

Endoscopic Carpal Tunnel Release Experience at King Hussein Medical Center

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ABSTRACT

Objective: To describe the results of the endoscopic carpal tunnel release using the MicroAire Carpal Tunnel Release System.

Methods: This descriptive study was conducted from June 2007 to May 2009 on 63 patients (68 hands) who underwent endoscopic carpal tunnel release for severe carpal tunnel syndrome in the Royal Jordanian Rehabilitation Center at King Hussein Medical Center. The procedure was performed using the MicroAire Carpal Tunnel Release System by an experienced hand orthopaedic surgeon. This is a new procedure performed for the first time in Jordan at King Hussein Medical Center. The operating time was between 10-25 minutes. The indications for carpal tunnel release are severe carpal tunnel syndrome diagnosed clinically and by nerve conduction studies and lack of response to conservative treatment using Futuro splinting and ultrasound physiotherapy for more than three months.

Results: Endoscopic carpal tunnel release provided complete relief of parasthesia on the first day and relief of wound pain during the first three days. Return to work after this procedure was between 4 to 22 days with a mean return time of 9 days. Three patients were converted to open technique because the flexor retinaculum and the median nerve could not be visualized. One patient had alkalptonuria and the other two had blood inside the carpal tunnel due to failure of Bier's block and release of the tourniquet. They were excluded from the sample and the study was conducted upon 65 hands. The complication rate among the study group was 7.6%. On the other hand, no vascular injuries and no major nerve injuries were reported. Complete relief of symptoms occurred in 93.8% of the study group.

Conclusion: This procedure is an effective, safe and convenient procedure for the treatment of carpal tunnel syndrome in the hand, associated with less palmar pain, less scar tenderness, a high return to work rate and an extremely low complication rate. It is a quick procedure with good results in short-term postoperative rehabilitation.

Key words: Carpal tunnel syndrome, Endoscopic release, Surgical outcome

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Introduction

Endoscopic Carpal Tunnel Release (ECTR) was first reported by Chow and Okutsu in 1989. Their technique was the 2-portal approach and transbursal.

Agee reported a one-portal technique for ECTR using The MicroAire Carpal Tunnel Release System in 1990.

The endoscopic technique for the surgical treatment of carpal tunnel syndrome was developed to decrease postoperative morbidity and accelerate the patient's return to normal activities and work.⁽¹⁾

Endoscopic techniques were introduced to address problems occasionally encountered with open carpal tunnel release surgery-scar tenderness, palmar pain,

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and protracted time away from work.

On the basis of clinical outcome measures, ECTR is an effective operation for treating idiopathic carpal tunnel syndrome.⁽²⁾ The MicroAire Carpal Tunnel Release System is a technological breakthrough in carpal tunnel surgery. This innovative system, using a minimally-invasive approach, provides significant patient benefits. The original Agee Carpal Tunnel Release System, was developed by J. M. Agee and F.C. King at the Hand Biomechanics Laboratory in Sacramento, CA, in 1990.⁽³⁾

A small incision at the base of the wrist creates an entry for the disposable blade assembly. An endoscope, connected to a standard video camera system, provides a clear view of the underside of the transverse carpal ligament. With the disposable blade assembly accurately positioned beneath the transverse carpal ligament, the surgeon elevates the retractable blade by means of a trigger, and withdraws the blade assembly—incising the ligament. Endoscopic decompression is a minimally invasive alternative to open decompression and offers a potentially quicker recovery for the treatment of the carpal tunnel syndrome.^(4,5)

The objective of the study was to describe the results of the ECTR as a new procedure using the MicroAire Carpal Tunnel Release System.

Methods

This descriptive study was conducted from June 2007 to May 2009, on 63 patients (68 hands) who underwent ECTR for severe carpal tunnel syndrome in the Royal Jordanian Rehabilitation Center at King Hussein Medical Center. The operations were performed by an experienced hand orthopaedic surgeon using the MicroAire Carpal Tunnel Release System. The indications for carpal tunnel release are severe carpal tunnel syndrome diagnosed clinically and by nerve conduction studies and lack of response to conservative treatment using Futuro splinting and ultrasound physiotherapy for more than three months.

A total of 63 patients (54 women and 9 men) underwent ECTR. The mean age of those patients

was 44 years (22 to 75). The mean duration of follow-up was 28 weeks. ECTR using the MicroAire Carpal Tunnel Release System was discussed with all the patients.

Wound scarring, wound pain, palmar pain, relief of parasthesia, infection and tenderness, time until return to work, patient satisfaction and operation time were the points considered in the study.

Operative Technique of Endoscopic Carpal Tunnel Release

The procedures were performed using the MicroAire Carpal Tunnel Release System under Bier's block anesthesia (Fig. 1) using the single-portal method where one incision is placed in the wrist flexion crease at the ulnar border of the palmaris longus tendon, that is, midway between the flexor carpi ulnaris and the flexor carpi radialis tendons (Fig. 2).

A distally based rectangular flap in the antebrachial fascia is raised to gain entrance to the carpal tunnel. After the synovial tissue has been cleared from the undersurface of the transverse carpal ligament, dilators are inserted (Fig 3), with the wrist held in slight extension; the endoscopic blade assembly is inserted into the carpal tunnel, making sure that the blade is aligned with the axis of the ring finger (Fig. 4). Once the distal edge of the transverse carpal ligament has been visually defined with the endoscope and the aim of the device has been confirmed, the blade is elevated at the tip of the device by a trigger mechanism and release is sectioned from distal to proximal under direct vision. With complete division of the Transverse Carpal Ligament, the cut edges separate widely enough that both leaves can no longer be seen at the same time through the endoscope and both ulnar and radial free distal edges can be identified by gentle rotation of the scope (Fig. 5). Incomplete division of the ligament is noted when these edges are not widely separated or when the distal margins converge as a V (Fig. 6).

A dry bandage is then secured over the site by elastic tape for at least 48 hours, after that the patient is advised to remove all bandages and to freely use the hand.



Fig. 1. The MicroAire Carpal Tunnel Release System.



Fig. 2. The marking of the single-portal method uses one incision. The final position of the entry portal was in line with the radial border of the fourth ray digit.



Fig. 3. Dilators are used to prepare a path to aid the entry of the blade assembly. Their design helps the surgeon locate the distal margin of the transverse carpal ligament.



Fig. 4. The endoscopic blade assembly is inserted with the axis of the ring finger.



Fig. 5. Complete Transverse Carpal Ligament release ("U" shape Fashion).



Fig. 6. Incomplete Transverse Carpal Ligament release due to its "V" shape Fashion. If the cut edges of the ligament do not fall apart easily or remain joined in a V-shaped fashion, then the ligament is incompletely divided.

Results

ECTR provided complete relief of paresthesia by the first day and relief of wound pain during the first three days. During the 1st three postoperative weeks, all patients return to work. Our study showed that return to work after ECTR was between 4 days and 22 days, with a mean of 9 days.

Three patients were converted to open technique because we could not visualize the flexor retinaculum and the median nerve. One patient had Alkaptonuria and the other two had blood inside the carpal tunnel due to failure of Bier's block and

release of the tourniquet, and were excluded from the study. One patient had severe keratosis, and ECTR was ideal for his condition to avoid improper wound healing.

The complication rate for the endoscopic technique was 7.6% for the study group. Complete relief of symptoms occurred in 93.8% of the study group. Table I shows the complications among the study group; two patients had reflex sympathetic dystrophy (complex regional pain syndrome), one patient had superficial infection at the entry portal, one patient had neurapraxia diagnosed by full

Table I. Results and complications of the procedure among the study group

Complications and Results	Endoscopic release No.	%
RSD * (Complex Regional Pain Syndrome)	(2/65)	3
Wound infection	(1/65)	1.53
Neurapraxia (Fully recovered in 2 weeks)	(1/65)	1.53
Pain of the 4 th finger	(1/65)	1.53
Vascular injury	(0/65)	0
Major nerve injury	(0/65)	0
Recurrent motor branch injury	(0/65)	0
Complete relief of symptoms	(61/65)	93.8

*Reflex Sympathetic Dystrophy

recovery after two weeks, one patient had pain of the 4th finger (ring finger) which improved 10 days following the procedure. On the other hand, no vascular injuries were reported and there were no major nerve injuries (neither median nor ulnar nerves). There was no palmar scarring because the entry point was at the wrist crease.

Discussion

The main indications for ECTR are failed conservative treatment and advanced weakness and atrophy of the Thenar muscles. Endoscopic techniques were introduced to address problems occasionally encountered with open carpal tunnel release surgery-scar tenderness, palmar pain, and protracted time away from work.^(6,7)

Endoscopic surgery has been found to shorten recovery time compared with open carpal tunnel decompression, with a two to three week earlier return to work.⁽³⁻⁵⁾ Patients benefit from a procedure which requires only a minimal incision at the wrist, resulting in less morbidity. Recovery time is lessened, with patients benefiting from, early return to activities of daily living, early return to work—almost 50% faster than those who undergo conventional open carpal tunnel surgery.⁽⁸⁾

Previous studies have suggested that open carpal tunnel release is associated with considerable morbidity, including prolonged tenderness of the scar and weakness of grip for as long as three to six months after the operation.⁽⁵⁻¹⁰⁾

In a study conducted by Manktelow *et al.* industrial employees lost an average of 87 days of work after open carpal tunnel release.⁽¹¹⁾ Although the average worker returned to work three months after surgery there was a large standard deviation of 3.5 months. In contrast, Chow, who retrospectively studied the results of Endoscopic Carpal Tunnel Release in 1156 patients, noted that 65% returned to normal activity and work before two weeks after ECTR.⁽¹²⁾

Previous studies have suggested a benefit in terms of time to return to work with ECTR with some suggesting that patients can return to work earlier⁽¹³⁻¹⁵⁾ as it was the case with our patients with a single-portal endoscopic release whom returned to work on average in 9 days (4 days to 22 days).

The results of a 63-center study indicate that the one-incision endoscopic technique can be safely performed by surgeons who have a thorough knowledge of hand anatomy, who have undergone training in the procedure, and who divide the transverse carpal ligament only with adequate visualization.⁽¹⁶⁾

No serious complications occurred with the endoscopic technique in our study. The reason behind the low rate of complications was that we adapt the Bier's block anesthesia and we converted the ECTR to open carpal tunnel release when the canal is not well visualized, and the surgeon was well trained on the use of the MicroAire Carpal Tunnel Release System.

Our preliminary experience showed that ECTR is reliable and effective for Jordanian patients with carpal tunnel syndrome, to decrease palmar discomfort and hasten the return to activities.

This study provided evidence that endoscopic surgery can be performed as fast as open surgery without an increased prevalence of complications, and the patient returns to work in a shorter period of time. Diminution of postoperative pain, early return to normal activities and work, and less scar tenderness are the major benefits of a successful ECTR.^(17,18)

General advantages of this technique include lesser palmar pain, lesser scar tenderness and a high return to work rate and daily activities. Endoscopic carpal tunnel release is technically oriented and requires special training (well trained hand surgeons), adequate learning curve and familiarity with endoscopic techniques and instruments, and it must

be performed by a specialized hand surgeon who has thorough knowledge of the surface and surgical anatomy. On the other hand, open carpal tunnel release needs less training and can be done by a general orthopaedic surgeon.

Among the disadvantages of ECTR is the need for special equipment which cannot be easily provided in every hospital.

There are limitations for the use of ECTR. These limitations include revision release for recurrent carpal tunnel syndrome, calcified tendinosis, Hamate hook fractures, and congenital hand anomalies.

Conclusion

This procedure is an effective, safe and convenient procedure for the treatment of carpal tunnel syndrome in the hand, associated with less palmar pain, less scar tenderness, a high return to daily activities, and an extremely low complication rate. It is a quick procedure with good results in short-term postoperative rehabilitation.

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