Faculty of Medicine, Zagazig University Hospital (Egypt) and Misurata Medical Centre (Libya) during the period from September 2018 to March 2019. The study included 48 patients of carpal tunnel syndrome, they were 37 females and 11 males their age ranged between 25 to 60 years with mean age 42 years, 20 patient had comorbidities such as (8 patients with hypertension, and 5 patients were Smokers and 15 patients with high body mass index) while other 28 patient with no comorbidities. They were treated by open and endoscopic release of CTS.

Written informed consent was obtained from all patients and the study was carried according to the research ethical committee, of Faculty of Medicine, Zagazig University, the work was carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving human.

Patients were divided into 2 groups:

Group I : included (24) patients operated by open technique

Group II: included (24) patients operated by single portal endoscopic release (Agee technique)

Inclusion Criteria:

- 1- Patients with Primary idiopathic Carpal tunnel syndrome .
- 2- symptoms duration was three months at least.
- 3- Patients treated six weeks for wrist splint with Inadequate response

- 4- Nerve conduction test showed median neuropathy of wrist .

Exclusion Criteria:

- 1- patients have Inflammatory joint disease,
- 2- Diabetes mellitus.
- 3- Thyroid gland disorder .
- 4- Pregnant patients.
- 5- Hand trauma during the last year and previous surgery carpal tunnel release for the affected hand .

Surgical Technique :

All patients underwent carpal tunnel release under local anesthesia except ten patient done under general anesthesia due to the patients request. We started by cleaning the limb with disinfectant such as surgical soap and saline. After that sterilization of surgical field using (iodine) furthermore drapping of the whole limb with complete aseptic technique .

Operative steps :

A - Open release of carpal tunnel syndrome (24 Patients)

Patient in supine position, tourniquet applied above elbow.

make The incision was made at the Kaplan cardinal line intersection and the radial border of the fourth ray ending at the wrist crease. to be long enough that distal and proximal aspects of the TCL can be visualized.

Expose the TCL use a scalpel to dissect through the subcutaneous fat and palmar tissue ,the palmaris brevis muscle is often seen superficial to the TCL. Incise and feather the palmaris brevis muscle from the TCL to allow sufficient visualization.(fig 1)

Visualize the superficial surface of the TCL place a retractor , to protect the critical structures that are located between the skin and the TCL. Release the TCL medially ,identify the most ulnar aspect of the TCL in the canal close to the hook of hamate, release the TCL under direct visualization

Release the distal anti brachial fascia proximally this is another site of compression.(fig 2)

Confirm release of the TCL proximally and distally ,Superficial wound closure use 3-0 proline to close skin

B - Endoscopic release of carpal tunnel syndrome (24 pateints)

Make the incision through a limited single opening in the wrist flexor crease through open less than 1 cm (fig 3), device is inserted into the carpal tunnel through this opening (fig 4). Viewing the transverse carpal ligament (TCL) deep side under direct visualization at the instrument tip, the surgeon elevates the blade to cut the ligament at the instrument withdrawal, then the tourniquet released after obtaining an adequate haemostasis, the skin sutured with 5-0 proline (fig 5). A sterile dressing was applied for the wound.

Statistical analysis

Data were analyzed by SPSS 20, software for Windows. The significance level was set at $P < 0.05$

RESULTS

Table (1), showed that the mean age was 56.33 ± 6.36 with no statistical significant difference in the studied groups, regarding to sex there was no statistical significant difference in the studied groups. Table (2),

showed that there was no significant difference in the studied groups according to complain side. Also, there was no significant difference between the studied groups regarding nerve conduction (Compression type). **Table (3)**, showed that before the surgical intervention, there was no statistical significant difference in the studied groups as regard the Hand assessment scores before operation. Endoscopic group were significantly better than open group regarding to the Hand assessment scores after operation in first 9 weeks post operative. There was no statistical significant difference in the studied groups regarding final assessment, they were significantly improved postoperatively. **Table (4)**, showed that there were insignificant difference regarding to general distribution of complication between studied groups, but the infection and pillar pain were significantly higher in open group and recurrence was higher significantly in the endoscopic group

Table (1): Age and sex distribution between studied groups

			Endoscopic (N=24)	Open (N=24)	X ² /t	P
Age			56.33 ± 6.36			
Sex	Female	N	17	20	1.22	0.224
		%	70.8%	83.3%		
Male		N	7	4		
		%	29.2%	16.7%		
Total			N	24		
			%	100.0%		

Table (2): Patients characters distribution between studied groups

			Operation type		Total	X ²	P
			Endoscopic	Open			
Side	Left	N	10	6	16	1.5	0.22
		%	41.7%	25.0%	33.3%		
	Right	N	14	18	32		
		%	58.3%	75.0%	66.7%		
Compression type	Mild	N	3	0	3	5.6	0.058
		%	12.5%	0.0%	6.2%		
	Moderate	N	10	6	16		
		%	41.7%	25.0%	33.3%		
	Severe	N	11	18	29		
		%	45.8%	75.0%	60.4%		
Total		N	24	24	48		
		%	100.0%	100.0%	100.0%		

Table (3) : Boston Score distribution between groups at pre operative, early post operative and late post operative

Pre operative symptom	45.83±7.23	47.95±5.3	1.772	0.072
Pre operative function	33.91±5.42	35.37±3.6	1.880	0.061
Early post operative symptom	15.04±2.92	21.7±3.8	6.704	0.00**
Early Post operative functional	10.37±2.1	16.37±4.5	5.857	0.00**
Late post operative symptom	13.12±4.7	12.16±2.05	0.907	0.369
Late post operative functional	9.73±3.2	8.71±1.57	0.933	0.356

Table (4): Complication distribution between studied groups

			Endoscopic	Open	Total	X ²	P
Complication	Normal	N	21	21	42		
		%	87.5%	87.5%	87.5%		
	Infection	N	0	2	2	0.01*	
		%	0.0%	8.3%	4.2%		
	Pillar pain	N	1	2	2	0.242	
		%	4.2%	8.3%	4.2%		
	Recurrence	N	2	0	2	0.01*	
		%	8.4%	0.0%	4.2%		
Total		N	24	24	48		
		%	100.0%	100.0%	100.0%		

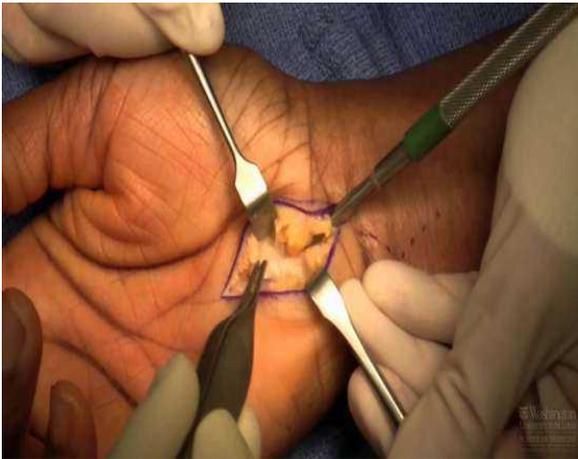


Fig (1): Open release of TCL

DISCUSSION

Many variations of the endoscopic approach were developed, several studies evaluated their safety and compared them with the traditional open technique [5].

Open Carpal tunnel release (CTR) is considered the operative approach choice for releasing the median nerve in the wrist. Endoscopic carpal tunnel release (ECTR) has the advantage of minimal scarring and pain due to the small opening, a short recovery period and a highly patient satisfaction. Recent studies reported that the endoscopic CTR long-term results are similar to open CTR results, although other studies reports was disagreement with the result of quick functional recovery and less postoperative pain in the endoscopic carpal tunnel release [6].

Dalziel and Shimi [7] Concerns persist about endoscopic release resulting in incomplete release, higher recurrence rate along with questionable safety of endoscopic approach, endoscopic equipment cost and difficulty of the operation.

Our study demonstrated that age was distributed between groups as 56.33 ± 6.36 with no significant difference in the studied groups, female were majority in both groups with no significant difference between studied groups as regard sex.

Our study demonstrated that there was no significant statistical difference in the two groups as regard preoperative score.

The results of **Fernandes et al.** [8] who conducted a clinical trial in Brazil including 15 patients (30 hands) were estimated by



Fig (2): Median nerve after decompression

Boston Questionnaire and Michigan hand questionnaire, palmar grip strength, and tripod pinch strengths were in agreement with our study, where they found no statistical significant difference between the means of the preoperative period.

The study of **Hu et al.** [9] revealed that the symptom severity was reduced by ECTR and OCTR compared with the preoperative case. ECTR had a significant improvements in the recovery of hand function, where daily living and self-care activities of patients such as personal care, work, and leisure were highly improved during a short postoperative time.

The study of **Sayegh and Strauch** [2], demonstrated that patients who underwent ECTR returned to work sooner according to the validation scores.

In our study endoscopic group was significantly better than open group regard **Boston Carpal Tunnel Syndrome Questionnaire (BCTQ)** in early stage, then the studied groups became the same in late stage.

Also, there was no significant statistical difference between studied groups regard any score and both group were nearly matched both group were significantly improved from pre to early and also late post.

Fernandes et al. [8] verified that the endoscopic and open surgeries regarding three-digit (tripod) pinch grip power scores, no dissimilarity was detected in the mean scores in the preoperative period, and at 14 days, 30 days, and 90 days postoperatively. At 180 days postoperatively, the open surgery group

presented higher three-digit grip strength than the endoscopic surgery group.

Results of our study were coincide with the study of **Hu et al.** [9] who reported that symptom severity was reduced by ECTR and OCTR, compared to the preoperative case. ECTR had a significant progresses in hand function improvement, which allow patients to reach higher gains in self care and daily living activities, such as work, self care and leisure during a short postoperative time [15].

Chen et al. [10] reported that ECTR the required time for return to work by 8 days in comparison to OCTR:

Larsen et al. [11] found that ECTR reduced the pain in the scar area, good esthetic results, daily activities and a rapid return to work.

Al-kelabi and Alashraf [12] reported that there **was** no significant statistical difference in the studied groups regard any scores of symptoms severity in all postoperative follow up periods and both group showed identical symptoms relief .

Vasiliadis et al. [6] demonstrated that patients in endoscopic surgery group were had recover palmar and finger grip strengths faster than patients in open surgery group.

Klein et al. [13] reported that endoscopic release had quicker recovery, less scar tenderness, and early return to work. However, ECTR had great complication rates ranged between 0.43 - 24 % .

In our study there was no significant statistical difference between studied groups regard general distribution of complication between groups but infection and pilar pain was significantly higher in open but recurrence significantly higher in endoscopic group, these results were agreed with the study of **Hu et al.** [15] reported that there was no statistical significant difference between ECTR group and OCTR group as regard complications .

Also, **Vasiliadis et al.** [6] reported that complications were infrequently in study of 25 patients, where complications recorded in 10 patients. Major complication ere reported in 12 patients in ECTR group and in 12 patients also in OCTR group.

In contrary to our results, **Thoma et al.** [14] who reported that ECTR was associated with frequent complications and high costs

which requires additional equipment. The limits of this study was due to the fact that the hands were not operated during the same surgical procedure. In the current study, surgery was indicated for the contralateral hand according to justified symptoms for surgical treatment.

Our results suggest that short-term results were good with the endoscopic approach due to absence of scar tenderness and results after more than 9 weeks (late) were comparable in studied groups. There were no statistical significant difference regarding complications in the carpal tunnel release by the two methods in the studied groups.

Conclusion : Short-term outcomes were better in the endoscopic method according to the absence of scar tenderness and the comparable results at six months in the surgical and endoscopic approach. There were no statistical significant difference regarding complications in the carpal tunnel release by the two methods in the studied groups.

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