

Endoscopic treatment in carpal tunnel syndrome: a case study in Bucharest – Romania

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ABSTRACT

Background. Carpal tunnel syndrome is currently the most common peripheral nerve compression neuropathy that affects approximately 1% of the population. The incidence of CTS seems to be increasing. The diagnosis is based on clinical symptoms and electrodiagnostic studies. The purpose of this study is to analyze the effects of the endoscopic technique on patients with carpal tunnel syndrome. In addition, we want to demonstrate if this condition occurs more in men than in women.

Methods. In a group of 53 patients we used the endoscopic technique for the treatment of carpal syndrome, and as a measure of its effectiveness we used the Phalen, Durken and Tinel tests. Also, for the qualitative analysis of the data, the clinical and demographic characteristics of the patients were taken into account.

Results. We identified statistically significant differences between men and women regarding the occurrence of carpal syndrome, women having significantly lower results than men in the Phalen, Durken and Tinel tests ($X^2_{Phalen(2)} = 17.33$, $X^2_{Durken(2)} = 15.94$, $X^2_{Tinel(2)} = 10.76$, $p < 0.05$). There are statistically significant differences between the results of the Phalen, Durken and Tinel tests before and after surgery ($W_{Phalen} = 111.24$, $W_{Durken} = 139.91$, $W_{Tinel} = 102.46$, $p < 0.05$).

Keywords: Endoscopic, carpal tunnel, median nerve, decompression, one-portal endoscopic

INTRODUCTION

Carpal tunnel syndrome is the compression of the median nerve in the wrist (radiocarpal joint and palm) and the most common neuropathy in the upper limb. Paresthesias, especially nocturnal pain, numbness and weakness of the hand, tingling, atrophy of the thenar muscles are the most common clinical signs of CTS in addition to the Tinel sign, the Phalen and Durkan test, ultimately leading to severe damage to the hand and forearm [1].

Among the causes of CTS are: idiopathic, hereditary, infectious, endocrinological, metabolic, hematological, renal, rheumatic, traumatic, tumor.

Diagnostic It's put in principle on the clinical signs, the Tinel sign, the Phalen and Durkan test, then it is passed to the paraclinical analyzes: electromyography (EMG), nerve conduction speed, radiology, ultrasound, MRI, laboratory blood tests.

The costoclavicular Adson and Wright test are used to exclude chest compression syndrome that can mimic CTS. Cervical examination, including the Spurling test, is essential to exclude cervical radiculopathy. The percussion of all the primary peripheral nerves can lead us to an unexpected area of compression [2].

A study of nerve conduction speed and electromyography is performed. They help us to confirm the diagnosis of CTS and to exclude other pathology [3].

Basic x-rays of the wrist are useful in detecting unexpected pathology.

The estimated prevalence of CTS among the population is between 4% and 5%, particularly affecting individuals between 40 and 60 years of age [4].

Nowadays, the medical costs are high, because of expensive surgical devices; the cost of endoscopic

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carpal tunnel surgery is higher than that of standard open and other minimally invasive methods. The complexity of tools and the surgical technique of endoscopic surgery require a longer learning curve for surgeons. In order to eliminate the difficulties of use and cost, endoscopic treatment is a good solution for this pathology [4]. Endoscopic treatment were developed to help patients gain minimally invasive surgery outcomes. Now, surgery is easier because surgeons have greater visibility. In previous studies, we found better outcomes with small wounds, less pain, and early return to work [5, 6]. Nevertheless, we have improved some features in the next generation of kits, thus increasing effectiveness and safety.

MATERIALS AND METHODS

This is a prospective study conducted during 2017-2020, on 62 hands in 53 patients diagnosed with carpal tunnel syndrome hospitalized at the Arca Life Clinic in Bucharest and who requested endoscopic technique.

Inclusion criteria: paresthesias and pain in the distal territory of the median nerve distribution (police, index, medius); positive Phalen maneuver (forced hyperflexion of the wrist induces pain and paresthesia in the first 30-60 sec); positive Tinel sign (percussion of the median nerve induces symptoms in the first three fingers); decrease in muscle strength in the territory of the median nerve; atrophy of the thenar eminence; sensitivity disorders at the level of the thenar eminence and the first two fingers [7–9].

Exclusion criteria: patients with spasticity and the impossibility of extending the fist (who have the fist fixed in flexion); pregnant patients; if the patient has suffered trauma (fractures) of the carpal area (wrist) in the last 6 months, cervical radiculoneuropathy [7–9].

Electrophysiological diagnostic Includes electromyography and electroneurography that show a decrease in the speed of sensory and motor nerve conduction [7–9].

Electrophysiological diagnostic criteria: (one or more of them): Distal motor latency greater than 4.5 msec.; Sensitive latency greater than 3.7 msec.; Amplitude less than 20 mV.; Conduction velocity less than 40m/sec. [9]

In all cases, the following were taken into account: age, profession, height, weight, body mass index calculation, hereditary antecedents, personal pathological antecedents, personal medication, smoker, alcohol user, date of onset of signs and symptoms and their severity, clinical examination generally compared with the healthy limb, assessment of appearance and muscle strength, Reverse

Phalen Test, Tinel Sign, Durkan Test and assessment of the radiocarpal joint and its mobility.

Surgical methods – One portal procedure (Agee's technique modified)

Following the inflation of a tourniquet with local anesthesia with or without sedation, a 1-1.5 cm incision is made in one of the flexion creases of the wrist. Palmaris longus tendon is retracted radially. Longitudinal subcutaneous dissection exposes the forearm fascia. A U-shaped incision is made on the forearm fascia, creating a rectangular flap based distally on the TCL. While the flap is raised, a synovial lift is placed under the TCL [6]. An instrument (a kind of dilator) is inserted into the carpal tunnel to create a path for the blade assembly. The blade endoscope assembly is then inserted into the carpal tunnel and is passed distally to the distal edge of the TCL. A few steps are usually required to obtain an adequate definition of TCL. After defining the distal edge of the ligament, the tip of the instrument (along with the blade) is placed distal to the edge of the TCL. After checking the correct positioning, the trigger mechanism is activated and the blade is engaged and raised to 3.5 mm above the assembly at an angle of 80 ° [6]. The instrument is retracted, and under direct view, the TCL is split in a distal to proximal direction. With the blade retracted, several passes can be made to check the ligament transection. If necessary, the blade can be coupled and the remaining TCLs can be sectioned (the instrument should not be placed too deep into the tunnel as this may cause damage to the superficial palmar arch). Then, a proximal volar antebrachial fasciotomy is performed, followed by standard closure of the wound [10].

Statistical analysis of the data

Statistical data analysis was performed with IBM SPSS 22 Corp for Windows. Descriptive statistics, mean and standard deviation, the Wilcoxon test and the CHI square test of association were applied. The Wilcoxon test evaluates the condition of the patients before and after the operation, and the Chi-square test evaluates the gender differences in terms of the occurrence of the studied condition.

RESULTS

Analysis of personal and clinical characteristics of patients

Study involved 62 hands in 53 patients, 19 men (36 %) and 34 women (64%), aged between 30 and 80 years (M=59.6 years, SD=3.12). Befor surgery patients had numbness in their palms and fingers (25 patients), decreased muscle strength (25 patients),

paresthesia (20 patients), nocturnal wrist pain and weakness (8 patients), thenar atrophy (10 patients). Clinical signs disappeared after 6 months in 95% of patients. 18 patients had general and 25 local anesthesia. Before surgery Phalen's, Durken and Tinel's test was positive for 95% of hands, after 6 months no patient has positive test. Post-operative median nerve electroneuromyography full recovery after 6 months for 94% of patients. Before the operation, 15 women and 12 men had the right hand affected, 11 women and 6 men had the left hand affected, and 8 women and one man had bilateral damage (Table 1, 2 and 3).

The efficiency of the endoscopic technique and gender differences regarding the occurrence of carpal syndrome

Regarding the differences between men and women regarding the occurrence of this condition, we randomly selected from the number of women a number equal to that of the men in the sample, 19. Thus, we identified statistically significant differences between men and women regarding the occurrence of carpal syndrome, women having significantly lower results than men in the Phalen, Durken and Tinel tests ($X^2_{Phalen}(2) = 17.33$, $X^2_{Durken}(2) = 15.94$, $X^2_{Tinel}(2) = 10.76$, $p < 0.05$) (Table 4).

There are statistically significant differences between the results of the Phalen, Durken and Tinel tests before and after surgery ($W_{Phalen} = 111.24$, $W_{Durken} = 139.91$, $W_{Tinel} = 102.46$, $p < 0.05$) (Table 5).

TABLE 1. Analysis of personal and clinical characteristics of patients

Gender	Number
W	34
M	19
Anesthesia	
General anesthesia	18
Local anesthesia	35
Simptoms	
Pain	33
Paraesthesia	25
Decreased muscle strength	20
Thenar atrophy	10

TABLE 2. Affected hand

Affected hand	Women	Men	Total
Right hand	15	12	27
Left hand	11	6	17
Bilateral	8	1	9

TABLE 3. Test results

Test	+ Preoperator	+ Postoperator
Tinel	51	2
Phalen	50	0
Durkan	50	3

TABLE 4. Chi square test

$X^2_{Phalen}(2) = 17.33$	$p < 0.01$
$X^2_{Durken}(2) = 15.94$	0.021
$X^2_{Tinel}(2) = 10.76$	0.036

TABLE 5. Wilcoxon test

$W_{Phalen} = 111.24$	0.041
$W_{Durken} = 139.91$	0.035
$W_{Tinel} = 102.46$	0.022

DISCUSSION

Our results are closely related to those in the literature.

Sassi and Giddines [13] demonstrated in their study that the mean relative cross-sectional area was appreciably smaller in women than men ($p < 0.05$). This suggests that the carpal tunnel cross-sectional area relative to the size of the hand is constitutionally smaller in women than in men. This could in theory be a significant factor in patients developing carpal tunnel syndrome.

Giersiepen, Eberle, Pohlabein demonstrated in their study that men with a higher BMI than women and by carrying out activities that require repeated movements of the hands with a higher frequency per week than women present a greater risk for the occurrence of carpal syndrome [14].

Malhotra, Kiran, Dua, Mallinath, and Bhan [15] suggest that during the initial months after surgery, the patients treated with the endoscopic method were better symptomatically and functionally. Local wound problems in terms of scarring or scar tenderness were significantly more pronounced in patients undergoing open carpal syndrome compared to patients undergoing endoscopic carpal syndrome. Average delay to return to normal activity was appreciably less in group undergoing endoscopic carpal syndrome. In our study, 94% of the participants had a quick recovery, as evidenced by the results of the Phalen, Durken and Tinel tests.

A possible limitation of this study was the relatively small number of patients.

In the next study we propose to determine the causal pathway between sex and CTS which might include more determinants such as hormonal factors, anthropometric characteristics, and non-occupational exposure to biomechanical overload (e.g. household tasks).

CONCLUSIONS

In conclusion, endoscopic technique is a modern technique that requires a special professional experience of the surgeon. It is a minimally invasive technique with the protection of noble elements

(vessels, nerve and tendons) at this level (from the radioiocarpal joint and palmar). Recovery of the hand operated much faster with endoscopic technique (does not require immobilization, rapid socio-professional reintegration). The duration of surgery in an experienced surgeon is much shorter than with the classical technique.

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