

## THE MANUAL THERAPY IN TREATMENT OF THE CARPAL TUNNEL SYNDROME

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### Abstract

The fist joint is responsible for the facilitation and the dynamic of the upper limb extremity in general and in particular it ensures many various types of movements: flexion, extension, abduction, adduction, circumduction, for the hand and fingers.

The purpose of this research was to create a rehabilitation programme for the carpal tunnel syndrome, adapted to the subjects functional necessities, with a high degree of efficiency and by the instrumentality of which they regain their independence in daily activities. The study was conducted at the Balneal and Recovery Sanatorium from Techirghiol, on a period of five months and included 4 patients diagnosed with carpal tunnel syndrome, having aged media 51,75 years. The rehabilitation programme combined various electrotherapy procedures (5 per week, 3 weeks each subject) with physical therapy (5 sessions per week, 3 weeks each subject) and manual therapy (3 sessions per week, 3 weeks each subject), individualised by the subjects specificity.

By verifying and comparing the muscular and the articular testing, before starting the study and at the end of the research it has been ascertained that the subjects articular functionality level was improved.

Thus, as a conclusion, the combination of the three therapeutical ways (electrotherapy, physical therapy, manual therapy) helps in the purpose of an efficient carpal tunnel syndrome reability and rehabilitation.

**Keywords:** *carpal tunnel syndrome, maual therapy, physical therapy, electrotherapy*

### Introduction

Carpal tunnel syndrome is the most common entrapment neuropathy of upper limb, affecting motor, sensory and vegetative fibers of the median nerve in the carpal tunnel (Vetu S. A. et al. 2017), thus bringing often its treatment, prevention and management into the research field.

The approach of this theme was made taking into consideration the importance of the wrist joint in the professional life, sport, daily living and the negative impact upon all these types of activities due to functional imbalances, disorders or injuries affecting the inferior part of the upper limb, which occur frequently. The programs proposed in the specialized literature (Moraru G. & Pâncotan V. 1999) must be combined with other therapies so that the recovery of the upper limb is of quality and duration. The carpal canal is an osteofibrous space through which pass the nine tendons of the long flexor of the

finger muscles (Rață M. 2004). The carpal tunnel is situated at the level of the radiocarpal joint, carpal anterior face and is the passageway on the palmar side of the wrist that connects the forearm to the hand (Schmidt. H-M. & Lanz U. 1998). A patient with any numbness or tingling in the fingers or with any weakness or atrophy of the thenar muscles must be considered as having carpal tunnel syndrome (Phalen G. S. 1972).

The clinical picture of carpal tunnel syndrome, pain and paresthesia on the palmar radial aspect of the hand, often worse at night, and/or exacerbated by repetitive, forceful use of the hand is a condition of the middle age people (Szabo R.M. 1998). Hereditary predisposition and regional congenital abnormalities may also contribute to the development of median nerve compression (Tanzer Radford C. 1959). The disorder can progress rapid or progressive, in a work-related context. In some cases, the symptoms

can be linked to rheumatoid arthritis, diabetes, pregnancy and thyroid disease and the syndrome considered a multifactorial condition (Genova A. et al. 2020).

The treatment could be surgery for the nerve decompression, when the syndrome's symptoms last more than six months without any relief (Williamson E.R. 2019) or conservative: medications, physical therapy, combined with various physiotherapeutically procedures.

Different forms of manual therapy represent an efficient method to prepare the tissues for movement. As technical repertory, it enhances maneuvers executed by local pressure, passive mobilizations, manipulations, various means of massage.

The purpose of this research was to create a rehabilitation programme for the carpal tunnel syndrome, adapted to the subjects functional necessities, with a high degree of efficiency and by the instrumentality of which they regain their independence in daily activities.

The aim of the study was to identify if manual therapy as supplementary procedure improve rehabilitation in carpal tunnel syndrome patients.

### Material and methods

This study was conducted at the Balneal and Recovery Sanatorium from Techirghiol, on a period of five months. The inclusion criteria was that the subjects had no surgery intervention and so we included 4 patients diagnosed with carpal tunnel syndrome, having aged media 51.75 years.

The rehabilitation program combined various electrotherapy procedures (5 per week, 3 weeks each subject) with physical therapy (5 sessions per week, 3 weeks each subject) and manual therapy (3 sessions per week, 3 weeks each subject), individualized by the subject specificity.

The 4 patients involved in the research were equally divided into two groups. All subjects attended the electrotherapy procedures, along with the physical therapy sessions, in which the mechanical energy were utilized in various forms: the patient voluntary motor activity, the gravity force, the forced induced by the physical therapist through passive

mobilization of the fingers, hand, fist and upper limb joints. They also performed exercises for fingers fine motor skills (Gidu D.V. et al. 2010) and dexterity (Gidu D.V. et al. 2017), hand integration into the upper limb kinetic chain and bilaterality exercises, avoiding the forcing phenomenon (Gevat, C. & Larion, A. 2009).

Two of the subjects had supplementary manual therapy sessions, before the physical therapy ones, with the purpose of connective tissues preparation. For this, larger than the affected hand, fist and fingers zone body's areas were approached: the medium and superior trunk, the pectoral arch, the arm and forearm. Massage de-sensitization maneuvers, carpal bones and median nerve manual mobilization and stretching for the flexor retinaculum to open the carpal tunnel were performed, with the objectives of decreasing the local pressure and improving the blood circulation.

In order to perform the functional balance of the patients, the measurement of the fist mobility were used, as evaluation methods, by goniometry. An initial assessment was made at the admission of subjects, prior to physical therapy (flexion, extension, abduction, adduction) and one after the last session, before discharge.

Patients were also evaluated initially and finally by the use of Tinel, Phalen and Durkan tests, initially all presenting positive result.

The Tinel's test is performed by tapping over the nerve to elicit a sensation of tingling in the distribution of the nerve. The test is positive when a tingling or prickling sensation is felt in the distribution of the nerve.

The Phalen's test consist in placing the flexed elbow on a table allowing the wrist to fall into maximum flexion. The patient is asked to push the dorsal surface of her hands together and hold this position for 30 - 60 seconds. During the test the patient will be asked to explain each 15 seconds what feels like. The test is considered positive when the patient's symptoms are reproduced as that experienced with the carpal tunnel syndrome.

For the Durkan's test the patient forearm is supinated and the examiner applies direct pressure over the carpal tunnel for 30

seconds. A positive test indicates any numbness, pain or paresthesia in the distribution of median nerve.

**Results and discussions**

Testing the patients included in the group that hasn't supplementary manual therapy sessions, we noticed at the initial test that for the extension movement the values obtained were 44° and 38°. Prior to discharge, at the final test the two patients obtained values for the extension movement of 62° and 74° (figure 1).

Knowing that the normal values of flexion in the fist joint according to Sbeneghe, T. et al. (2019) are 85° we notice improvements in the mobility of patients in the group without supplementary manual therapy.

For the extension movement, the values obtained at the initial testing of the patients included in the group without supplementary manual therapy are 50° and 56°, while at the final testing the values are of 68° and 65° (figure 2).

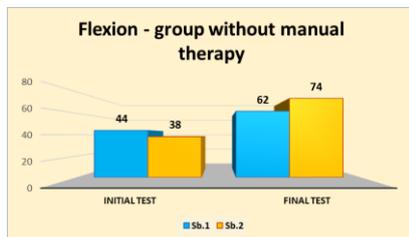


Figure 1- Flexion-group without manual therapy

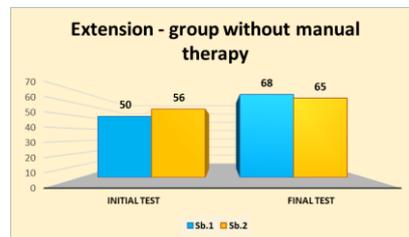


Figure 2 - Extension-group without manual therapy

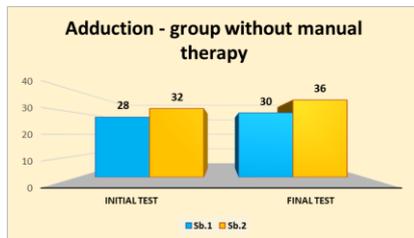


Figure 3 - Adduction-group without manual therapy

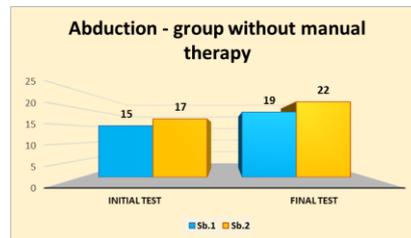


Figure 4 - Abduction-group without manual therapy

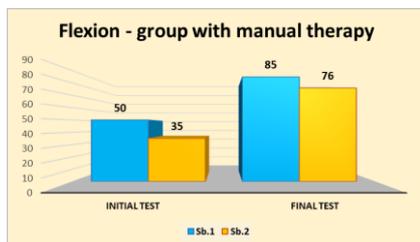


Figure 5 - Flexion-group with manual therapy

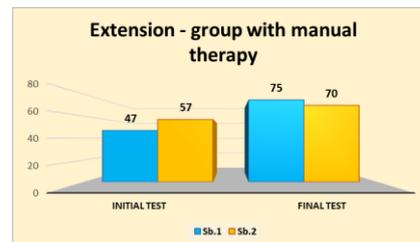


Figure 6 - Extension-group with manual therapy

Regarding the adduction movement at the initial testing, the group without manual therapy obtained values of 28° and 32°. At the final testing, the values recorded by the subjects of this group were 30° and 36° (figure 3).

For the abduction movement in the fist joint, the two subjects of the group without supplementary manual therapy obtained at the

initial test 15° and 17°. At the final test the recorded values were 19° and 22° (figure 4).

The subjects of the group who did manual therapy supplementary record, at the initial test, for the flexion movement in the fist joint 50° and 35°. At the final test the values obtained by the two patients are 85° and 76° (figure 5).

For the extension movement, the two subjects of this group register values of 47° and 57° at the initial test, while at the final test the values are 75° and 70° (figure 6). The values obtained at the initial testing, by the two subjects of the group who did manual

therapy, for the adduction movement, values were 23° and 29° and at the final testing values were 34° and 36°. For the abduction movement the values obtained at the initial test are 11° and 19° and at the final test 18° and 25° (figure 8).

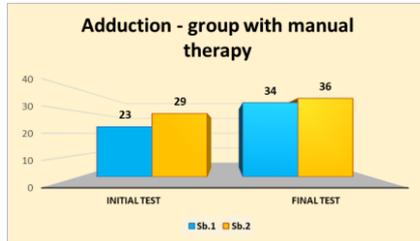


Figure 7 - Adduction-group with manual therapy

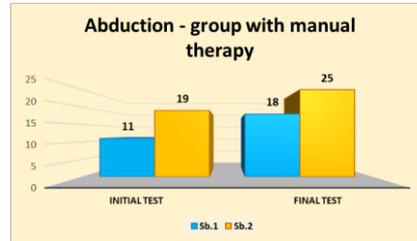


Figure 8 - Abduction-group with manual therapy

Table 1. Recovery of joint mobility (percentages)

%	Initial test				Final test			
	P without MT		P with MT		P without MT		P with MT	
	S <sub>1</sub>	S <sub>2</sub>						
Flexion	51.7	44.7	58.8	41.1	72.9	87	100	89.4
Extension	50	56	58.7	71.2	68	65	93.7	87.5
Adduction	70	80	57.5	72.5	75	90	85	90
Abduction	60	68	44	76	76	88	72	100

Legend: G-group; MT-manual therapy; S<sub>1</sub>- Subject no.1; S<sub>2</sub>-Subject no.2

Observing in table 1 the percentages of mobility recovered for each patient we can say that the subjects of the group who did manual therapy improved their mobility in the fist joint than the group who didn't supplementary manual therapy. As we see manual therapy was a plus to recover mobility in this joint after diagnosis with carpal tunnel syndrome.

**Discussion**

At the final evaluation, at the Tinel and Durkan tests, both subjects of the group that didn't do manual therapy had still a positive result and one at the Phalen test, presenting paresthesia and diffuse pain in the median nerve territory.

In the case of group who did manual therapy, both subjects registered negative results at the second Tinel, Phalen and Durkan tests, with no discomfort or paresthesia, one had negative, one positive result at the final Durkan test evaluation.

The effects upon the inflammation and edema decreasing of the electric procedures and the physical therapy exercises strategy are highlight in the increased range of motion of all measured types of movements, for both groups.

Processing and comparing the data obtained from the initial and final fist goniometry measurements for the subjects involved in this study, it showed that flexion, extension, abduction and adduction progress was gained for all, but with a higher score for the two subjects who did manual therapy supplementary.

The manual therapy techniques applied on the mechanic interface of the median nerve and the connective tissues mobilization were proved efficient upon the functional and dynamic difficulties of the affected area: fist, hand and fingers The pressure upon the nerve were diminished and its collision with the surrounding tissues, the local blood flux intensity were increased. Similar observations

reported Ghadam Ali Talebi et al. (2018) and Yunting Tang et al. (2017) in their researches. The specific symptomatology for the carpal tunnel syndrome presents manifestations as paresthesia of the fingers 3, 4, 5 and the lateral face of the last one, nocturnal pain, discomfort or pain in the middle of the palm at the finger flexion, usually the middle and index being affected the most. Thus, at the evaluation with the Tinel, Phalen and Durkan tests, initially all the subjects marked positive result.

At the second evaluation, the two patients without manual therapy as supplementary procedures had still positive result at the Tinel and Durkan tests and one at the Phalen test, (one subject registered negative Phalen test), fact that can be interpreted as low efficiency of the electric procedures and physical therapy only in median nerve de-compression. The de-sensitization manual therapy techniques and the maneuvers of carpal bones and connective tissues mobilization and stretching upon the median nerve conducted the results for the group with manual therapy in having no positive for the Tinel and Phalen tests in any cases and with one Durkan test positive.

Thus, after the evolution comparison of the two study groups, it can be stated that the manual therapy optimized the functional capacity of the joint, by gaining a better range of motion for those who have manual therapy as supplementary procedures than the subjects that didn't do this type of therapy, most probably due to the tissues elasticity increasing. Same time, manual therapy diminished the subjective symptoms of pain, discomfort and paresthesia.

### Conclusions

The rehabilitation process stages developed as follows: the inflammation and edema decreasing, the muscular force and joint mobility recovery, the hand and fingers dexterity optimization along with relief of biological stress reactions (Alexe C.I. et al. 2012), the paresthetic sensation diminishing. All these aspects were not treated separately, but by a systemic approach, taking the upper limb as whole.

Like the statistical data interpretation confirmed, flexion, extension, abduction and adduction of the fist had a significant improvement, with a higher score for group with manual therapy than the other one. The neurological testing highlights also more progress for the subjects of the experimental group.

As Huisstede et al. (2018) and Maddali Bongi, S. et al. (2013) shows, manual therapy combined with other types of therapy can improve symptoms and the function of hand for the patients who suffer of carpal tunnel syndrome.

Thus, it can be concluded that the manual therapy introduced as an associated technique in the carpal tunnel syndrome rehabilitation strategy is efficient. The stress relieved condition of the median nerve, the muscular fibers decontracting, the biometric training qualities (Damian M. et al. 2014), the connective tissues elasticity are some of its beneficial effects.

As Walker M.J. et al. (2017) and Wolny T. et al. (2017) stated after developing a similar study, manual therapy has a positive repercussion upon the nervous conductivity, improves the structures functionality and decreases the subjective symptoms.

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