

## Carpal Tunnel Syndrome Treatment with Open Surgical Release: a Study in 292 Patients

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Carpal tunnel syndrome is the most common peripheral neuropathy in the upper extremity due to compression of the median nerve at the wrist. It affects around 3 to 6 percent of adults, predominantly women. Clinically, the carpal tunnel syndrome is presented by numbness of the thumb, index finger, middle finger and the radial side of the ring finger, which becomes painful and aggravates at night. In the present article, we retrospectively review the results of 292 patients treated by simple open surgical decompression of the median nerve due to carpal tunnel syndrome. We also briefly review the literature data concerning this pathology including diagnosis and different treatment modalities. In conclusion, our results confirm that open carpal tunnel release by simple decompression is an effective and safe procedure that could be performed under local anaesthesia with timely return to daily activities and low risk of complications or relapse.

*Key words:* carpal tunnel syndrome, median nerve, compression, open release

### Introduction

Although described for the first time in 1854 by James Paget, the carpal tunnel syndrome (CTS) is still often encountered nowadays. For example, the incidence of CTS in the United States is 1:20 for people between the age of 45 and 60 years [14]. CTS develops as a result of median nerve compression within the carpal tunnel and is the most common neuropathy of the upper extremity [9]. Anatomical variations such as those of the palmaris longus muscle, hypothenar muscles, abductor digiti minimi, persistent median artery, bifid median nerve, etc. are a prerequisite for the occurrence of this syndrome [3-7, 13]. Metabolic disorders (diabetes, thyroid pathology, etc.) can also be a cause of median nerve compression [10]. CTS is characterized by the classical symptoms of numbness and paraesthesia along the distribution of the median nerve and typically aggravate at night. Detection of thenar muscle weakness is a late manifesta-

tion of this pathology [8]. Tinel's (percussion over the median nerve at the level of the carpal crease) and Phalen's (holding the wrist at maximum flexion for 30 to 60 seconds) signs are often positive and could help in establishing the diagnosis. Electromyography (EMG) and ultrasound imaging can be used to confirm the diagnosis. In rare cases with atypical clinical presentation, a magnetic resonance imaging could be used [8, 9].

The aim of the present study was to examine retrospectively the results of patients who suffered from CTS and were treated by simple open surgical decompression of the median nerve, as well as to review the pertinent literature data with regard to diagnosis and the different treatment modalities.

## Materials and Methods

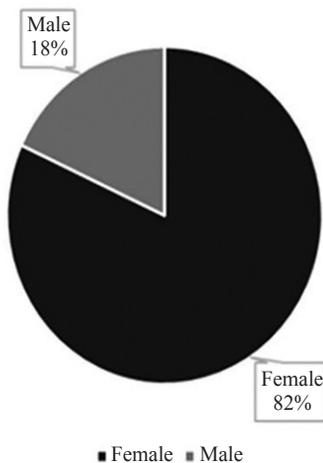
The current retrospective study included 292 patients (239 female and 53 male) with CTS treated by open surgical release over a 5-year period. Diagnosis was established on the basis of clinical examination and EMG study. The indications for surgical treatment included: failed conservative treatment (after 3 months of unsuccessful treatment) and signs of muscle damage, confirmed by EMG. The open surgical decompression was performed on 202 right and 110 left hands (20 patients had bilateral CTS). The average follow-up period was 17 months.

## Results

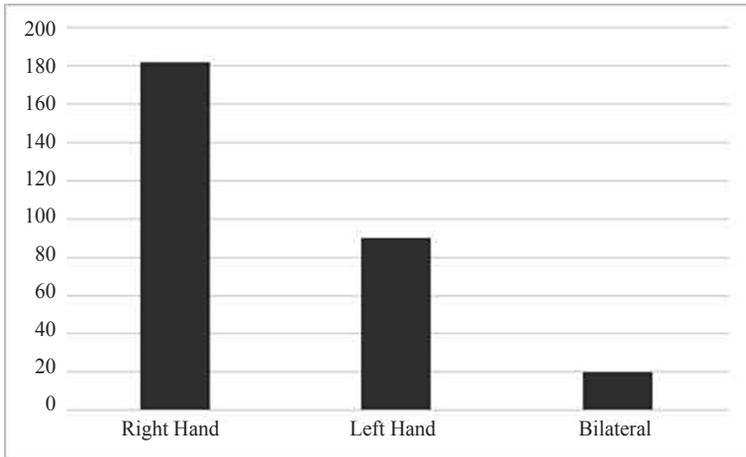
In our retrospective study, females (82%) were more commonly affected than males (18%) (**Fig. 1**).

The average age at the point of operation was 57.4 years. Local anaesthesia was used in 98% of cases and regional - in 2% of the patients. The right hand was affected in 182 patients (62%), the left - in 90 patients (31%) and in 20 patients (7%) we performed bilateral decompression (**Figs. 2, 3**).

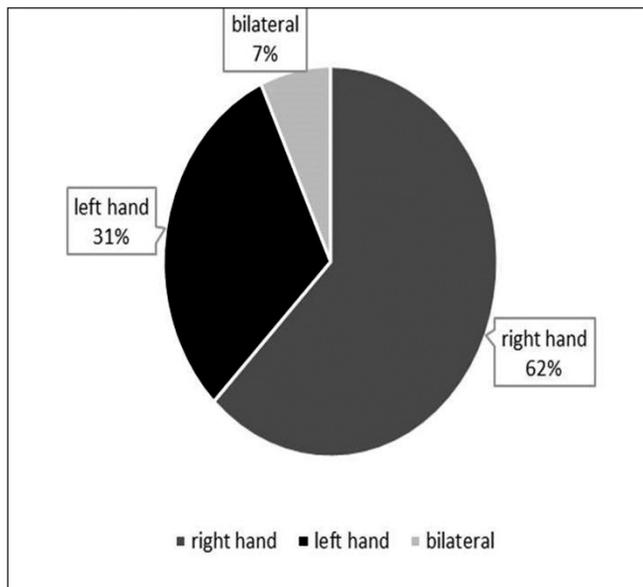
The hospitalization of all patients was 2 days and post-operative dorsal splints were applied for two weeks. We did not report the occurrence of any infections, intra- or postoperative complications. The outcome of the operation was determined on the basis of recovery of the function of the affected hand compared to the contralateral hand



**Fig. 1.** Chart representing the distribution of carpal tunnel syndrome (CTS) between males and females

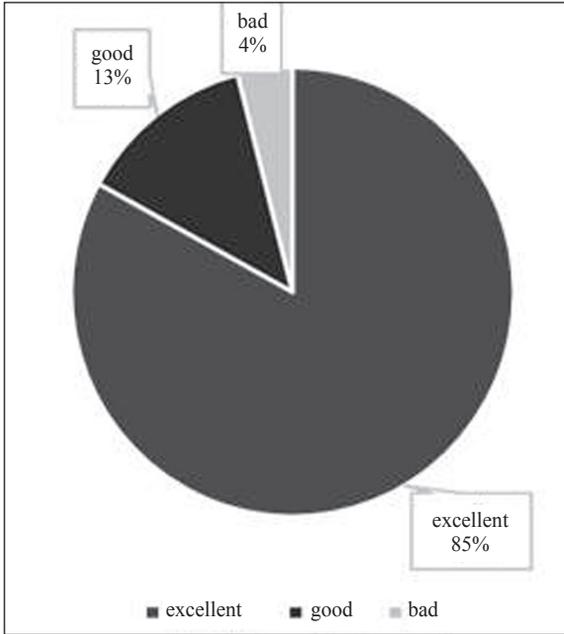


**Fig. 2.** Chart representing the number of carpal tunnel syndrome (CTS) cases in right hand, left hand and bilateral occurrence



**Fig. 3.** Chart representing the percentage of carpal tunnel syndrome (CTS) cases in right hand, left hand and bilateral occurrence

and patient satisfaction at six month after surgery. If the patient recovered 100% of the function of the other hand, the results were accepted as “excellent”; 50% recovery or more of the function - as “good”; and no recovery - as “bad”. The results of our study included 83% “excellent” outcomes, 13% “good” and 4% “bad” (**Fig. 4**). The “good” and “bad” outcomes were observed in patients suffering from diabetes.



**Fig. 4.** Chart representing the outcomes of the open surgical decompression of the median nerve in carpal tunnel syndrome (CTS)



**Fig. 5.** Intraoperative findings during open nerve decompression due to carpal tunnel syndrome (CTS)

### *Operative technique*

When performing the nerve decompression, the skin incision is on the thenar crease from the distal transversal skin fold of the wrist to the middle of the palm (**Fig. 5**). After incising the fibres of the palmar aponeurosis, it reaches the volar side of the flexor retinaculum, which is explored for perforating branches of the median nerve. Sometimes, the nerve's motor branch can pass through the retinaculum. Under the cover of the Mosquito, the flexor retinaculum is cut from the distal to the proximal end, and it is recommended that this should be done at its ulnar end. After lifting the skin at the proximal end of the wound, the distal fibres of the volar carpal ligament are also cut. The median nerve is inspected. If the epineurium in the compression region is fibrous, it is recommended to cut it along the constriction. Immobilization in the postoperative period is recommended for 2 weeks.

### Discussion

In 1933, Learmonth presented the first article regarding the surgical treatment of CTS after releasing the transverse carpal ligament [12]. In spite of the fact that this was the first official publication of surgical median nerve decompression, Galloway may be the first who performed surgical treatment for CTS in 1924, according to a discovered historical letter to his colleague at the start of the new century [12]. Nowadays, median nerve decompression remains also most common operation in the hand. More specifically, the most popular type of surgical treatment remains the open carpal tunnel decompression. Two other approaches have also been described in literature: endoscopic release and mini-incision techniques [11, 15].

The open carpal tunnel decompression should be performed after conservative treatment has failed to produce the desired outcome. Conservative treatment includes wearing splint at night, non-steroidal anti-inflammatory drugs, physiotherapy, local application of cortisone, as well as drugs used to treat neuropathic pain such as pregabalin, gabapentin, amitriptyline, duloxetine, which have a very good effect on night pain and paraesthesia [9].

Different complications after surgical treatment include: infection, haematoma, cutaneous neuralgia, injury of a recurrent motor branch of the median nerve or the superficial palmar arch, excessive scarring and reflex sympathetic dystrophy [16]. Recurrences are rare and due to incomplete division of the flexor retinaculum, inadequate release of the distal part of the antebrachial fascia, lack of normal gliding of the median nerve or iatrogenic trauma. In case of recurrent symptoms, another CTS release is indicated [1, 2]. Tung and Mackinnon [15] proposed surgical techniques such as internal neurolysis, neuroma-in-continuity assessment, neuroma management, nerve grafting and tissue interposition flaps in the second surgery after failed previous operations.

### Conclusion

The present retrospective study examined 292 patients after simple open carpal tunnel release. The outcomes confirm that this classic open surgical treatment, which is usually performed under local anaesthesia, is safe, effective and produces excellent results. In our group of patients, we did not report any infections, intra- or postoperative complications. After this procedure, most commonly patients make a fast recovery to their usual life and work. The results of this study are comparable with data available in the literature.

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