The Effect of Acupuncture, Neuromuscular Taping, Tendon and Nerve Gliding Exercise on Improving Wrist Function in Conditions *Carpal Tunnel Syndrome*At Clinic T

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Abstract.

Carpal Tunnel Syndrome (CTS) commonly affects workers with repetitive hand motions, causing pain, tingling, and impaired hand function due to median nerve compression. This study aimed to assess the effectiveness of combined tendon & nerve gliding exercises, neuromuscular taping, and acupuncture in reducing pain and improving wrist function in CTS patients. A quasi-experimental pre-post test design was applied to CTS patients aged 20-60 years at Binawan University, with interventions twice weekly for 3-4 weeks (gliding exercises 5-10 reps, taping 3-5 days, acupuncture at LI-4, PC-6, etc., 20-30 min/session). Assessments used VAS pain, BCTQ function, goniometer ROM, and MMT. Results revealed significant pain reduction (VAS from 4-5 to 1-2), improved ROM (dorsiflexion 10-20°), muscle strength gain (MMT up 1-2 grades), and BCTQ scores shifting from moderate to mild. The combination effectively reduced adhesions, enhanced nerve mobility, and promoted Qi circulation per TCM principles. In conclusion, this integrative approach is safe and effective for mild-moderate CTS, recommended as conservative therapy prior to surgery. Larger-scale studies are warranted.

Keywords: *Carpal Tunnel Syndrome; Accupuncture and Neuromuscular taping.*

I. INTRODUCTION

One of the most frequently used body parts in various daily activities is the hand, if doing work or activities using the hand and wrist excessively for a long time and repeatedly will cause various symptoms such as numbness, pain to tingling, so that it can affect the neuromusculoskeletal system due to work-related musculoskeletal disorders (WMSDs) with a case review of workers in 2017-2020, one of which occurred Carpal Tunnel Syndrome (CTS) with a prevalence of 2.30 per 100,000 and National Health Interview at the age of 40-60 years (Ayesha et all,. 2024). So the static work position and the result of excessive load on the wrist for a long time will cause inflammation of the muscle tissue, nerves, and bones. This inflammation causes swelling that will press on the median nerve of the hand and cause Carpal Tunnel Syndrome (CTS) (Wahyuni, Sultan, & Baharuddin,. 2023). Carpal Tunnel Syndrome (CTS) is a neuropathy that occurs due to increased pressure on the median nerve in the carpal tunnel at the wrist, as well as under the flexor retinaculum and the ulnar nerve just below the forearm area.

Typical signs of CTS include numbness, paraesthesia affecting the three fingers from the thumb and the lateral half of the fourth finger, and pain that occurs in the wrist, and can radiate to the forearm or beyond the elbow. (Husniyyah & Rakhma, 2024). According to the World Health Organization (WHO) based on a report from the American Academy of Orthopedic Surgeons (ACOS), the prevalence of CTS in the United States is estimated at 1-3 cases per 1,000 individuals per year, with a prevalence of approximately 50 cases per 1,000 individuals in the general population (Qudus and Arofy, 2019). Several previous studies have shown that the application of tendon and nerve gliding exercises is effective in accelerating the recovery of hand function, improving daily function, and quality of life for CTS sufferers (Hirata et al., 2016). Although scientific evidence supports the benefits of each intervention in the rehabilitation of carpal tunnel syndrome, there has been no published research in Indonesia combining physiotherapy with acupuncture, neuromuscular tapping, and tendon and nerve gliding exercises. Based on the above description, the author aims to determine the effect of these interventions on carpal tunnel syndrome.

II. LITERATURE REVIEW

*Carpal Tunnel Syndrome*Carpal Tunnel Syndrome (CTS) is a form of neuropathy that occurs when pressure is applied to the median nerve in the carpal tunnel at the wrist, just below the flexor retinaculum. This is caused by inflammation of the muscle tendons. Typical signs of CTS include numbness and paresthesias affecting the first three fingers and the lateral half of the fourth finger, as well as pain in the wrist that can radiate down the forearm or beyond the elbow. (Husniyyah & Rakhma, 2024).

CTS is closely related to work that is dominated by the hands, resulting in biomechanical stress on the wrist. Most cases of CTS are primary, when the cause is unknown or idiopathic. Primary CTS is associated with synovial hypertrophy of the flexor tendons due to connective tissue degeneration with vascular sclerosis, edema, and collagen fragmentation. Secondary CTS is caused by pre-existing conditions or disorders that involve abnormalities in the carpal tunnel wall and its components (Sujadi, 2022).

Anatomy of the Wrist and Arm

Anatomy of the Carpal Tunnel The Carpal Tunnel (CT) is located in the central part of the wrist where the sides of the base of the carpal tunnel are formed by the carpal bones and ligaments with the CT structure being a narrow and rigid 'U' shaped channel on the palmar surface of the wrist. The carpal tunnel protects the median nerve which functions to transmit sensory impulses to the thumb, index and ring fingers and innervates the function of the muscles of the base of the side of the thumb.In addition to the median nerve, the tunnel contains nine tendons that function to move the fingers. The roof of the carpal tunnel is formed by a strong fibrous tissue known as the carpal tunnel. According to Agustina (2022), the bones of the hand are classified as follows:

Finger bones (Os. Phalanges)

The finger bones are called phalanges which are numbered I to V (or 1 to 5) starting with the thumb, just like the metacarpals. The thumb has two phalanges known as the proximal phalanx and the distal phalanx and the other fingers each consist of three phalanges namely the proximal phalanx, the medial phalanx, and the distal phalanx (Khairunisa & Ramadhani., 2022). Factors that influence pulse include age, gender, physical condition, emotional state, and seasonal changes. Furthermore, pulse rates can change during exercise but return to their normal levels after rest. Athletes generally have slower pulses.

III. PHYSIOTHERAPY MANAGEMENT

Examination Evaluation Results

After 6 examination meetings were conducted on Mrs. B, Mr. C and Mrs. P, there were changes in the examination results in the last session of the 6th therapy (June 3, 2025) and in the 3rd therapy session (May 24, 2025) adding complaints because the research was on holiday due to KKN, but the researcher always provided education and asked about health online to the patient. The three patients had the main complaints: numbness, pain, tingling in the wrist that spread to the thumb, index finger, middle finger, and sometimes to the elbow. Treatment for the three patients was acupuncture, neuromuscular taiping, tendon and nerve gliding exercise. The following explains the results of the examination of the three patients, April 2025, the results of Shen's observational examination found in the three patients: His facial skin color was pale, dry, dull and tanned. As well as observations of his tongue, there were tooth prints, yellow membranes. Dry, and there were cracks at the tip of the tongue and in the middle of the tongue. At first there was dizziness, facial expressions looked like he was holding back tingling pain when moving his wrist. The patient's eyes were watery and reddish then his bowel movements were only once again difficult but not hard or runny and his urine was yellow. Then the results of palpation were found to be weak and fast. At the next meeting on April 17, 2025, there was a decrease in blood pressure of 140/90 mmHg, no dizziness, the patient felt his eyes were bright but there was still watering, including:

1) Results of the Third Wu-Xing Examination The participant came for the first time on Monday, the 14th.no dizziness, the patient feels his eyes are bright but there is still watering.The results of blood pressure increased in the 3rd therapy (March 24, 2025) there was no change from the observations and the results of the blood pressure from the first 151/86 mmHg increased to 155/95 mmHg because the patient was working a lot and was on holiday from therapy after April 17.In the next examination, it increased and in the final

examination of the 6th meeting (June 3, 2025), there was a change in the observation of the tongue, from the cracks along the middle of the tongue and the cracks had begun to close, then the tongue was moist and red, there was no yellow membrane and the tooth prints began to fade. Blood pressure dropped to 125/80, so there was no dizziness, pressure on the point. The pain has reduced pain, spasms and increased movement limitations.

Color skin No dull (fresh),damp, breathing is not shining (takes deep breaths like someone is out of breath)The above conditions according to Salchi (2010) remember that this disorder is included in the domain of blockage or obstruction caused by cold, moisture or wind that penetrates the muscles and tendons of the wrist inhibiting the circulation of Qi and Xue (blood) which causes blood to clot (Xue stagnation syndrome and Bi syndrome). Treatment is directed at clearing blocked channels and activating the blood, expelling pathogens in the patient's body and patients who experience aches and pains to the bones that occur every night due to Lung Qi deficiency, Heart and disorders in the San Jiao meridian, with the care of the Lung, Heart and San Jiao meridians, the client does not feel aches and pains to the bones when approaching the night, and finally. sleep disturbances are felt. As well as the patient's yellow urine and difficulty defecating due to heat syndrome seen from the tongue which is a yellow membrane so that the pulse is deficient spleen and kidney deficiency. With the change in data in the 1st therapy session with the 2nd therapy session, and the 6th therapy session which resulted in changes in improvement, the formulation of the acupuncture diagnosis applied remains following the syndrome according to the current condition and also the syndrome is not immediately changed even though there are changes in the examination.

BCTQ Examination Results

Based on the results of the functional examination evaluation using the BCTQ, which the author will explain, there are two items: the first regarding the severity of CTS (SSS) and the second regarding daily functionality (FSSS). This examination was conducted over six sessions, twice a week for three weeks. The results of the BCTQ examination are as follows:

Table 1. Results of the BCTQ-SSS Discussion (Symptom Severity Item)

NamePatient	April 14, 2025	April 17, 2025	24/5-2025	27/5- 2025	31/5-2025	03/6/2025
Mrs. B	38	28	46	35	22	12
Mr. C	37	27	45	34	21	11
Mrs. P	38	28	46	35	22	12

Table 2. BCTQ-FSS Discussion Results (Functional Items)

NamePatient	April 14, 2025	April 17, 2025	24/5-2025	27/5-2025	31/5-2025	03/6/2025
Mrs. B	29	20	26	17	11	8
Mr. C	28	19	25	17	10	7
Mrs. P	29	20	26	17	11	8

Table 3. BCTQ Interpretation

Interpretation		
Total Score SSS	Total FSS Score	Explanation
Score (11)	Score (8)	Asymptomatic
Score (12-22)	Score (9-16)	Mild symptoms
Score (23-33)	Score (17-24)	Moderate symptoms
Score (34-44)	Score (25-32)	Severe Symptoms
Score (45-55)	Score (33-40)	Very severe symptoms

The effect of acupuncture, neuromuscular taiping, tendon and nerve gliding exercise on improving wrist functional ability can be seen before it was carried out on Monday, April 14, 2025, using the BCTQ to determine the severity of CTS symptoms with the Symptom Severity Scale (SSS) item having (11 questions) and the Functional section with the Functional Status Scale (FSS) item having (8 questions). All respondents before undergoing treatment experienced an increase in symptoms and a decrease in wrist functional ability with a category where the interpretation indicated severe symptoms, namely (34-44). The three patients in this study with the Symptom Severity Scale (SSS) item on Mrs. B got a score of 38 then Mr. C got a score of 37 and Mrs. P got a score of 38. And in the Functional Status Scale (FSS) item on Mrs. B got a score of 29

then Mr. C got a score of 28 and Mrs. P got a score of 29. After undergoing therapy until the last therapy on Tuesday, June 3, 2025, it was stated that there were changes in the SSS and FSS items that respondents showed improvements with SSS scores on Mrs. B (Score 12), Mr. C (Score 11) and Mrs. P (Score 12). As well as showing increased results on functional values with the results found in FSS scores on Mrs. B (Score 8), Mr. C (Score 7) and Mrs. P. (Score 8). The results of this study indicate that intervention with acupuncture, neuromuscular taiping, tendon and nerve glide exercise can reduce symptoms such as reducing pain, regularizing sleep patterns or relaxing patients so they do not wake up in the middle of the night due to tingling in their wrists, as well as in daytime activities so there are no limitations in their work or activities. As well as increasing the functional abilities of the wrist such as typing, opening jars, carrying items in plastic bags, holding a telephone, bathing with a dipper, and doing housework.

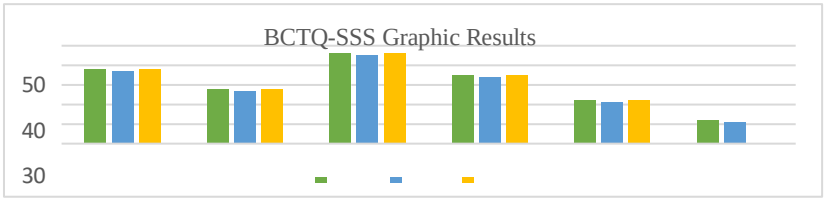
IV. ANALYSIS AND DISCUSSION

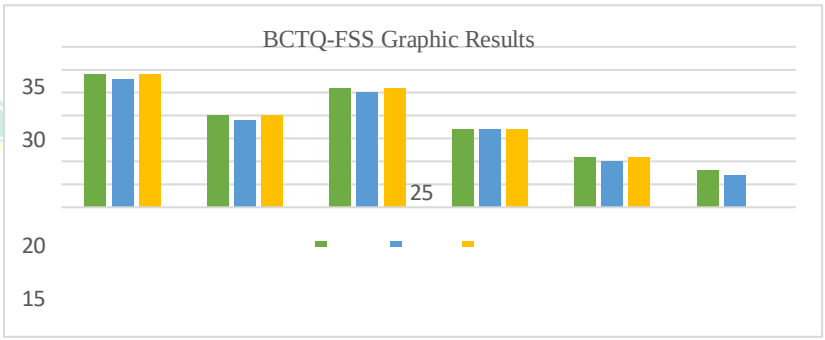
Analysis of Carpal Tunnel Syndrome Factor Characteristics

Based on the characteristics of the respondents, this study found that the three subjects were women aged 51–54 years and men aged 42 years. This finding aligns with research (Utamy et al., 2020) which reported that CTS sufferers aged 30–60 years were affected by bone degeneration resulting in reduced muscle and bone stability, such as tissue damage, scar tissue changes, and fluid loss. These authors indicated that women were at greater risk than men because women were at higher risk than male workers. This was due to women. When viewed from the Body Mass Index (BMI), the three respondents had values between 26.7–27.2, which falls into the overweight category. This overweight condition can cause fluid retention in the carpal tunnel. This relationship is explained as being caused by increased hydrostatic pressure within the canal. Pressure can occur due to the accumulation of fatty tissue, resulting in a compressive effect within the carpal tunnel, specifically on the median nerve (Ulbrichtová et al., 2020). In this study, the three respondents had a history of hypertension and when their blood pressure was checked, the three respondents had blood pressure that exceeded the normal limit of pressure and had a narrow carpal space for the tendons and nerves to pass through.

Hormonal changes during menopause and pregnancy put women at greater risk of developing CTS.blood pressure of 125/83 mmHg at age > 45 years. This finding is in line with research by Wenjie Guan, Jie Lao, Yudong Gu, Xin Zhao jing Rui, and Kaiming Ga. (2018) a history of hypertension can cause CTS because Hypertension is a clinical syndrome characterized by increased systemic arterial pressure, which can cause target organ damage, and is associated with systemic metabolic changes. This suggests that the occurrence of CTS is a protective factor because hypertension increases arterial pressure, which can cause small vasodilation and microcirculatory blood supply can be compensated.The factors that cause CTS are usually related to non-ergonomic wrist posture and excessive wrist movements over a long period of time will have an impact on muscle tissue or nerves that can become inflamed due to flexion or the position of the wrist forming a 450 angle that bends inward and extension that occurs while working will cause swelling so that it presses on the median nerve in the wrist and the occurrence of CTS cases (Sandra et al., 2023).

Description of functional improvement with BCTQ before and after being given acupuncture treatment, neuromuscular taiping, tendon and nerve gliding exercise.





The results of this study indicate that women have the highest prevalence of CTS in terms of symptom severity compared to men, based on the National Health Interview Survey (NHIS) which estimates that the prevalence of CTS among the adult population is 1.55% (2.6 million) and is more common in women than men with an age range of 25-64 years and CTS usually appears at the age of 40-60 years (Ayesha et al,. 2024).The decreased functional ability and the presence of symptoms in CTS disorders have a pathophysiological mechanism that may be caused by increased pressure in the carpal tunnel, microcirculatory injury of the median nerve, compression of the median nerve connective tissue and hypertrophy of the synovial tissue in the carpal tunnel. (Diah & Riami. 2023). As a result, pain such as pain, numbness, paraesthesia in the wrist, fingers other than the little finger and sometimes tingling to the elbow can occur so that there can be a decrease in functional ability (Wright & Atkinson, 2019).The results of this study indicate that the provision of acupuncture, neuromuscular taiping, tendon and nerve gliding exercise for 2 meetings over 3 weeks resulted in changes in symptoms and increased wrist functional ability in the study subjects. The acupuncture treatment in this study is in line with previous research by (Mohammadjavad et al., 2015) in this study using a randomized trial study method, published inJournal of Acupuncture and Meridian Studiesand this study was conducted in various rehabilitation hospitals in Shiraz, Iran.

The Ethics Committee of Shiraz University of Medical Sciences approved this study before it began. This study used acupuncture points for CTS, including PC-7 (Daling), PC-4 (Ximen), PC-6 (Neiguan), PC-8 (Laogong), HT-2 (Qingling), HT-7 (Shengmen), HT-8 (Shaofu), LU-9 (Taiyuan), and LI-11 (Quchi) these specific points were left for 20 minutes and the treatment was carried out twice a week for 4 weeks. There were significant results found ($p < 0.05$), The findings of this study indicate that effective acupuncture treatment for CTS can affect BCTQ scores, and VAS scores. The results of this study are also consistent with the findings (Fatma & Öztürk, 2017) Treatment of CTS acupuncture points (PC-7, PC-4, PC-6, PC-8, HT-2, HT-7, HT-8, LU-9, and LI-11) with a 0.25 x 25 mm needle and left for 25 minutes. Acupuncture treatment was applied two or three days a week, for 4 weeks there were results showing a significant increase in wrist functionality ($p < 0.05$). And according to (Maeda et all 2017) the treatment of CTS acupuncture points (PC-7, LU5-LI10-SI4-LI5 PC-6, PC-8, HT-2, HT-7, HT-8, LU-9, and LI-11) with a 0.25 x 25 mm needle and left for 20 minutes. Acupuncture therapy was given 16 times for 8 weeks with a 3-month follow-up. The results showed that there was a significant ($P < 0.001$) reduction in the BCTQ symptom severity scale score.

This research was then handled using Neuromuscular Taping, which the author obtained references from the research of Ayu Pertama, Renni Hidayati Brilian.Z, Dini MA, Iballa (2024). Neuromuscular Taping was given twice in three weeks with a 15-minute installation duration, worn for 3-5 days. The tape was applied with minimal to moderate tension (10-25%). There was a WHDI score result with a significant value of 0.023, indicating <0.05, which means there is an effect of adding NMT on nerve mobilization in CTS cases.The final treatment in this study was Tendon and Nerve Gliding Exercise. Previous research by Cici

and Rahmi (2021) found that therapy was given twice a week for three weeks, with the tendon gliding exercise dose being 5–10 repetitions, performed 2–3 times a day, and the Nerve Gliding Exercise being performed 10–15 times a day, with a duration of 20–30 minutes. The results showed a decrease in pain from grade 2 to grade 1 pain, and the BCTQ interpretation was in the moderate phase, with changes in functional improvement.

Analysis of the effectiveness of acupuncture, neuromuscular taiping, tendon and nerve gliding exercises based on dose, frequency, duration and intensity

Acupuncture is a non-pharmacological therapy modality performed by inserting fine needles at acupuncture points, as a component of Traditional Chinese Medicine (Rukmono et al., 2019). The mechanism of how acupuncture works by inserting needles at certain points on the human body under the skin and even penetrating muscle tissue and by being applied to acupuncture meridian points can activate nerve fibers and peripheral afferent receptors, producing sensory interactions at various levels of the central nervous system and releasing various transmitters and modulators, thus producing anti-inflammatory signals, neuroendocrine and neuroimmune signals, increasing nerve conduction so that it can reduce the severity of CTS symptoms after receiving acupuncture therapy (Wahyuningsih et al., 2019). Many previous studies have shown that acupuncture has an effect on reducing the severity of symptoms felt by patients and increasing functional abilities in the wrist in cases of CTS (Djaali et al., 2019).According to Ayu & Ismaningsih (2020), Neuromuscular Taping (NMT) is one of the newest innovative biomechanical therapy methods in 2013. (NMT) is a specific application of elastic adhesive attached to the skin surface with eccentric stimulation techniques resulting in decompression and dilation of the covered area used for therapeutic purposes. (Hargiani,2019). There are many previous studies stating that Carpal Tunnel Syndrome (CTS) is a collection of symptoms that occur as a result compression on median nerve, and the symptoms that often appear first are sensory complaints, such as numbness, tingling or pain was also found.

The results of the NMT study can reduce the NRS score from 6-7 so that the patient's pain complaints improve with the NRS reduced to 3-4 and can improve wrist function with a significant value of 0.023 which indicates <0.05, which means there is an effect of adding NMT on nerve mobilization in cases of CTS.The Tendon Glide Exercise aims to increase flexibility and reduce stiffness in the wrist and fingers. This exercise consists of five movements: straight hand, hook fist, full fist, tabletop position, and straight hand.*fist*Treatment was performed twice a week for three weeks, with each session lasting 20-30 minutes. The movements were performed for 5-10 repetitions, held for 5-7 seconds, in three sets, with a 1-minute rest period between each set. This treatment was highly effective in improving the functionality of the right and left wrist and hand, as measured by the BCTQ (Meida et al. 2023).Furthermore, this study used Nerve Glide Exercise treatment which is in line with previous research findings stating that the purpose of this treatment is to reduce pressure on the median nerve in cases of CTS because this exercise regenerates nerves, and increased nerve conduction can improve the function of the affected hand, both in the ability to reduce pain that is set to rest for 1 minute. This treatment is very effective for improving function in patients with BCTQ occurring at a score of 19 to 14. It was concluded that the Application of Nerve Gliding Exercise Therapy Intervention can overcome movement disorders and function of the right wrist joint in cases of CTS. (Anggun et al., 2023)

V. CONCLUSION AND SUGGESTION

Conclusion

Based on the treatment given to the three patients NY.B, Mr.C and NY.P in this case study, the average patient is a worker aged 45-55 years with complaints of Carpal Tunnel Syndrome diagnosis, where the patient complained of feeling uncomfortable in the wrist, decreased muscle strength & lack of functional grip. It can be concluded that a series of physiotherapy sessions carried out 6 times for 3 weeks were carried out two days a week with the provision of acupuncture, Neuromuscular Taiping and tendon and nerve gliding exercises given a duration of treatment for 60 minutes. duration of 15 minutes and a dose of tendon gliding exercise 5-10 repetitions performed 2-3x / day and Nerve Gliding Exercise performed 10-15x / day with a duration of 20-30 minutes. The goal is to reduce symptom complaints so as to improve functionality

Suggestion

Based on the results described by the author, several recommendations will be made to improve the effectiveness of therapy and support patients' quality of life, including a continuous exercise program, education and activity modification, the adoption of a healthy lifestyle, and regular monitoring and evaluation. These recommendations are expected to help improve management success, reduce CTS symptoms, and support patients in living a better quality of life.

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