

Incidence of Recurrent and Persistent Carpal Tunnel Syndrome following Open Transverse Carpal Ligament Release

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Article information	Abstract
<p>Article history: Received: 4 July 2013 Accepted: 23 July 2013 Available online: 26 Oct 2013 ZJRMS 2015 Jan; 17(1): 19-22</p> <p>Keywords: Carpal tunnel syndrome Recurrent Persistent</p> <p>*Corresponding author at: Department of Physical Medicine and Rehabilitation, Yasuj University of Medical Sciences, Yasuj, Iran. E-mail: yazdanpanah.p@yums.ac.ir</p>	<p>Background: Carpal tunnel syndrome is entrapment of the median nerve in carpal tunnel of the wrist. In severe cases of carpal tunnel syndrome, or those refractory to conservative treatment, surgery is performed. The main aim of this research was to determine the incidence of recurrent and persistent rates of carpal tunnel syndrome following open surgery.</p> <p>Materials and Methods: This descriptive cross sectional study was performed on 105 patients having open carpal tunnel release in the range of 5 to 60 months ago. These cases were operated at Shahid Beheshti hospital in Yasuj, Iran. Assessment of carpal tunnel syndrome after open surgical release of the median nerve was done by electrodiagnostic studies and MRI. If symptoms of carpal tunnel syndrome maintain after surgery, this condition is persistent and if reappearance of the syndrome 3 months or more following surgery this is recurrent. In cases of observing changes from severe to lower stages of the disease in electrodiagnostic studies, treatment is considered successful.</p> <p>Results: All of 58.1% of patients had right severe carpal tunnel syndrome and 41.9 % had left severe carpal tunnel syndrome prior to surgery. The incidence of recurrent and persistent carpal tunnel syndrome following open transverse carpal release was 12.4% and 10.4%, respectively.</p> <p>Conclusion: The incidence of persistent and recurrent rates of carpal tunnel syndrome following open transverse carpal release was higher than the expected rate. These rates were dependant to the appropriate patient, the correct diagnosis and duration of symptoms before surgery.</p> <p>Copyright © 2015 Zahedan University of Medical Sciences. All rights reserved.</p>

Introduction

Carpal tunnel syndrome (CTS) is entrapment of the median nerve in carpal tunnel of the wrist [1]. Symptoms of carpal tunnel syndrome include paresthesia (numbness, tingling, and burning) involving the median nerve distribution (first 3 digits and median half of 4th finger) along with a deep aching pain in the hand and wrist [2]. Carpal tunnel syndrome is the most common entrapment neuropathy, affecting approximately 3-6% of adults in the general population [3]. The diagnosis of this syndrome is based on history and physical examination. Electrodiagnostic studies are gold standards for confirmation diagnosis of this syndrome [4]. Neurophysiological tests grade the CTS into the mild, moderate, and severe categories, according to the American Association of the Electrodiagnostic Medicine criteria [5].

Conservative treatment methods are used for the syndrome, but in case of unsuccessful conservative treatment, or in severe CTS, surgical operation is recommended. The methods applied in surgical operation of CTS are as follows:

1-Endoscopic release of transverse carpal ligament, 2-Open surgical release of transverse carpal ligament [6]. In carpal tunnel syndrome, endoscopic surgery was associated with less postoperative pain than open surgery,

but the small size of the benefit and similarity in other outcomes make its cost effectiveness uncertain [7].

Diagnosis of severe CTS and recurrence of the syndrome is by electrodiagnostic studies. MRI may be used in association with electromyography for accurate postoperative evaluation of the carpal tunnel [8]. Among the postoperative problems following transverse carpal ligament release are recurrence implies that the patient's symptoms were initially relieved but recurred some time after the operation and remaining of symptoms 3 months after operation was considered as persistent (residual) could be mentioned [9].

The main objective of this research was to determine the recurrent and persistent rates of CTS following open transverse carpal ligament release.

Materials and Methods

In this descriptive cross sectional study, the medical records of 430 patients suffering from CTS, who had undergone open surgical operation by orthopedic or neurosurgeon at Shahid Beheshti hospital of Yasuj between 2006 to 2012 years was selected as target population. From all records, 120 patient's records were selected randomly by simple random sampling method.

The selected patients based on the available addresses especially the phone numbers mentioned in the case sheets were invited to specialist clinic. From all sample size, only 105 patients were accepted to participant in study (14% attrition rate in calculated sample size). History was taking and the physical examination was done in view of the symptoms of CTS and the obtained results were recorded in continuation of the primary checklist of each patient. Remaining of symptoms 3 months after surgical operation and reappearance of symptoms at least three months after surgical operation was considered as persistent and recurrent cases respectively.

If cases had symptoms and signs of CTS, electrodiagnostic studies were done. Three conditions were observed in electrodiagnostic studies:

1-Electrodiagnostic studies were normal but symptoms were existent, a condition in which MRI was recommended and interpreted by a radiologist. 2-Electrodiagnostic studies were abnormal, a condition in which there was either recurrent or persistent, also in this condition patients were subject to wrist MRI. 3-There were no symptoms for CTS, a condition in which no electrodiagnostic studies were necessary.

Electrodiagnostic studies performed with Medelec device manufactured in the United Kingdom.

The settings of electromyography are as follows:

Pulse duration: 0.2 ms, Stimulus speed: 2 ms/division, Sensitivity: 20 μ V/division for sensory, 1 V/division for motor, filter settings were 3 Hz to 10 kHz in motor and 10 Hz to 3 kHz in sensory study.

In this study, median nerve motor component was stimulated orthodromically and the sensory component antidromically. For evaluating the motor nerve conduction study of median nerve, stimulating electrode was stimulate at the wrist, 3 cm proximal to the distal crease and recording surface electrode over the belly (G1) and tendon (G2) of the abductor policis brevis, ground electrode was located on the palm. For evaluation of sensory nerve conduction study of median nerve, recording electrode was done on 3rd digit with stimulation of sensory median nerve antidromically 14 and 6 cm proximal to G1 electrode.

The ground electrode was located at the distal of forearm. For evaluating the motor and sensory conduction study of the ulnar nerve, the stimulation at the wrist, 3 cm proximal to the distal crease, and recording over the belly (G1) and tendon (G2) of the adductor digiti minimi for motor conduction (8 cm), and around the proximal (G1) and distal (G2) interphalangeal joints of the fifth digit for antidromic sensory conduction (14 cm) and ground electrode was located at the distal of forearm. Latency (the time from onset of stimulation until wave appearance or peak of wave) and was determined.

In evaluation of nerve conduction studies of motor nerve's compound muscle action potential, onset latency and in sensory nerve's sensory nerve action potential, peak of latency were calculated. Peak-to-peak amplitude was calculated in the evaluation of nerve conduction studies. The surface temperature of upper limbs was

greater than 32°C. The criteria for electrodiagnostic of CTS were: 1-A difference of greater than 0.5 ms between the median and ulnar nerve sensory latencies in the same hand, 2-A difference of greater than 1 ms between the median and ulnar nerve motor latencies in the same hand [10]. The supramaximal intensity was used for the detection of sensory and motor responses.

Persistent symptoms suggested either incomplete release or an error in the initial diagnosis, recurrent CTS define as reappearance of the syndrome three months or more following surgery [11]. With respect to longitudinal approach of data collection and with respect to the presumptions of each test, the estimation of the ratios mentioned in the objectives, were prepared and reported with 95% approximate assurance for each ratio.

For more evaluation, MRI was requested and done in the patients with persistent sign or symptoms that had undergone open surgical operation to release CTS were exposed to wrist MRI. In MRI, the objective was to study the mass effect, fibrous, excessive growth of tenaculum, and ultimately a study on the release quality (quality of release) of the median nerve.

Results

One hundred-five cases with carpal tunnel syndrome operation history were selected randomly from client referred to Shahid Beheshti hospital of Yasuj Medical University, Iran.

All of 96 (91.5%) of participants in the study were females, and 9 (8.5%) of them males. The age ranges of patients were 24 to 88 years, with average of 50.97 years, and the highest-frequency between 38 and 64 years. In view of body mass index (BMI) by kg/m^2 , the range value was between 17.3 to 42.9 with average of 27.6 and the highest frequency between 23.2 and 32.1. In the total cases, the shortest period of post-operative referral was 5 months, and the longest 60 months, with average of 17.7 months, and the highest frequency was between 15.1 to 19.3 months, with 95% confidence interval.

Of all patients in study that had open surgical operation history for release transverse carpal ligament of wrist, 58.1% and 41.9% were suffering from severe CTS of right and left hand before operation respectively and in other patients despite of complaint from symptom. The 77.2% were in the normal group, based on normal electrodiagnostic or mild entrapment of the median nerve. Thirteen patients were in recurrence condition at least for 3 months after open surgical operation of transverse carpal ligament (recurrence incidence equal to 12.4%). No immediate post-operative clinical recovery or reappearing of symptoms less than three months after operation was observed in 11, which are equal to 10.4% persistent rate (Table 1).

Table 1. Frequency distribution of the patient's post-operative condition

Post-operative condition	Frequency	Percent	Cumulative percent
Normal	81	77.2	77.2
Persistent	11	10.4	87.6
Recurrent	13	12.4	100
Total	105	100	

In 4 patients MRI was reported absolutely normal and in 4 other cases edema around the median nerve was observed. Other cases were absolutely normal.

Discussion

According our finding, incidence of recurrent and persistent rates of CTS after open transverse carpal ligament release was 12.4% and 10.4% respectively. In previous studies, using endoscopic or open surgical procedures, the incidence of the 2 complications are very different [11-13].

Diagnosis and appropriate treatment of complications related to carpal tunnel release facilitate early appropriate treatment which usually diminishes disability.

In a study by Botte et al. the recurrence rate of CTS is to occur in 0% to 19% of patients following carpal tunnel release, with up to 12% requiring re-exploration. Common causes of recurrent CTS are incomplete release of transverse carpal release, fibrous proliferation, or recurrent tenosynovitis [12].

In a study by Raimbeau, the recurrence rate of CTS following surgery varies from 0.3% to 12% [11]. In the study of Concannon et al. there seems to be a statistically higher incidence of recurrent CTS after endoscopic release compared with the traditional open carpal release [13].

In a study by Erbayraktar et al. the results of open surgical operation of CTS without removing sheath of the median nerve was better in comparison to endoscopic surgery [14]. In different research studies, the recurrence rate of CTS, using endoscopic surgical method has been reported 0.5% to 6% [15, 16].

In a study by Omer, while surgery of transverse carpal ligament is usually successful, 7-30% of patients will have either persistent or recurring symptoms [17]. Although most outcomes of transverse carpal release are positive, CTS symptoms persist or recur in 7% to 20% of surgical releases, and reoperation is required in approximately 5% of cases [18].

In the present research, the recurrence rate and persistent of CTS symptoms were high, the reasons for which could be late referral of patients, insufficient removal of transverse carpal ligament, surgeons' experience and differential diagnosis coupled which with the syndrome. General complications have also been discussed including recurrent scar formation which is probably the most commonly encountered complication following carpal tunnel release [19].

In 50% of the patients of the present research, edema around the median nerve was reported in wrist MRI, a finding which is in consistency with a study by Taghizadeh et al. in which median nerve edema has been

reported in 70% of cases after surgical operation to release transverse carpal ligament followed by the recurrence of syndrome [20]. In other research studies, circumferential fibrosis around the median nerve has been the most prevalent reason for recurrence and persistent symptoms of CTS, which is usually specified after surgical re-operation or in MRI by an experienced radiologist [16, 21]. In this research, about 91% of the cases were females, showing the high prevalence of CTS among women, which is inconsistency with other research studies [21, 22].

The mean age of patients was 50.97 years, with the highest frequency between 37.85 and 64 years which is also in consistency to other research studies such as [23], with respect to the prevalence of the disease in the middle ages of life. The prevalence of CTS in the right hand (dominant hand) is often higher than left hand, which was in consistency with other research studies such as Shapiro and Preston [22].

No recovery was reported in 11 patients who were all females, which were placed in the residual group. The reasons for this status included late referral of the above mentioned patients, no elimination of severity factors of the syndrome such as job related factors, presence or absence of experienced surgeon, economic factors and etc.

Incidence of persistent and recurrent rates of CTS following open transverse carpal release was high. These rates were dependant to the appropriate patient, the correct diagnosis, by an experienced surgeon and duration of symptoms before surgery. We propose screening and training people especially women on the symptoms of CTS. Furthermore, timely performances of surgical operations are necessary.

Acknowledgements

This article is a part of medical student thesis (p/23/14/402) supported by Yasuj University of Medical Sciences. The researchers consider it necessary to express their gratitude and thanks to the management of Yasuj faculty of Medicine and Shahid Beheshti hospital of Yasuj, research councils of Yasuj faculty and Yasuj University of Medical Sciences, the staffs of Shahid Mofateh clinic of Yasuj and the cases taking part in this research.

Authors' Contributions

All authors had equal role in design, work, statistical analysis and manuscript writing.

Conflict of Interest

The authors declare no conflict of interest.

Funding/Support

Yasuj University of Medical Sciences.

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Please cite this article as: Yazdanpanah P, Mohamadi H, Mousavizadeh A, Sahuli-Tanha A. Incidence of recurrent and persistent of carpal tunnel syndrome following open transverse carpal ligament release. *Zahedan J Res Med Sci*. 2015; 17(1): 19-22.