



Original Article

Comparing Effectiveness of Median Nerve Mobilization with and without Transverse Carpal Ligament Stretching in Patients with Carpal Tunnel Syndrome

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ABSTRACT

Carpal tunnel is the narrow space which is present between smaller bones of hand and an important ligament of hand which is called transverse carpal ligament. Compression of median nerve occurs commonly at wrist which results in Carpal Tunnel Syndrome (CTS). **Objective:** To compare effectiveness of median nerve mobilization with and without transverse carpal ligament stretching in patients with carpal tunnel syndrome. **Methods:** In this study, 34 patients were randomly assigned into one of two groups, each with 17 individuals. For two weeks, group B received a combination therapy strategy of Neurodynamics and transverse carpal ligament stretching, while group A only received neurodynamics. After two weeks, there was an improvement in functioning and pain. The DASH questioner and VAS were filled at baseline. The current RCT was conducted at the Akhtar Saeed Trust Hospital in Lahore. SPSS was used to conduct the analysis. **Results:** In the present study of 34 patients independent sample t test was applied as the mean difference was less in group B, which used a combination treatment method of transverse carpal ligament stretching and neurodynamics, compared to group A, which used only neurodynamics. The p value is less than 0.05, indicating that the results were significant. In comparison to group A, results of group B in which combined treatment approach was applied found to be more substantial and superior. **Conclusions:** Group B, which included both neurodynamics and transverse carpal ligament stretching, was shown to be more effective than group A, which solely used neurodynamics.

INTRODUCTION

Carpal tunnel is the narrow space which is present between smaller bones of hand and an important ligament of hand which is called transverse carpal ligament. Compression of median nerve occurs commonly at wrist which results in Carpal Tunnel Syndrome (CTS) [1-3]. It causes motor and sensory changes as a result of any pressure and over stretching of the median nerve as it passes through the narrow space in the wrist [4-6]. Median nerve mobility can also be restricted if the space of carpal tunnel decreases and contents of carpal tunnel enlarges [7,8]. This results in the neurological symptoms that can travel down the wrist along the median nerve distribution [9,10]. CTS can be classified into 3 grades such as mild, moderate, and severe

CTS. Mild and moderate CTS patients present with numbness and paresthesia in hand fingers but wrist functions are not affected but in severe CTS wrist activities are restricted. Its incidence rate is 1% and age ranges from 40 to 60. Its prevalence is more in females as compare to males. Prevalence of this syndrome in US population is 3.72 percent and its incidence is 139.4 females out of 100 000 and 67.2 males out of 100 000 [11]. There are many causes for this syndrome such as metabolic diseases, tendinitis, tendinosis, repetitive wrist activities, gripping activities, constant pressure over median nerve, fracture of carpal bones, poor posture, lesions of median nerve, any trauma, arthritic changes and pregnancy but many have idiopathic

cause [12-14]. The most common characteristics is tenderness and pain especially at night [15,16]. There is decrease in pain and numbness after flicking the wrist [17,18]. The pain is limited to median nerve distribution as it can spread to forearm and shoulder [19,20]. Delay in treatment can result in permanent change such as sensory loss and muscle atrophy of Thenar muscles. This can result in limitation of activities of daily life as there is weakness and atrophy of muscles innervation by median nerve [17,21]. Phalen's test and Tinel's sign is positive in this syndrome [11]. Different treatment plans are given to patients in physiotherapy in order to protect the nerve wrist splint is used which keeps the wrist in neutral position [22]. It is advised to use wrist splint at night as symptoms are more severe at night and it can be added along with conservative treatment. It is mentioned that wrist splint decreases the symptoms in 67 percent. TENS, laser, stretching exercises, cryotherapy, PNF techniques, Ultrasound therapy, tendon glides, nerve stretching exercises, carpal bones mobilization techniques, traction exercises and strength training can also be used [23]. There are different techniques of nerve mobilization which includes nerve tension exercises and nerve glides. These treatments can result in decrease in pain, numbness, strength improvement and ROM improvement. Tendon glides prevents adhesion formation and compression in carpal tunnel [24]. Kinesio taping can also be used for same purpose. When conservative treatment fails surgery is recommended in severe cases but there can be surgery related complications and failure [25]. Nonsurgical treatment also includes NSAIDs and Steroids [12,26,27]. There is very limited literature which tells us about combined effect of splint along neurodynamics so present study showed that combined intervention is more effective as compared to neurodynamics alone.

METHODS

In present study, 34 patients were chosen and separated into two groups, with each group containing 17 patients, using the Randomization Concealment method and random convenient sampling. The research was conducted at the Akhtar Saeed Trust Hospital's Department of Physiotherapy. The second group had a combined neurodynamics and carpal ligament stretching treatment, whereas the first group received solely neurodynamics (distal nerve tension technique and nerve slide) treatment. The hand is positioned in six postures for the Median Nerve Tension Technique. The first position consists of a neutral wrist with flexed fingers, the second position consists of finger extension with the wrist in a neutral position, the third position consists of wrist extension with finger extension, the fourth position consists of thumb extension, the fifth position consists of forearm supination, and the

sixth position consists of slight thumb tension. Five repetitions were completed, with each position held for seven seconds. Wrist extension and finger flexion are used in the nerve slide technique, and vice versa. When the wrist extends, the elbow flexes, and vice versa. 10 repetitions were done during a two-week period, 5 days per week. Patients with signs and symptoms of CTS, having discomfort and paresthesia, as well as positive Tinel and Phalen tests, were included. Symptoms of patients that lasted at least for four weeks were included. Patients with a history of surgery, who were more than 50 years old, who had been in a car accident, who were pregnant, who had received corticosteroid injections, and who had a systemic condition were all eliminated. The DASH determines the functional restriction. The subjects completed this questionnaire before beginning treatment and again after finishing treatment. Patients were observed for two weeks and treated five days a week for a total of ten sessions. After a two-week period, a comparison of outcomes was made. After completing out the questionnaires, the data was analyzed using SPSS. In the study, the P value of 0.05 was indicated and considered significant.

RESULTS

34 patients were taken in this study in which group A has the mean age of 46.00+4.16 years and group B has the mean age of 45.59+4.47 years. In group A 5 males and 12 females were present while in group B 6 males and 11 females were present. It was concluded that CTS is more prevalent in females as compared to males. In group A 11 married and 6 unmarried were present and in group B 9 married and 8 unmarried were present. 14 patients in group A developed CTS in right hand and 3 in left hand while 13 patients in group B developed CTS in right hand and 4 in left hand. As in group B when mean paired difference was seen it was lesser in group B in which combined treatment approach was used as compared to Group A in which only neurodynamics were used so second group of neurodynamics and transverse ligament stretching found to be more superior as compared to first group in which only neurodynamics alone were used. Through independent sample t test baselines values for DASH were insignificant in both groups ($P>0.05$). In the end of 2 weeks' treatment, there was significant difference in both groups but group B results were found to be more significant as compared to group A as $p<0.05$. Baseline values for VAS were insignificant as $p>0.05$ but after two weeks' duration significant results were found in both groups but more significant results were found in second group as compared to first group. It was concluded that Group B in which neurodynamics and carpal ligament stretching were used found to be more effective as compared to group A in which only neurodynamics were used. In group A mean age was 45.7+ 4.28 and in group B

mean age was 34.06 + 4.35, Table 1.

Age	N	Mean±SD (Years)
Group A	17	46.00±4.16
Group B	17	45.59±4.47

Table 1: Age of participants in Group A and Group B

In group A 5 males and 12 females were present while in group B 6 males and 11 females were present. It was concluded that CTS is more prevalent in females as compared to males. In group A 11 married and 6 unmarried were present and in group B 9 married and 8 unmarried were present. 14 patients in group A developed CTS in right hand and 3 in left hand while 13 patients in group B developed CTS in right hand and 4 in left hand, Table 2.

Variable	Group	Attribute	N	Total
Gender	Group A	Male	5	17
		Female	12	
	Group B	Male	6	17
		Female	11	
Marital status	Group A	Married	11	17
		Unmarried	6	
	Group B	Married	9	17
		Unmarried	8	
Hand involvement	Group A	Right hand	14	17
		Left hand	3	
	Group B	Right hand	13	17
		Left hand	4	

Table 2: Demographics of Group A and Group B

pretreatment values of DASH questioner were insignificant among two groups ($p=0.38$) but after follow up period when interventions were given, significant difference was found with p value 0.00 which falls under $p < 0.05$. Group B in which neurodynamics and transverse carpal ligament stretching were used found to be more effective as compared to group A in which only neurodynamics were used, Table 3.

Study Group	Mean±SD	N	S. E	Mean difference	T	Sig.
DASH-baseline	Group A 86.41±5.00	17	1.21	-1.35	-0.88	0.38
	Group B 87.76±3.89	17	0.94			
DASH-post	Group A 19.00±9.98	17	2.42	7.82	2.84	0.00
	Group B 11.17±5.34	17	1.29			

Table 3: An independent sample t-test demonstrating the significance of the difference between groups A and B as $n=34$

Pretreatment values of VAS scale varied insignificantly with $p=0.17$ but after follow up period when interventions were given, there was significant difference between two groups with p value 0.01 which falls under $p < 0.05$. Group B in which neurodynamics and carpal ligament stretching were used found to be more effective as compared to group A in which only neurodynamics was used, Table 4.

Study Group	N	Mean±SD	p-value (**)
Baseline	Group A	17	8.58±1.00
	Group B	17	9.05±0.96
Week_2	Group A	17	1.29±0.46
	Group B	17	1.00±0.00

Table 4: Independent sample t-test demonstrating significance of difference between group A and B as $n=34$

DISCUSSION

In the past Wolny and Linek 2019 did a study in which 103 patients were enrolled. There were two groups. First group received neurodynamics alone and the second group received neurodynamics together with traditional physical therapy. In previous study the second group that received neurodynamics and traditional physical therapy found to be more effective than the first group of neurodynamics alone. Treatment was given twice a week for a total of 20 sessions. Similarly, when previous study was compared with present study it was seen that combined interventions such as neurodynamics and transverse carpal ligament stretching were found to be more effective as compared to first group that received only neurodynamics [28]. Previously, there was a study conducted by Goyal, Mehta, and colleagues in 2016. The first group received traditional physiotherapy, whereas the second group received procedures for neural nerve mobilization. Each group consisted of 15 patients. Finally, it was determined that the group that incorporated neural nerve mobilization was more effective than the other group. Similarly, in the present study the group that incorporated neural nerve mobilization was found to be more effective [29]. In the past De-la-Llave-Rincon and Ortega-Santiago conducted a study on 18 CTS patients. The researchers wanted to see how soft tissue technique and neurodynamics affected pain and pressure sensitivity. Scalene neck muscle, elbow aponeurosis (bicipital aponeurosis), pronator teres, and hand ligaments were all subjected to soft tissue mobilization (transverse carpal ligament). Finally, it was discovered that while neurodynamics and soft tissue massage reduce pain, they do not reduce pressure sensitivity. Likewise, in present study it was found that neurodynamics and transverse carpal ligament stretching reduces tenderness in CTS [11]. When previous studies were compared with present study same results were found as it was seen that the outcomes in the current study were significant in both groups, however group A, which used a ligament stretching as well as neurodynamics, was shown to be more significant than group B, which used simply neurodynamics in other words combined treatment approach was found to be more effective.

CONCLUSIONS

The researchers concluded that while both groups' results

were significant, the combined therapy technique (neurodynamics and carpal ligament stretching) was superior to neurodynamics alone. Pain was reduced and functional strength was improved more in Group B. When comparing the two groups, it was discovered that group B produced more significant results than the group A.

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