

THE EFFECT OF USING PAD GLOVES AND TAPING ON PAIN REDUCTION IN CARPAL TUNNEL SYNDROME

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ABSTRACT

Carpal tunnel syndrome is a disorder that occurs in the wrist where there is a carpal tunnel through which the median nerve passes, due to excessive movement or pressure on the carpal tunnel which causes irritation of the median nerve, the purpose of this study was to determine the effect of using gloves with pads and taps on reducing carpal tunnel syndrome pain, this research method uses a quasi-experimental pre and post design with 2 group design, as many as 50 subjects were divided into 2 groups given gloves with pads and the other group was given a tap intervention, the research subjects were people who worked more than 3 hours riding a motorbike in 1 day, when driving the hands get pressure when slowing down the vehicle and when passing through damaged roads, the research subjects used gloves for 10 working days in two weeks, and used tapping for 2 weeks with a duration of 1 day on for 8 hours, 1 day off to prevent allergy. The results of this study were obtained by 31 men and 19 women with an average age of 32.2 years and an average pain before 5.4 and after 4.08 on the vase scale, the group using gloves and the taping group had an average pain of 4.12 before and after 1.84, in the statistical test conducted, a p value of 0.0001 was obtained where $p < 0.05$ so it can be concluded that the use of gloves and taps can reduce pain in cases of carpal tunnel syndrome.

Keywords: Carpal Tunnel Syndrome, Gloves, Taping

ABSTRAK

Carpal tunnel syndrome merupakan gangguan yang terjadi pada pergelangan tangan dimana didalam pergelangan tangan terdapat sebuah terowongan carpal yang dilewati oleh saraf medianus, akibat dari gerakan yang berlebihan maupun tekanan pada terowongan karpal yang menyebabkan iritasi saraf medianus, tujuan penelitian ini adalah untuk mengetahui pengaruh penggunaan sarung tangan dengan bantalan dan tapping terhadap penurunan nyeri carpal tunnel syndrome, metode penelitian ini menggunakan design eksperimental pre dan post, sebanyak 50 orang diberikan stretching dan tapping, subjek penelitian merupakan seseorang yang bekerja lebih dari 3 jam berkendara sepeda motor dalam 1 hari, pada saat berkendara pergelangan tangan mendapatkan tekanan saat memperlambat kendaraan dan saat melewati jalan bergelombang, subjek penelitian menggunakan sarung tangan selama 10 hari kerja dalam dua minggu, dan menggunakan tapping selama 2 minggu dengan durasi 1 hari pasang selama 8 jam, 1 hari lepas. Hasil penelitian ini didapatkan laki-laki sebanyak 31 orang dan perempuan sebanyak 19 orang dengan rerata usia 32,2 tahun dan rerata nyeri sebelum 4,54 dan sesudah 1,84 skala vas, pada uji statistik yang dilakukan didapatkan nilai $p=0.0001$ dimana $p < 0.05$ sehingga dapat disimpulkan bahwa penggunaan sarung tangan dan tapping dapat menurunkan nyeri pada kasus carpal tunnel syndrome.

Kata Kunci : Carpal Tunnel Syndrome, Sarung Tangan, Tapping

INTRODUCTION

Diseases that arise due to risk factors from work are called occupational diseases. According to the International Labor Organization (ILO), there are around 160 million cases of non-fatal work-related diseases each year. Musculoskeletal Disorders (MSDs) are the most common diseases associated with health disorders at work in 27 European Union countries. In South Korea, MSD cases increased drastically from 2001 to 2010. Globally, Carpal Tunnel Syndrome (CTS) is one of the most common types of MSDs, especially in whites and women. CTS is a peripheral neuropathy disorder that affects the hand and fingers I to IV, causing a tingling sensation, numbness, or pain. These symptoms develop slowly and are usually more pronounced at night, especially in certain fingers (Santoso et al, 2022). The carpal tunnel is a pathway in the wrist that contains the median nerve and tendons that help move the fingers. If inflammation or irritation occurs in the carpal tunnel, the median nerve can be compressed, causing CTS. Gloves with padding can reduce impact and inflammation on the median nerve and wrist, while kinesiotaping can provide wrist stabilization.

Globally, CTS is estimated to occur in 1-4% of the total population worldwide. The incidence rate reaches 276/100,000 people per year worldwide. CTS disease occurs most often in the Caucasian race and female gender.

The carpal tunnel is a place in the wrist where the median nerve and tendons that help move the fingers are located. If there is swelling, irritation, or narrowing in this tunnel, the median nerve can be compressed, causing Carpal Tunnel Syndrome (CTS). When the median nerve is pressed or pinched, it can cause a tingling sensation, numbness, or numbness, as well as pain in the area supplied by this nerve. (Ayrapetyan et al., 2021). The use of gloves with padding is intended to reduce the impact of impact and ignition on the median nerve and wrist. (Sanseverino et al, 2020), while the use of kinesiotaping is expected to provide additional support for hand understanding.

METHOD

Design of this study is a Quasi Experiment with 2 groups pre test & post test. The study subjects were individuals who rode motorcycles for more than 3 hours per day, wherein their wrists experienced pressure when slowing down the vehicle and while riding on bumpy roads. The first group of participants used padded gloves for 10 working days over two weeks, while the second group used taping for two weeks with a schedule of 8 hours on one day followed by a rest day. Each participant's pain level was measured using the Visual Analogue Scale (VAS) before and after the intervention.

The primary purpose of this study is to evaluate the effectiveness of using padded gloves and taping in reducing pain levels in individuals with Carpal Tunnel Syndrome who frequently experience wrist pressure during activities such as motorcycle riding. This study aims to determine whether these interventions can provide significant pain reduction, thereby helping to alleviate CTS symptoms.

RESULTS AND DISCUSSION

- RESULTS

The respondents in this study were divided into two groups with differing characteristics in terms of age, gender, occupation, and Visual Analog Scale (VAS) assessment. Group 1 had an age range of 17 to 54 years with a mean of 28.8 years (SD 12.31), while Group 2 ranged from 18 to 62 years with a mean of 35.6 years (SD 15.11). In terms of gender, Group 1 consisted of 56% men and 44% women, while Group 2 consisted of 68% men and 32% women. The primary occupations of respondents in Group 1 included motorcycle taxi drivers (36%), students (52%), and motorcycle rider workers (12%). In Group 2, 52% were motorcycle taxi drivers, 32% were students, and 16% were motorcycle rider workers. VAS assessments before and after intervention also showed differences; in Group 1, the VAS score before using gloves averaged 5.4 (SD 0.65) and decreased to 4.08 (SD 0.86) after using gloves. Meanwhile, Group 2 recorded a VAS score of 4.12 (SD 1.30) before using taping, which then decreased to 1.84 (SD 0.85) after using taping.

TABLE 1. DESKRIPTIVE CHARACTERISTIC RESPONDENTS

Characteristic Responden	Min	F (%)	Max	Mean+SD
Age Group 1	17		54	28.8+12.31
Age Group 2	18		62	35.6+15.11
Gender Group 1				
Male	14	56%		
Female	11	44%		
Gender Group 2				
Male	17	68%		
Female	8	32%		
Occupation Group 1				
Motorcycle Taxi Driver	9	36%		
Student	13	52%		
Motorcycle Rider Worker	3	12%		
Occupation Group 2				
Motorcycle Taxi Driver	13	52%		
Student	8	32%		
Motorcycle Rider Worker	4	16%		
Vas Group 1				
Vas Before Wearing Gloves	4		7	5.4+0.65
Vas After Wearing Gloves	3		6	4.08+0.86
Vas Group 2				
Vas Before Wearing Tapping	3		7	4.12+1.30
Vas After wearing Tapping	1		4	1.84+0.85

The normality test results indicated that the data were not normally distributed; therefore, the hypothesis test used was a non-parametric test, specifically the Wilcoxon signed-rank test.

TABLE 2. DATA NORMALITY TEST USING THE SHAPIRO-WILK TEST

Characteristic respondent	P
Before Vas Test Group 1	0.001
After Vas Test Group 1	0.001
Before Vas Test Group 2	0.001
After Vas Test Group 2	0.001

TABLE 3. PAIN RELATIONSHIP TEST BEFORE AND AFTER THE USE OF GLOVES AND TAPING IN SUBJECTS WITH CARPAL TUNNEL SYNDROME

The statistical test results showed a significant difference in pain measurements before and after the intervention in both groups. The test used is wilcoxon signed rank test. In Group 1 (Gloves), the Z-value was -4.327 with a significance of $p=0.000$, indicating a significant reduction in pain after the intervention ($p < 0.05$). A similar result was observed in Group 2 (Taping), where the Z-value was -4.546 with a significance of $p=0.000$, also demonstrating a significant reduction in pain after the intervention in this group. These results indicate that the intervention successfully reduced pain levels significantly in both groups.

Test Statistics		
Group Variable	Vas Group 1	Vas group 2
Z	-4.327	-4.546
p	0.000	0.000

TABLE 4. PAIN DIFFERENCE TEST BEFORE AND AFTER THE USE OF GLOVES AND TAPING IN SUBJECTS WITH CARPAL TUNNEL SYNDROME

The Mann-Whitney U statistical test results indicated that there was no significant difference in the tested variable between the two sample groups. The Mann-Whitney U value was 46.5, and the Z-value was -0.746 with a significance level of $p = 0.456$ ($p > 0.05$), showing that the difference between the groups was not statistically significant. This means that, at a 95% confidence level, there is not enough evidence to conclude a real difference between the two groups in the tested variable.

Test Statistics	
Characteristic Respondents	VAS
Mann-Whitney U	46.5
Z	-0.746

Asymp. Sig. (2-tailed)	0.456
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- **DISCUSSION**

Carpal tunnel syndrome (CTS) is a group of symptoms and signs associated with damage to the median nerve within the carpal tunnel. Most cases of CTS occur due to pressure on the median nerve as it passes through the wrist within the carpal tunnel, without any other underlying disease contributing to the pressure. Like many structural problems, CTS can occur in both hands, and the main risk factor is genetics. In addition, CTS can be caused by other conditions such as wrist fractures or rheumatoid arthritis. A wrist fracture, for example, can cause swelling, bleeding, and deformity in the carpal tunnel, which then presses on the median nerve. In rheumatoid arthritis, enlargement of the synovial lining of the tendons can also cause pressure on the median nerve (Hernández-Secorún M et al , 2021). Common symptoms of CTS include numbness and tingling in the thumb, index finger, middle finger, and thumb on the side of the ring finger. The carpal tunnel is a space at the base of the palm through which nine flexor tendons and the median nerve pass. The tunnel is surrounded by the carpal bones that form an arch on three sides. The median nerve is responsible for sensation in the thumb, index finger, long finger, and part of the ring finger. At the wrist, the median nerve also innervates the muscles at the base of the thumb, allowing abduction and outward movements of the palmar plane (Karimzadeh A et al 2019). The carpal tunnel is located in the middle third of the base of the palm, bounded by the scaphoid and trapezoid bone prominences at the base of the thumb, and the hamate bone along the arch of the ring finger. Anteriorly, the carpal tunnel is bounded by the transverse carpal ligament or flexor retinaculum, a strong fibrous band attached to the pisiform bone and hamulus of the hamate. Its proximal boundary is the skin crease at the wrist, while its distal boundary is Kaplan's cardinal line, which is drawn from the top of the skin crease between the thumb and index finger to the hamate bone (Genova A et al, 2020). The carpal tunnel is a narrow channel surrounded by bone and fibrous tissue. The median nerve passes through this space along with the flexor tendons and their sheaths. Any increase in compartment pressure can compress the median nerve. Specifically, the increased pressure can disrupt normal intraneural blood flow, which ultimately causes a series of physiological changes in the nerve itself.

There is a dose-response curve such that greater and longer periods of pressure are associated with greater nerve dysfunction. Most cases of carpal tunnel syndrome are idiopathic (the cause is unknown), but common causes are hypertrophy of the synovial tissue surrounding the flexor tendons of the forearm, and repetitive wrist movements.

Prolonged pressure can change the nerve tissue physiologically. Initially, the pressure damages the nerve's natural protective covering and increases the permeability of the surrounding blood vessel membranes. This can lead to swelling. If the pressure continues, the nerve can begin to lose its protective covering (called demyelination) in the area of compression. This results in abnormal nerve conduction, and even when the pressure is relieved, this demyelination can cause symptoms of numbness that persist until the nerve's protective covering is restored. If the pressure is prolonged and severe enough, nerve fibers (axons) can be injured and degenerate. At this stage, there may be weakness and decreased innervation of the muscles or tissues innervated by the median nerve depending on the extent of damage to the nerve fibers (Jernigan EW et al, 2020).

The pressure that can interfere with blood flow to the nerve depends on blood pressure. High blood pressure requires a greater external pressure on the nerve to interfere with blood flow. The critical pressure required to interfere with blood flow to the nerve is about 30 mm Hg below diastolic blood pressure or 45 mm Hg below mean arterial pressure. For adults with normal blood pressure, the average systolic blood pressure is 116mm Hg, and the diastolic blood pressure is 69mm Hg. Using this data, the average person will experience symptoms with a pressure of about 39mm Hg at the wrist. Patients with carpal tunnel syndrome tend to have increased carpal tunnel pressure (12-31mm Hg) compared to those without the condition (2.5 - 13mm Hg). Wrist movements or positions, such as flexion and extension, can increase carpal tunnel pressure up to 111mm Hg. Many daily activities are related to the carpal tunnel, such as driving, holding a mobile phone and activities that use wrist flexion, then there will be an increase in carpal tunnel pressure when doing these activities.

Nerve compression can cause various nerve injuries. Most patients with carpal tunnel syndrome experience grade I nerve injury (Sunderland classification), also called neuropraxia. This is characterized by conduction block, segmental demyelination, and intact axons. Without further compression, the nerve will remyelinate and recover completely. Severe carpal tunnel syndrome patients may experience grade II/III injury (Sunderland classification), or axonotmesis, where the axon is partially or completely injured. Axon injury will result in weakness and muscle atrophy, if further compression occurs, the nerve can only recover partially (Wolny T et al, 2017).

The use of padded gloves and taping (especially kinesiology tape) for carpal tunnel syndrome (CTS) has distinct advantages and limitations, depending on the patient's needs and symptom severity. Padded gloves offer additional protection for the wrist and help reduce direct pressure on the carpal tunnel area, alleviating pain and discomfort during strenuous manual tasks. This option is suitable for patients with mild to moderate symptoms who require stabilization during physical activities.

In contrast, taping, particularly kinesiology taping, works by creating more space around the median nerve reducing pressure, inflammation, and fixation in the wrist joint. Studies suggest that this method effectively reduces pain, improves hand function, and expands the carpal tunnel area, providing short-term relief for mild to moderate CTS cases. Another advantage is that taping supports movement without restricting daily activities.

However, the effectiveness of either padded gloves or taping largely depends on individual conditions. Taping often requires professional expertise for proper application, while gloves are more practical and user-friendly. Research also indicates that taping produces better outcomes when combined with other interventions, such as laser therapy, compared to its standalone use.

Patient compliance is crucial. Gloves are generally more comfortable for long-term use, whereas taping, despite its efficacy, may require frequent replacement and can cause skin irritation due to adhesive materials. Thus, the best approach often involves personalization based on the patient's needs and lifestyle.

Overall, both methods can be effective for CTS. A combined strategy, such as using gloves for heavy activities and taping during recovery or acute pain phases, may yield optimal results. Consulting healthcare professionals is essential to determine the most suitable approach based on the patient's specific condition.

Use gloves with gel pads to avoid CTS, soft gloves specifically designed to protect the palms from external pressure. In this study we concluded that gel-coated gloves can provide significant protection against CTS caused by pressure while driving. These gloves provide significant comfort, as well as better grip on the wrist so that they can reduce excessive vibration while driving, gloves with gel can provide comfort and reduce vibration in patients with Carpal tunnel Deltombe (2001). In a study conducted by (Mahmuda R et al, 2022) it was found that the use of Yuna Gloves can be used as wrist supports, help improve blood circulation, and protect the wrists of pregnant women in the Cipanas area of West Java with carpal tunnel syndrome. The use of taping also provides a fixation effect on the wrist so that hand movement can be minimized so that nerve root irritation due to compression can be avoided. Kinesiology taping is a non-invasive treatment method developed to provide external and dynamic support and protection to certain areas of the body. The use of kinesiology taping varies depending on the purpose but overall consists of applying adhesive and elastic tape with a certain level of stretch to certain areas in certain body part positions. (Cahyaningsih et al, 2023). The application of kinesiology taping to CTS can relieve symptoms by relaxing muscles, inhibiting movement and increasing blood flow and lymphatic circulation, and can reduce pain. Kinesiotaping has been shown to be effective in reducing symptoms, reducing pain in carpal tunnel syndrome sufferers in laundry workers (Agus Widodo et al, 2018). Further research on kinesiotaping should focus on proving this initial hypothesis using diagnostic tools.

CONCLUSIONS

- Both padded gloves and kinesiology taping can reduce CTS pain effectively.
- Statistical analysis tools should be used to validate findings and provide stronger evidence for these interventions.

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