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### PHYSIOTHERAPY MANAGEMENT FOR CARPAL TUNNEL SYNDROME: A CASE STUDY

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#### Abstract

**Introduction:** Carpal tunnel syndrome (CTS) is the most common neuropathy caused by compression of the median nerve in the carpal tunnel, which can cause symptoms such as pain, tingling, and numbness, the prevalence is 5.8% in adult women and 0.6% in men. The purpose of this study was to determine the effectiveness of a physiotherapy program using manual therapy, and exercise therapy to reduce pain and increase functional activity in patients with Carpal Tunnel Syndrome (CTS).

**Case Presentation:** Mr. H complained of tingling in his left hand from the wrist to the 4th finger and sometimes felt pain. Complaints are exacerbated at night so that it is difficult to sleep. Mr. H has difficulty driving a motorbike or car, buttoning clothes, opening bottles, and doing activities requiring the left hand.

**Management and Outcome:** The patient attended therapy four times once a week for four weeks with a physiotherapy program manual therapy, stretching exercises and strengthening exercises. Patients were evaluated using the Numerical Rating Scale (NRS), Manual Muscle Testing (MMT), and Boston Carpal Tunnel Syndrome Questionnaire (BCTSQ).

**Conclusion:** Physiotherapy management in the form of manual therapy, stretching exercises and strengthening exercises performed once a week for four weeks can reduce pain and increase the functional activity.

**Keyword:** carpal tunnel syndrome, manual therapy, exercise, physiotherapy



## Introduction

Carpal tunnel syndrome (CTS) is the most common neuropathy caused by compression of the median nerve in the carpal tunnel, which can cause symptoms such as pain, tingling, and numbness (Hafez et al., 2019). The prevalence is 5.8% in adult women and 0.6% in men. Usually, patients complain of tingling and numbness in the hands, especially in the first three fingers and the radial half of the fourth finger (skin distribution of the median nerve); this condition usually worsens at night (Siqueira, 2017).

Carpal Tunnel Syndrome can be caused by movements in the hands that are used accumulatively for a long period with the excessive intensity of movement, causing the muscles to turn into inflammation, causing swelling, which ultimately results in suppression of the median nerve. In addition, swelling, tendon inflammation, hormonal changes, and activity manual pressure can contribute to increased nerve compression and sometimes cause pain, as in the case of tendon inflammation. In more severe cases, muscle weakness of the median nerve can occur, resulting in weakness in the hand. (Padua et al., 2016).

Most cases of carpal tunnel syndrome are idiopathic. Other causes or associations have been identified with pregnancy, excessive hand or wrist use, wrist trauma, obesity, hypothyroidism, renal failure, diabetes, and inflammatory arthropathy (Middleton & Anakwe, 2014). Complaints of pain in CTS will greatly interfere with daily activities involving hand function and disrupt sleep at night. Still, it can also result in weakness in the thenar muscles, which will affect the functional abilities of the hands, such as grasping, clamping, and so on (Zuhri et al. al., 2016).

Manual therapy and exercise therapy techniques, including carpal bone mobilization and median nerve mobilization, can reduce pressure around the nerves and increase nerve blood flow, which helps nerves heal and improve CTS symptoms (Talebi, 2018). The purpose of this study was to determine the effectiveness of a physiotherapy program using manual therapy, and exercise therapy to reduce pain and increase functional activity in patients with Carpal Tunnel Syndrome (CTS).

## Case Presentation

### Subjective Examination

Mr. H is a driver and has a hobby of playing badminton, and he is 68 years old with no medical or surgical history. Mr. H complained of tingling in his left hand from the wrist to the 4th finger, and sometimes it was painful. Complaints are exacerbated at night so that it is difficult to sleep. Mr. H has difficulty driving a motorbike or car, buttoning clothes, opening bottles, and doing activities requiring the left hand. This complaint has been felt since one year ago, causing work as



a driver to be stopped, activities and hobbies are also disturbed due to pain, tingling and muscle weakness.

### Physical Examination

The study is related to the physical examination, which is related to examining vital signs, inspection, palpation. From the inspection results on the left-hand looks atrophy, can not perform the movement of the left finger opposition, unable to grip perfectly, limited movement and tremors when the movement of finger flexion and extension. From the palpation results, it was found that there was tenderness in the carpal bone and there was atrophy of the thenar muscle.

The findings of the vital signs indicate normal conditions in various aspects such as blood pressure, respiratory rate, pulse rate, and temperature.

Table1. Vital Signs

Blood pressure:	125/80 mmHg
Pulse:	67 x/minute
Respiration:	21x/minute
Temperature:	36 °C
Height:	160 cm
Weight:	58 kg

Basic motion examinations were carried out, namely examination of active motion, passive motion, and isometrics. On examination of passive motion, a limited range of motion was found in the left-hand MCP joint and accompanied by pain. On examination of isometric movement found muscle weakness so that it can not fight the resistance given by the therapist and when fighting movement tremors appear.

Specific examination for the diagnosis of carpal tunnel syndrome is performed using the Tinnel sign, tesphalen, and carpal compression tests. Based on the results of the three specific examinations, it was positive; namely, there was a tingling feeling in the fingers one, two, three, and part of the fourth finger. To ensure the validity of the test, it is necessary to know the validity and reliability values of the three tests. The study found that the sensitivity and specificity of the Tinel's test were 82.2% and 88.9%, the sensitivity and specificity of Phalen's test were 84.4% and 86.7%. In comparison, the sensitivity and specificity of the Carpal compression test were 84.4% and 82.2% (Ma & Kim, 2012).



Examination of pain using a numeric rating scale (NRS), measurement of muscle strength using manual muscle testing (MMT), sensory examination using tactile sensation, and functional activity examination using the Boston Questionnaire Carpal Tunnel Syndrome (BQCTS).

Pain measurement was carried out using a numeric rating scale (NRS). This instrument allows the patient to express the pain and complaints they experience and describes the pain classification consisting of 0-10 scores where 0 is without pain and 10 is the worst pain.

In the examination of muscle strength using Manual Muscle Testing, the results of wrist flexion and wrist extension were 4, meaning they were able to resist light resistance, while flex MCP and MCP extension were 3, meaning they were unable to resist resistance.

Sensory examination of the patient using a tactile examination showed a decrease in sensation in the palms. This examination was carried out by the way the patient was instructed to distinguish between coarse and fine.

BCTSQ assesses the general symptoms that appear in patients with CTS with symptom and functional assessment, where the symptom assessment is 11 questions, and functional is eight questions. Symptom questions in the form of pain intensity, tingling, numbness/discomfort in the upper extremities, especially the hands. While the functional assessment in the form of writing, buttoning clothes, closing bottles, etc.

In aspects 1 and 2, it was reported that the patient's symptom level was moderate to the intense difficulty.

## Management and Outcome

The physiotherapy process is carried out to patients as long as the patient follows all treatment sessions at Prof. Hospital. Dr. Margono Soekarjo, Purwokerto. The patient came to the physiotherapy clinic once a week for four weeks. The intervention goals are to reduce pain, increase muscle strength, and optimize the patient's functional ability. The table below describes the interventions carried out:

Table 2. Intervention Plan

Intervention	Dose	Information
Manual therapy	F: 1 time/week	- Transverse carpal
	I: according to patient's tolerance	ligament release
		- Median nerve



	T: 1 sets of 7 reps	mobilization techniques
Strengthening exercise	F : 3-5 times/week I: according to patient's tolerance T: 3 sets of 7 reps, hold for 10 seconds while stretching	- Grip strengthening with ball - Finger extention with rubbers - Extention wrist with therabend
Stretching exercise	F : 3-5 times/week I: according to patient's tolerance T: 3 sets of 7 reps, hold for 10 seconds while stretching	- Wrist Extension Stretch - Wrist Flexion Stretch

All outcome measurements were recorded before and after treatment. The primary outcome measurement tool was the Boston Carpal Tunnel Syndrome Questionare (BCTSQ). There are 2 assessment items, namely the symptom severe scale with 11 questions and the functional status scale with 8 questions. Secondary outcome measures were Numerical Rating Scale (NRS) (0-10 Score), and Manual Muscle Testing (MMT) to measure muscle strength.

## RESULTS

After doing the physiotherapy program at the Prof. Hospital. dr. Margono Soekarjo Purwokerto for 4 weeks with 1 intervention a week got the following results.

### Pain Measurement Results with NRS

After an examination of Pain using NRS (Numerical Rating Scale) the following results were obtained:

Table 3. Pain Measurement

	T1	T(End)
<b>Silent Pain</b>	2/10	0/10
<b>Motion Pain</b>	5/10	3/10



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<b>Pressure Pain</b>	6/10	4/10
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From the results obtained on the measurement of the pain scale, the effects on the first examination with a value of silent pain 2, motion pain five and tenderness six after routine physiotherapy interventions and the final results in measuring pain values became silent pain values 0, motion pain three and pressure pain with a value of 4.

#### Muscle Strength Measurement Results

The results of measuring muscle strength using MMT (Manual Muscle Testing) obtained the following results:

Table 4. Measurement of Muscle Strength

Muscle Region	T1	T(End)
Palmar flexor	4	4
Dorsal flexor	4	4
Radial deviation	4	4
Ulnar deviation	4	4
MCP Flexor	3	3
MCP extensor	3	3
Flexor thumb	3	3
Thumb extension	3	3

Based on the table above, there was no increase in muscle strength from the implementation of therapy for four meetings.

#### *Functional Ability Measurement Results with BCTSQ*

Measurement of functional ability was carried out after doing therapy, namely at T1 and T4 with the following results:

Table5. Functional activities



BCTSQ	T1	T4
Symptom severity scale	2,7	2,4
Functional status scale	4,5	4

Based on the results of the BCTSQ during therapy four times, it was found that there was a functional improvement and a reduction in symptoms. Specifically, based on the questionnaire on functional ability, there was an increase in writing and buttoning clothes. While the decrease in the degree of pain in the intensity of pain at night and during the day.

Although the degree of BCTSQ does not change, it still shows a change, namely in increasing functional activity and decreasing pain.

## Discussion

The physiotherapy program carried out in cases of Carpal Tunnel Syndrome aims to reduce pain, tingling, increase muscle strength, and increase functional activity. The interventions carried out are manual therapy, stretching exercises and strengthening exercises

Manual therapy techniques, including mobilization of the carpal bone and mobilization of the median nerve, have the potential to reduce pressure around the nerve and increase nerve blood flow, which helps the nerve heal and improve symptoms of CTS (Talebi, 2018). The use of dynamic neuro techniques resulted in a significant reduction in pain. The mechanism of descent may be due to decreased pressure in the carpal tunnel and decreased tissue edema. Nerve compression causes chronic inflammation that can lead to symptoms of carpal tunnel syndrome. The use of neurodynamic techniques can increase blood supply, reduce mechanical irritation and increase nerve displacement to improve its physiological function, that is, reduce intraneural edema, increase axonal transport, and decrease intraneural pressure, thereby reducing mechanical sensitivity (Wolny & Linek, 2019).

Exercise therapy is an action that is used to increase tissue extensibility by stretching the tissue and increasing flexibility. The benefits obtained from exercise therapy are maintaining and increasing muscle strength and endurance, increasing the ability of functional activities and maintaining flexibility and tissue extensibility (Kisner and Colby, 2007).

## Conclusions



Physiotherapy program for 4 weeks with manual therapy and exercise therapy can reduce pain, tingling and increase functional activity.

## Acknowledgments

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