

## COMPARATIVE STUDY OF TENDON AND NERVE GLIDING EXERCISES VERSUS KINESIOTAPING FOR CARPEL TUNNEL SYNDROME

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### ABSTRACT

**Background:** Carpal tunnel syndrome (CTS) is the most common entrapment neuropathy, with a reported annual incidence per 100,000 persons ranging from 324 to 524 among women and 135 to 303 among men. There are several treatment options which they can be broadly categorised into surgical and non-surgical. The various nonsurgical methods include: use of hand brace, splinting of the wrist, ultrasonic therapy, laser therapy, oral steroids, non-steroid anti-inflammatory drugs (NSAIDs), oral vitamin B6, local injection of corticosteroids, transcutaneous electrical nerve stimulation. There are a limited number of studies on the effectiveness of kinesiотaping in CTS. The purpose of this study was to evaluate the therapeutic efficacy of ultrasound treatment combined with nerve and tendon gliding exercises and kinesiотaping and to compare the two regimens.

**Materials and methods:** In the present study a convenience sample of 20 individuals between 25 to 55 years suffering from mild to moderate carpal tunnel syndrome were randomly and evenly divided into 2 groups: Group A (Tendon and Nerve gliding exercises) & Group B (Kinesio taping). Group A received Ultrasound over the area of carpal tunnel along with tendon and nerve gliding exercises 5 times a week for 2 weeks. Group B received Ultrasound 5 times a week over the carpal tunnel area along with kinesiотaping with 5 day interval for 2 weeks. At the end of 2 weeks the outcome measures which included VAS, Boston CTS Questionnaire assessed in both the groups and the data was statistically analysed.

**Results:** Intragroup analysis of both groups pre and post intervention showed statistically significant values for both the outcome measures VAS and BCTS Questionnaire (p value < 0.05). Intergroup analysis also showed statistically significant values for outcome measures inferring that Group B was better than Group A (p value < 0.05).

**Conclusion:** The study concluded that both kinesiотaping along with Ultrasound as well as tendon and nerve gliding exercises with ultrasound are effective in reducing pain and improving functional activities in patients with Carpal Tunnel Syndrome. Kinesiотaping with Ultrasound is more effective than tendon and nerve gliding exercise.

**KEY WORDS:** Carpal Tunnel Syndrome, Kinesiотaping, Ultrasound, Tendon gliding, Nerve gliding.

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Access this Article online	Journal Information
<b>Quick Response code</b> 	<b>International Journal of Physiotherapy and Research</b> ICV for 2016 86.93 ISSN (E) 2321-1822   ISSN (P) 2321-8975 <a href="https://www.ijmhr.org/ijpr.html">https://www.ijmhr.org/ijpr.html</a> DOI-Prefix: <a href="https://dx.doi.org/10.16965/ijpr">https://dx.doi.org/10.16965/ijpr</a> 
	Article Information
	Received: 04 Dec 2019 Peer Review: 04 Dec 2019 Revised: 15 Dec 2019
	Accepted: 05 Jan 2020 Published (O): 11 Feb 2020 Published (P): 11 Feb 2020
DOI: 10.16965/ijpr.2019.204	

### INTRODUCTION

Carpal tunnel syndrome (CTS) is the most common entrapment neuropathy, with a reported annual incidence per 100,000 persons ranging

from 324 to 524 among women and 135 to 303 among men [1-4]. Carpal tunnel syndrome is the most common neuropathy in the upper limb [1-3], which is caused by compression of

median nerve in the carpal tunnel at the wrist. At the beginning, and in mild cases, the symptoms include sensory complaint such as numbness and tingling of the first three fingers that are innervated by median nerve. Of course, the symptoms are not necessarily and always limited to the median nerve territory. At the beginning, the symptoms are intermittent and it exacerbates with repeated tasks by wrist, and at nights [1,4,5].

As the disease progresses, the symptoms are intensified and hand weakness and thenar muscles atrophy began. In addition to the patient's history, there are a number of tests, which may be positive, based on the intensity of the disease. In the mild cases, usually provocative tests such as Tinel and Phalen tests may be positive, while the neurologic examination appears to be normal. As the disease progress, other examinations such as decrease sensation in the median nerve territory, decrease two-point discrimination, and thenar muscle atrophy are noticeable. The diagnosis of the carpal tunnel syndrome is confirmed by electrodiagnosis. Based on the electrodiagnostic findings, the severity of carpal tunnel syndrome is classified into mild, moderate and severe [2].

There are several treatment options which they can be broadly categorised into surgical and non-surgical. The various nonsurgical methods include: use of hand brace, splinting of the wrist, ultrasonic therapy, laser therapy, oral steroids, non-steroid anti-inflammatory drugs (NSAIDs), oral vitamin B6, local injection of corticosteroids, transcutaneous electrical nerve stimulation [2,3]. However, conservative treatment choices are not always satisfactory. Therefore, modern rehabilitation still looking for an effective and non-invasive treatment options [7,8]. Of these conservative treatments, tendon and nerve gliding exercises are popular, and have been used since 1990 in the management of CTS. However, while evidence for the efficacy of tendon and nerve gliding exercises for CTS is emerging, the use of these exercises for the treatment of CTS remains controversial. It has been stated previously that support for the use of tendon and nerve gliding exercises in the treatment of CTS will require high-quality

studies with rigorous methodological approaches. It has been assumed that the analgesic, anti-inflammatory, and antiedematous effects of the application of ultrasound might be caused by stimulation of biochemical and biophysical processes at the cellular and tissue level [1,2]. The application of gliding exercises may influence "stretching the adhesion in the carpal tunnel, broadening the longitudinal area of contact between the median nerve at the transverse carpal ligament, reducing tenosynovial edema, improving venous return from the nerve bundles, and reducing pressure inside the canal."

Kinesiology taping (KT) is a therapeutic tool and has become increasingly popular within the sporting arena and daily physiotherapy practice. It was developed by Dr. Kenzo Kase in the 1970's with the intention to alleviate pain and improve the healing of soft tissues. Many benefits of KT using, including: proprioceptive facilitation, reduced muscle fatigue and delayed-onset muscle soreness, pain inhibition and improvement of lymphatic drainage and blood flow were demonstrated in the literature [8-10]. Kinesiotaping is a method that has been used in musculoskeletal system diseases in recent years and its effectiveness in certain diseases has been demonstrated. On the other hand, in the literature, there is a limited number of studies on the effectiveness of kinesiotaping in CTS [7]. This study was conducted to detect the efficacy of Kinesio tape on the treatment of carpal tunnel syndrome [8]. The purpose of this study was to evaluate the therapeutic efficacy of ultrasound treatment combined with nerve and tendon gliding exercises and kinesiotaping and to compare the two regimens.

## MATERIALS AND METHODS

**Study design and participants:** This was an interventional study with convenient sampling. 20 patients with symptoms of CTS including nocturnal paresthesia, pain in the median nerve distribution during activity, or numbness in the median nerve distribution was examined. Mild and moderate CTS patients, according to NCSs, were asked to participate in the study. Patients between 25 to 55 years who met the inclusion criteria were included in the study. Inclusion

criteria involved a diagnosis of the mild or moderate stage of CTS (according to criteria by Whitney and McDonnell), symptom duration for more than three months. Exclusion criteria comprised advanced CTS, secondary CTS, any previous surgery in the upper limb, steroid injections and any physical therapy treatment within six months before the study, pregnancy, cervical radiculopathy, peripheral polyneuropathy, or other neurological conditions. Patients who underwent surgical treatment were excluded from the study.

**Assessments:** All patients were examined by the Phalen test and Tinel test. Patients showing positive signs were further evaluated for the study with following outcome measures:

#### 1. Pain level

The visual analogue scale (VAS) pain score is between 0 (no pain) and 10 (worst possible pain).

#### 2. Functional status

The Boston questionnaire (BQ) (14) is self-administered and assesses the severity of symptoms and functional status in patients with CTS. The symptom severity scale (SSS) assesses the symptoms with respect to severity, frequency, time, and type. The scale consists of 11 questions with multiple-choice responses, scored from 1 point (mildest) to 5 points (most severe). The overall symptom severity score is calculated as the mean of the scores for the 11 individual items. The Functional Status Score (FSS) consists of eight questions with multiple-choice responses, scored from 1 point (no difficulty with the activity) to 5 points (cannot perform the activity at all). The overall score for functional status was calculated as the mean of all eight individual terms. Thus, a higher symptom severity or FSS score indicates worse symptoms.

**Methodology:** In the present study a convenience sample of 20 individuals between 25 to 55 years suffering from mild to moderate carpal tunnel syndrome were randomly and evenly divided into 2 groups: Group A (Tendon and Nerve gliding exercises) & Group B (Kinesio taping). Group A received Ultrasound over the area of carpal tunnel along with tendon and nerve gliding exercises 5 times a week for 2

weeks. Before the treatment course began, gliding exercises were presented by the physiotherapist and then performed by the patient with the supervision of the therapist. Each position in the tendon and nerve gliding exercises was maintained for seven seconds and repeated five times.<sup>12,24</sup> The nerve gliding exercises involved maintaining the fingers and the hand in six consecutive positions (fig 1).

At the beginning, (1) with the wrist in neutral and the fingers and thumb in flexion (grasp), then (2) with finger extension, (3) with the wrist and fingers extended and the thumb in neutral, (4) with the wrist, fingers, and thumb extended, (5) as the fourth position with the forearm in supination, and (6) as the fifth position and the other hand gently stretching the thumb.

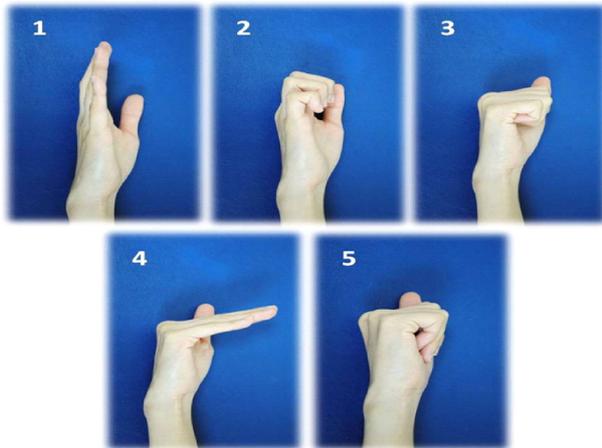
When doing the tendon gliding exercises the fingers were placed in 5 discrete positions: (fig. 2) (1) neutral—with all finger joints in the neutral position, (2) angle—with the metacarpophalangeal (MP) joints at 90° of flexion and the interphalangeal joints in neutral position, (3) straight fist—with the MP and proximal interphalangeal joints flexed maximally and the distal interphalangeal joints in straight position, (4) hook—with the MP joints in the neutral position and the interphalangeal joints flexed maximally, and (5) fist—with all finger joints flexed maximally.

Group B received Ultrasound 5 times a week over the carpal tunnel area along with kinesio taping (Fig 3) with 5 days interval for 2 weeks. At the end of 2 weeks the outcome measures which included VAS, Boston CTS Questionnaire assessed in both the groups and the data was statistically analysed.

Fig. 1: Nerve Gliding Exercises.



**Fig. 2:** Tendon Gliding Exercises.



**Fig. 3:** Kinesiotaping for Carpel Tunnel Syndrome.



**Statistical analysis:** In the present study was performed to evaluate the therapeutic efficacy of ultrasound treatment combined with nerve and tendon gliding exercises and kinesiotaping on patients suffering from carpal tunnel syndrome and to compare the two regimens.

Intra group analysis was done using paired t- test.

Inter group analysis was done using unpaired t- test post intervention for both groups.

**DATA ANALYSIS AND RESULTS**

**Table 1:** Intragroup comparison of mean values of variables pre & post intervention in both Group A and Group B.

Variables	Mean		t value	p value	Interpretation of p value
	Pre	Post			
VAS					
Group A	6.98	2.05	15.91059	3.38E-08	Significant
Group B	7.79	1.63	14.19692	9.09E-08	Significant
SSS					
Group A	4.37	1.62	9.175166	3.65E-06	Significant
Group B	4.35	0.925	16.10341	3.04E-08	Significant
FSS					
Group A	4.54	1.44	16.04402	3.14E-08	Significant
Group B	4.43	0.53	15.33643	4.65E-08	Significant

The above table indicates that there was statistically significant difference observed in all the variables pre and post 4 weeks of intervention ( $p < 0.05$ ).

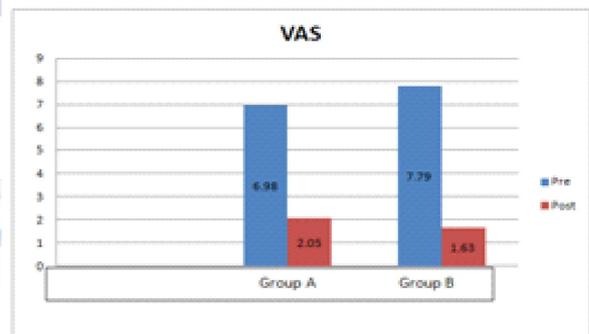
**Table 2:** Intergroup Comparison of mean difference of variables between Group A and Group B.

Variables	Mean		t value	p value	Interpretation of p value
	Group A	Group B			
VAS	4.99	6.16	-2.30693	0.01658	significant
SSS	2.75	3.425	-1.83664	0.041417	significant
FSS	3.1	3.9	-2.5049	0.011041	significant

The above table indicates that there was significant difference observed in all variables with p value less than 0.05. The results state that Group B was better than Group A.

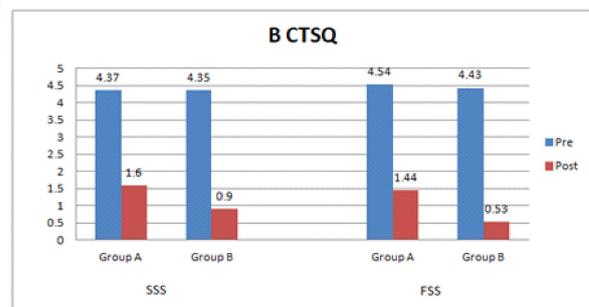
**Demographic characteristics of the study:** Total 20 subjects participated in the study. The total number of subjects in each group was 10.

**Graph 1:** Comparison of mean of VAS pre & post intervention in Group A and Group B.



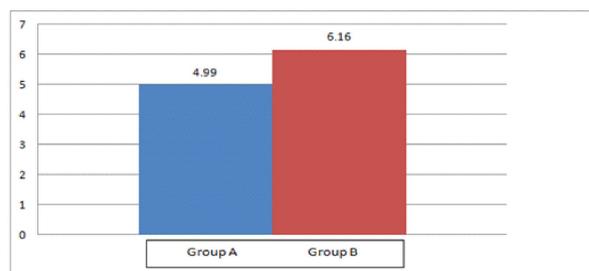
The above graph shows that there was decrease in the mean VAS value in both the Groups pre & post 4 week of intervention with significant difference ( $p < 0.05$ ).

**Graph 2:** Comparison of mean of components of B CTSQ pre and post intervention in Group A and Group B.



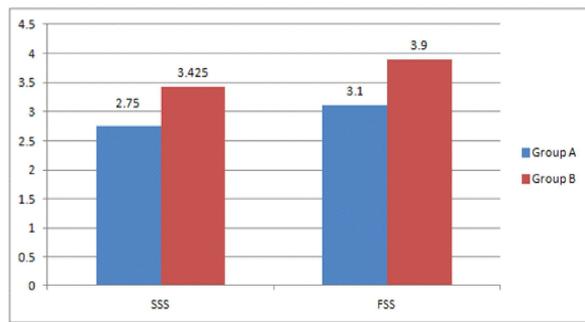
The graph states that there was significant improvement in the B CTSQ score in both the groups.

**Table 3:** Intergroup Comparison of mean difference of VAS between Group A and Group B.



The graph indicates that there was significant difference observed in VAS Group B was better than Group A.

**Graph 4:** Intergroup Comparison of mean difference of BCTSQ variables between Group A and Group B.



## DISCUSSION

The Present study was done to evaluate the effect of Tendon and nerve gliding exercises with Ultrasound and Kinesiotaping with Ultrasound on patients suffering from Carpel Tunnel Syndrome and to compare the effect of both the interventions.

The current study reported improvements on Pain, symptom severity scale and functional status scale. When literature was consulted regarding the effects of nerve and tendon gliding exercises, it was observed that these exercises caused significant improvement in many parameters like they improved phalen's sign, improve grip strength, muscle strength, symptom severity scale and functional status scale. In current study, the symptom severity score was significantly improved with significant reduction in the symptoms of pain, paresthasias, nocturnal pain, tingling and disturbed sleep.

In current study, although functional status scale showed improved results in both groups but this improvement was noted more in group B as compared to group A, with obvious differences in the values of the means of both groups showing higher improvements in group B.

Table 1 along with graph 1 and 2 shows the intragroup comparison of variables of Group A and Group B showing significant improvement in all the variables.

Literature review of studies done on nerve and tendon gliding exercises have also shown similar results. Another study done on finding the effectiveness of nerve and tendon gliding exercises revealed that that group which received nerve and tendon gliding exercises showed better results than those who have not received nerve and tendon gliding exercises. Patients

showed increased improvements in symptom severity scale, functional status scale and on clinical findings [7]. In the literature we found significant improvement in pain intensity in CTS by applying neurodynamics in combination with soft tissue mobilization [10]. Their results also support the results of the current study. Small sample size, shorter duration of study, unwillingness of patients for follow up and unequal distributions of gender are few limitations of this study that must be addressed. The goal of treatment for carpal tunnel syndrome is to allow to return to normal function and activities and to prevent nerve damage and loss of muscle strength in fingers and hand. The narrow carpal tunnel physically restricts overused and compromised nerve tissue between its surrounding structures, causing pain, numbness, and/or tingling in the wrist and forearm and reducing or seriously hampering proper wrist function.

Table 2 along with Graph 3 and 4 shows the intergroup comparison of variables between Group A and Group B which states that Group B was more effective than Group A with statistically significant difference.( $p < 0.5$ ).

Kinesio taping (KT) techniques can help decrease discomfort, increase range of motion, and increase function. Furthermore KT helps reduce inflammation by improving circulation of blood and lymph creating an environment that is conducive to healing. However, to date still is little known about effect of KT method in carpal tunnel syndrome. The present study was designed to determine the efficacy of Kinesio tape on the treatment of carpal tunnel syndrome in a mild and moderate degree of symptoms. However, in KT group mean values obtained in BCTSQ and VAS scale after intervention were slightly better - compared to results obtained in group A, where mean scores increased to terms of baseline data. Only in one previous study assessed effect of KT and described of this method as an alternative in treatment of CTS. Kulcu et al., in randomized, placebo-controlled study reported significantly improved in terms of VAS scores and BCTSQ scores - compared to results in control group and splinting group. However, there was no association between grip strength and KT treatment. According to values presented in Table 2 Kinesiotaping along with

ultrasound was found to be more effective. Further clinical studies with larger sample sizes are needed.

## CONCLUSION

The present study concluded that both kinesiotaping along with Ultrasound as well as tendon and nerve gliding exercises with ultrasound are effective in reducing pain and improving functional activities in patients with Carpel Tunnel Syndrome. Moreover, Kinesiotaping with Ultrasound is more effective than tendon and nerve gliding exercise.

**Conflicts of interest: None**

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### How to cite this article:

Ramzan Mohammed Rafique, Farheen Farooque Khan, Sanjeev Kumar Singh. COMPARATIVE STUDY OF TENDON AND NERVE GLIDING EXERCISES VERSUS KINESIOTAPING FOR CARPEL TUNNEL SYNDROME. *Int J Physiother Res* 2020;8(1):3366-3371. DOI: 10.16965/ijpr.2019.204