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**ORIGINAL ARTICLE**

# Comparative Effects of Neurodynamics With and Without Wrist Splint in patients with Carpal Tunnel Syndrome

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## ABSTRACT

**Aim:** To compare effectiveness of neurodynamics with and without wrist splint in patients with carpal tunnel syndrome.**Study design:** Randomized controlled trial.
**Settings:** Farooq Hospital & Akhtar Saeed Trust teaching hospital,Lahore.
**Methodology:** In present study 34 patients were randomly allocated into two groups in which each group contains 17 patients. Group A received combined treatment approach of neurodynamics and wrist splint while group B received only neurodynamics for two weeks .Improvement in functions and pain were recorded after 2 weeks .Initially baseline measurements were taken on DASH questioner and VAS. Present RCT study was carried out at Akhtar Saeed Trust Hospital,Lahore. Analysis was established through SPSS.
**Results:** Independent sample t test was applied in present study of 34 patients as the mean difference was greater in group A in which combined treatment approach of wrist splint and neurodynamics were applied as compared to other group B in which only neurodynamics were applied.The p value is < 0.05 which shows results were significant. Results were more significant and superior in group A as compared to group B.
**Conclusion:** Group A in which neurodynamics and wrist splint were used found to be more effective as compared to group B in which only neurodynamics were used.
**Keywords:** Carpal tunnel syndrome; neurodynamics; wrist splint.

## INTRODUCTION

Carpal tunnnel 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)[1,2,3]. 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[4,5,6]. Medaian 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 effected 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% 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[12,13,14]. 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%. 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 neurodymics alone.

The aim of study was to look at the effects of soft tissue technique and neurodynamics on pain and pressure sensitivity

## METHODOLOGY

In this study 34 patients were elected and were divided into two groups in such a way that each group contains 17 patients according to Randomization Concealment method by the usage of random convenient sampling. This study was carried out at Department of Physiotherapy of Akhtar Saeed Trust Hospital. First group received combined treatment approach of neurodynamics and wrist splint while second group received only neurodynamics (distal nerve tension technique and nerve slide). For Median nerve tension technique, hand is placed in six positions.First position consist of wrist in neutral with fingers flexed,second position consist of extension of fingers with wrist again in neutral position,third position consist of wrist extention with extension of fingers, fourth position consist of thumb extension, fifth position consist of supination of forearm ,sixth position consist of slight tension on thumb. 5 repetitions were done and each position is maintained for 7 second. Nerve slide technique consist of wrist extension and fingers flexion then vise versa. The elbow goes into flexion with wrist extension then vice versa .10 repetitions done for a time period of 5 days per week for 2 weeks. Those patients were included that were having signs and symptoms of CTS such as pain and paresthesia with positive Tinel test and phalen

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test.Symptoms that persisted for at least 4 weeks. Those patients were excluded that have any previous surgery, older than 50 years, any trauma, pregnancy, steroids injection and any systemic disease. The DASH is the questioner that measures the functional limitation. The patients wore wrist splint at night for 5 days in a week. This questioner was filled by the subjects before starting treatment and after giving treatment. The patients were followed upto two weeks and were treated for 5 days in a week with total 10 sessions. Comparison of results were established after a period of 2 weeks. In the end after filling questioner data analysis was established through SPSS. P value<0.05 in the study was mentioned and taken as significant.

## RESULTS

Thirty four patients were taken in this study in which group A has the mean age of 45.7±4.28 years and group B has the mean age of 34.06±4.35 years. In group A 6 males and 11 females were present while in group B 3 males and 14 females were present. It was concluded that CTS is more prevalent in females as compared to males. In group A 12 married and 5 unmarried were present and in group B 8 married and 9 unmarried were present.13 patients in group A developed CTS in right hand and 4 in left hand while 12 patients in group B developed CTS in right hand and 5 in left hand.

As in group A when mean paired difference was seen it was greater in group A in which combined treatment approach was used as compared to Group B in which only neurodymics were used so first group of neurodymics and splint found to be more superior as compared to second group in which only neurodynamics alone were used. Throuh 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 A results were found to be more significant as compared to group B 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 first group as compared to second group. It was concluded that Group A in which neurodynamics and wrist splint were used found to be more effective as compared to group B in which only neurodynamics was used.

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

Pretreatment values of DASH questioner were insignificant among two groups (p>0.05) but after follow up period when interventions were given, significant difference was found with p value 0.01 which falls under p <0.05. Group A in which neurodynamics and wrist splint were used found to be more effective as compared to group B in which only neurodynamics was used pretreatment values of VAS scale varied insignificantly with p>0.05 but after follow up period when interventions were given, there was significant difference between two groups with p value 0.002 which falls under p <0.05. Group A in which neurodynamics and wrist splint were used found to be more effective as compared to group B in which only neurodynamics was used

Table I: Age of subjects in both groups

| Age | N | Mean (Years) | SD |
|---|---|---|---|
| Group A | 17 | 45.7 | 4.28 |
| Group B | 17 | 34.06 | 4.35 |

In group A mean age was 45.7±4.28 and in group B mean age was 34.06±4.35

Table II: Demographics

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

Table III: Independent sample t-test showing significance of improvement between group A and B with respect to carpal tunnel syndrome(n=34).

| Study Group | | Mean | N | SD | Std. error of mean | Mean difference | t | Sig. |
|---|---|---|---|---|---|---|---|---|
| DASH-baseline | Group A | 86.82 | 17 | 5.17 | 1.25 | 0.76 | 0.44 | 0.66 |
| | Group B | 86.05 | 17 | 4.85 | 1.17 | | | |
| DASH-post | Group A | 8.70 | 17 | 2.22 | 0.54 | -2.76 | -2.69 | 0.01 |
| | Group B | 11.47 | 17 | 3.59 | 0.87 | | | |

Table IV: Independent sample t-test showing significance of improvement between group A and B with respect to carpal tunnel syndrome (n=34).

| VAS | Study group | n | Mean | SD | p-value (**) |
|---|---|---|---|---|---|
| Baseline | Group A | 34 | 8.29 | 0.58 | *0.402* |
| | Group B | 34 | 8.47 | 0.62 | |
| Week_2 | Group A | 34 | 2.41 | 0.50 | *0.002* |
| | Group B | 34 | 3.35 | 0.99 | |

## DISCUSSION

There was a study conducted by Wolny and Linek 2019 in which 103 patients were included in the study .In this study the group that received neurodynamics with conventional physical therapy found to be more effective as compared to second group. They were treated twice weekly and there was 20 sessions. The same neurodynamics were included in the present study and was found effective in both groups[28].

In a study conducted by Goyal, Mehta et al. 2016 there were 2 groups .First group received conventional physiotherapy and second group received neural nerve mobilization techniques.15 patients were included each group. In the end it was concluded that the group which included neural nerve mobilization found to be more effective as compared to other group. In the present study neurodynamics were included found to be effective[29].

RCT on 120 subjects was done by De Angelis, Pierfelice in which there were two groups. First group wore hand brace and second group wore wrist splint.Both splint and brace were worn at night for time period of three months. In the end it was concluded that both groups improved functionally. The same was found in present study that the group that included wrist splint found to be more effective as compared to other group in which only neurodynamics were used[30].

There was a study conducted by De-la-Llave-Rincon, Ortega-Santiago on 18 patients of CTS. Soft tissue mobilization was done at scalene neck muscle, aponeurosis of elbow(bicipital aponeurosis), pronator teres and hand ligament (transverse carpal ligament). In the end it was concluded that neurodynamics and soft tissue massage decreases the pain but does not decreases the pressure sensitivity[11].

In present study it was found that the results in both groups were significant but in group A in which wrist splint and neurodynamics were applied, found to be more significant as compare to group B in which only neurodynamics were applied.

## CONCLUSION

This study ended with the conclusion that results were significant in both groups but combined treatment approach (neurodynamics and wrist splint) was more superior as compare to neurodynamics alone .Group A was more effective in decreasing pain and improving functional strength. When comparing both groups it was seen that group A gave more significant results as compare to group B.

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**Ethical considerations:** Subjects were told that there were known benefits of these maneuvers in reducing pain and improving functions of upper extremity. They were informed that were free to withdraw at any time during the process of the study and all data was kept confidential with subjects anonymous in present study.

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