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A STUDY TO EVALUATE THE EFFECTIVENESS OF NERVE GLIDING EXERCISE WITH TENS AND ULTRASOUND FOR ATIENTS WITH CARPALTUNNEL SYNDROME

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Abstract: BACKGROUND OF THE STUDY: Carpal tunnel syndrome is a medical condition due to compression of the median nerve as it travels through the wrist, causing disabling pain which leads to limitations in daily life activities, discomfort and sleep disturbance.(1)Carpal tunnel syndrome (CTS)was first described by sir James Paget in 1854.(2)CTS is the most well known and frequent form of median nerve entrapment for 90percentage of all entrapment neuropathies.(3) this syndrome is characterized by pain in the hand, numbness,and tingling in the distribution of median nerve. this sensation May be felt in the thumb, index finger, middle finger and radial side of the ring finger.(1,2,3). occupational groups such as carpenters, musicians, dentists, shoemakers, butchers, tailors, computer operators, and clerks are at high risk for CTS due to repetitive hand movements.(4,5) Nerve gliding exercises is Provided for "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. (11)Transcutaneous electrical nerve stimulation (TENS) is applied for pain relief. Based on gait control theory in CTS (12).A transcutaneous electrical nerve stimulator (TENS) sends electrical pulses through the skin to start body's own pain killers. The electrical pulses can release endorphins and other substances to stop pain signals in the brain. TENS can reduce pain.Ultrasound is provided in CTS to decrease soft Issue inflammation, increase soft tissue healing, decrease pain, decrease swelling .(13)Purpose of the study to evaluate the effectiveness nerve gliding exercises with tens and ultrasound for patients with carpal tunnel syndrome. (7,9) ***CONCLUSION****:*The study was conducted to compare the effectiveness of nerve gliding exercises with Tens and ultrasound for patient with carpal tunnel syndrome.30 subjects were included in this study and were randomly divided into two groups.The group A was treated with nerve gliding exercises with Tens and Group B treated for nerve gliding exercises with ultrasound.From the results, it can be concluded that there is significant difference in reducing pain and improving functional ability in both groups but when comparing the mean value it is found out that the group B treated with nerve gliding exercises with ultrasound is more effective than group B nerve gliding exercises with tens.

Keyword's-nerve gliding exercise,ultrasound,TENS,carpel tunnel syndrome, visual analog scale,boston carpel tunnel questionary

I. INTRODUCTION

Carpal tunnel syndrome is a medical condition due to compression of the median nerve asittravelsthroughthewrist,causingdisablingpainwhichleadstolimitationsindailylifeactivities,discomfortandsleep disturbance.(1)Carpaltunnelsyndrome(CTS)wasfirstdescribedbysirJamesPagetin1854.(2)CTS is the most well known and frequent form of median nerve entrapment for 90percentage of allentrapmentneuropathies.(3)thissyndromeischaracterizedby paininthe hand,numbness,andtingling in the distribution of median nerve. this sensation May be felt in the thumb, index finger,middle finger and radial side of the ring finger.(1,2,3). occupational groups such as carpenters,musicians, dentists, shoemakers, butchers, tailors, computer operators, and clerks are at high risk forCTSdueto repetitivehand movements.(4,5)

The carpal tunnel (CT) is found at the base of the palm. It is bounded partly by the eight carpalbones and partly by a tough fibrous roof called the transverse carpal ligament (TCL). The tunnelgives passage to: eight digital flexor tendons (two for each of the medial four fingers); flexorpollicis longus (FPL) tendon for the thumb; their flexor synovial sheaths; and the

median nerve(MN)(6)The prevalence of carpal tunnel syndrome is estimated to be 2.7 - 5.8% of the general adultpopulationof withalifetimeincidenceof10-15%,dependingonoccupationalrisk.carpaltunnelsyndromeusually occursbetweenage25 and55and is morecommon in women.(7,8)

Pathophysiology of CTS involves a combination of mechanical trauma, increased pressure, andischemicdamageto themedian nerve with in the carpaltunnel.(4,5) Test for CTS can be performed during physical examination. Tapping the nerve in the CarpalTunnel to elict pain in the Medial Nerve Distribution.(Tinel' Sign) Holding the wrist in Flexion for60seconds to elictnumbness and pain inthe Medial Nervedistribution(PhalenTest.(9)There are various causes of carpal tunnel syndrome (CTS)being with most importance among them.Apart from the various conventional therapies are available for management of CTS.these includesteroid injection, night splint, ultrasound therapy, manual therapy, acupuncture, yoga exercise, andsofttissue mobilization.(10) Nerve gliding exercises is Provided for "stretching the adhesion in the carpal tunnel, broadening thelongitudinal area of contact between the median nerve at the transverse carpal ligament, reducingtenosynovial edema, improving venous return from the nerve bundles, and reducing pressure insidethecanal.

(11)Transcutaneous electrical nerve stimulation (TENS) is applied for pain relief. Based on gait controltheory in CTS (12).A transcutaneous electrical nerve stimulator (TENS) sends electrical pulsesthrough the skin to start body's own pain killers.Theelectricalpulsescan release endorphinsandothersubstancestostoppainsignalsinthebrain.TENScanreducepain.UltrasoundisprovidedinCTStodecreasesoftIssueinflammation,increasesofttissuehealing,decreasepain, decreaseswelling .(13)Purpose of the study to evaluate the effectiveness nerve gliding exercises with tens and ultrasoundforpatients with carpal tunnel syndrome.(7,9)

2 AIM AND OBJECTIVES

2.1 AIM OF THE STUDY

To find out the effectiveness of nerve gliding exercise with tens and ultrasound for carpal tunnel syndrome.

2.2 OBJECTIVES OF THE STUDY

- To evaluate the effectiveness of nerve gliding exercise and TENS for patient with carpal tunnel syndrome
- To evaluate the effectiveness of nerve gliding exercise and ultrasound for patient with carpal tunnel syndrome.
- To compare the effectiveness of nerve gliding exercise with tens and ultrasound for patient with carpal tunnel syndrome.

3. HYPOTHESIS

3.1NULL HYPOTHESIS:

It is hypothesized that there is no significant effect of nerve gliding exercise with TENS and ultrasound for patients with carpal tunnel syndrome.

3.2 ALTERNATE HYPOTHESIS:

It is hypothesized that there is significant effect of nerve gliding exercise with TENS and ultrasound for patients with carpal tunnel syndrome.

4 REVIEW OF LITERATURE

Bartkowiak et al, (2019) A study to evaluate effectiveness of Nerve andTendonGlidingExercisesCombinedwithLow-levelLaserorUltrasoundTherapyinCarpalTunnelSyndrome A total of seventy patients with mild tomoderate CTS, divided intotwo groups,wereincludedinthisstudy.Group1receivedultrasoundtreatment,whereasGroup2underwent LLLT. The treatmentlasted 2 weeks (5sessions/week).The measurement of gripstrength, Phalen test,Tinel sign, and the Boston CarpalTunnel Questionnaire were used.Theassessment was performed before and after thetreatment. The results of thisstudy maysuggest the clinical efficacy of LLLT or ultrasound combined withgliding exercises inpatientswith mild to moderate.

Mohammad Anwar hossian (2019) Validity and reliability o visual analog scale (VAS) forpain measurement. A critical review was was done for the study total 10 students wereincluded in the study. The majority of the studies showed that vis**M**

Marryam (2018)A study to evaluate the effectiveness of fullNeuro dynamicsversusnerve and tendon gliding exercises alone in patients ofcarpal tunnel syndrome by Singleblindedrandomized controlled trial.

Mehboob alam (2018) To compare the effectiveness of neural mobilizationandultrasoundtherapy on pain severity in carpal tunnel syndrome (CTS). Thisrandomized controlled trialwas conducted on 48 CTS patient. The CTS patientswererandomlyallocatedinto2

equalgroupsbysimplerandomizationmethod.Group1receivedneuralmobilisation;Group 2received ultrasound therapy witha predetermined intensity. A total of 12 sessions were givenover a period of 4weeks. Pre and post intervention data were collected from both

Sina jassemizadeh, et al (2017) This study aimed to compare the short termeffects of lowlevel laser therapy (LLLT) and transcutaneous electrical nervestimulation (TENS) on handpain and function in patients low or moderatelevels of carpal tunnel syndrome. The study wasincluded 24 patients with(CTS). The study documented that LLLT might be effective inreducingpainandimprovingfunctioninpatientswithmildtomoderateCTS.TENSmighthavebeen effectivein controlling pain in thesepatients.

Tomasz wolny et.al (2017) efficacy of manual therapy includingneurodynamic techniquesfor the treaent of carpal tunnel syndrome:Arandomized controlled trial. In this study 140subjectcarpaltunnelsyndrome.studyconcludedthattheresultsregardingpainreduction;subjective symptoms and functional status were better in themanual therapygroup.

Ruth Ballestero - Perez (2017) Effectiveness of nerve gliding exercise oncarpal Tunnelsyndrome : A systematic Review Standard concervative careseems to be the most appropriateoption for pain relief although neural glidingmight be a complementary option to acceleraterecovery offunction.

Sang-DolKim(2015) Efficacyoftendonandnervegli dingexerciseforcarpaltunnelsyndrome a systemic review randomized control trail suggest that tendon and nerve glidingexercise combine with conventional treatment mayhave a favourable effect in patient withcarpaltunnel syndrome

Ballestero-perez r, et al , (2014) The study A systematic review oneffectiveness ofnervegli dingexerciseonCarpaltunnelsyndrome.A13clinicaltrialsincludedin18yearsorolder.Thestudyconcludedthelimitedevi denceontheeffectivenessofneuralgliding.

Evgeniyavladeva(2014) Efficiencyofacomplexofphysicalfactoreinconservativetreatmentofcarpaltunnelsyndromeevalutedby usingtheVASandBCTQ.Clinicalsymptoms and functional status in patient with CTS using the visual analoge scale Bostonquestionary scale and to the reveal patients own participants of physical health and comfortasoociatedwith this syndrome.

I Ibrahim W.S Khan et al, (2012) Carpal tunnel syndrome A review of the recent literatureCtsisthemostwellknownandfrequentofmedianentrapmentandaccountsfor90%entrapmentneuropathies.

Fazal-ur-rehman saeed,saquib hanif,Muhammadaasim, et al (2012) the effects of laserand ultrasound therapyon carpal tunnelsyndrome: a total hundred patients of unilateralcarpal tunnel syndrome divided into two groups. First group ultrasound therapy and secondgroup level laser therapy. This study concluded ultrasound treatment proved to be moreeffectivethan laser therapy.

Arul retina et al, (2011) To compare the effectiveness of nerve gliding exercise and splintingversusultrasoundandsplintingimprovefunctionalactivitiesofcarpaltunnelsyndrome.Itappears that the nerve gliding exercise may aid in reduction of symptoms and improvement offunctions in patient with CTS while the efficacy of nerve gliding techniques for the treatment ofCTS is not clear. Trend to what pain and symptom reduction improved sensation and improvedfunctionaland strength..

Lamia-pinar et al, (2005) A study investigated the effectiveness of nervegliding exercises usedin combination with conservative treatment approaches in patients with carpal tunnel syndrome.Atotalof35handsof26patientswithcarpaltunnelsyndromeweredividedinto2groups.Intheexperimentalgroup,nervegli dingexerciseswereappliedto19handsthatwerealso

Vikranth g r, vinod kumar.c,lawrence mathlas.et al (2005) comprative effect of carpal bonemobilizationvsneuralmobilizationinimprovingpainfunctionalstatusandsymptomsSeverityinpatientswithcarpaltunnelSyn drome.30subjectswithcarpaltunnelsyndromewererandamised into two group with 15 subjects each in group.group Aand group B. Group Areceivedcarpalbonemobilizationand subjectingroupBreceived mediannervemobilization.

Jk wilson and t.l sevier (2003) Trail suggest that ultrasound treatment hasgood short termeffectivenessand evenyi.

5. MATERIALS AND METHODOLOGY

5.1 STUDYTYPE : Quasi experimental design.

5.3 SAMPLINGMETHOD : Randomised sampling Method

5.4 STUDYSETTING : physiotherapy outpatient Department, Aarupadai veedu medical collegeandhospital, Pondicherry.

5.5 TOTALSTUDYDURATION : 1months.

6. MATERIALS USED FOR THIS STUDY

- Therapeuticultrasoundmachine
- Therapeutictensmachine
- Ultrasoundgel
- Electrodes
- Cotton
- Couch
- Pillow
- Towel
- chair

7. SELECTION CRITERIA

7.1 INCLUSION CRITERIA

- Agegroup between 25-50
- Bothmaleandfemale
- UnilateralCTS
- Positivetinnel test
- Positivephalentest

7.2 EXCLUSION CRITERIA

- Highlevelmediannerveinjury
- Carpalbonefracture
- Historyoftraumato the wristorhand thatincludedbrokenbones
- Known history of other neurological disorders such as cervical radiculopathy,cervicalspondylosis

8. OUTCOME MEASURE

- Visual analogue scale
- Boston carpal tunnel questionary

9. PROCEDURE

30 participant will be included in the study after fulfilling selection criteria consent form will besinged and information sheet will be given pre test will be taken at zero week . they will be dividedinto two groups [groups A and group B]. group A, n=15participants will be received nerve glidingexercise with tens and group B, n=15participants will be received nerve gliding exercise withultrasound forthreeweeks.

GROUPARECEIVEDNERVEGLIDINGEXERCICEWITHTENSFORTHREE SESSIONPERWEEKFOR4WEEK.

Nerve gliding exercise will be performed 3 times a day. each position in the nerve glidingexercise will be maintain for 7seconds and repeated 5 times. The nerve gliding exercise involvedmaintainingthefingers and the hand in 6 consecutive positions.1.The wrist in neutral and the fingers and thumb in flexion. 2.wrist in neutral position, fingersextension and thumb straight in line with the finger.3.wrist and finger extension and extend the wristback.4.ThefingersAndthewristextendedback,movethethumbforwardawayfromthefinger.5.Maintaining the fourth position with the forearm in supination and the palm toward theface.6.Maintainingthe fifth position andtheotherhand gentlystretching inthumb.

TENS:

Before the start of the treatment the patient were instructed of the use and the harmful effects oftensthepatient wasalsoinstructedabout thetimeofapplicationand theduration oftreatment.The patient par to be treated was exposed and patient was made to sit on a char or couch withcomfortable position and shoulder with abduction and elbow flexion or wrist should be neutral andrestingon apillow whichwas applied over table.Tens current with pulse duration of 80 um and frequency100hz time of application ofwas 15minutesover theareaofcarpal tunnel

GROUP B RECEIVED NERVE GLIDING EXERCICE WITH ULTRASOUND FORTHREESESSION PER WEEK FOR 4 WEEK

ULTRASOUND:

Before the start of the treatment ,the patient was instructed of the use of and harmful effect ofultrasound.thepatient wasalsoinstructed about the time of application and the duration of time.The patient part to be treated was exposed and patient was made to sit on a chair or couch withcomfortable position And shoulder slightly abduction and elbow flexion or wrist should be neutralposition and resting on a pillow which was placed over table. Skin and transducer was coated withacousticgel .theapplication is movedin small concentriccircularmovement The transducer head was applied to the region at right to ensure maximum absorption.at a ferquency1mhz .the intensity of 1w/cm2,pulsed mode duty cycle of1:4and with a hand held transducer of 5cm2thetime ofappilcation was 6 minutes overtheareaof the carpal tunnel.

11. STATISTICAL ANALYSIS

Statistical Formula

In this study, pre and post interventional differences within the two groups were analyzed using paired 't' test and between the two groups were analyzed using unpaired 't' test for each of the outcome measures. Statistical significance was set at $p<0.0001$.

The paired "t" test is formulated as: $t = \frac{\bar{d}}{S/\sqrt{n}}$ $\boldsymbol{Where\ S} = \sqrt{\frac{\sum(d-\bar{d})^2}{n-1}}$

Where,

d=mean difference, a

d= mean,

n= total no. of sample.

For the between group analysis, unpaired 't' test is used.

The unpaired "t" test is formulated as: $t = \frac{x1-x2}{S\sqrt{\frac{1}{n1}-\frac{1}{n2}}}$

$$S = \sqrt{\frac{n1s1^2+n2s2^2}{n1+n2-2}}$$

Where,

x1&x2 are means of group A and group B;

n1 and n2 are sample sizes of two groups. Variance of sample 1 $(s1^2) = \frac{\sum(x1-x)^2}{n1-1}$

Variance of sample 2 $(s2^2) = \frac{\sum(x2-x)^2}{n2-1}$

The outcomes values obtained were manually calculated.

In this study, to find out the effects of circuit training program and stretching in Spastic diplegia was founded by comparing the significant difference between the both groups. The pre-test and post-test interventional differences within the two groups were analyzed using paired test „„GMFM 88& 66"" for outcome measures. Statistical significance was set at $p < 0.01$ was considered as a significancedifference.

The p-value was chosen as per the description given by research book.

12. RESULT

30 subjects with carpal tunnel syndrome patient. The subjects were randomly divided intotwo groups.

Group A was treated with nerve gliding exercises with Tens.GroupBwastreated withnervegliding exerciseswithultrasound.

The patient was treated for three session per week for 4weeks. Before starting the treatment,FSS was graded by functional ability and the pain was graded by VAS. The measurementwasrepeatedat theend of thestudy session.

AnalysisofdependentvariablepaingroupA:

The calculated paired 't' value is 7.250 at 0.001 level. Hence, calculated 't' value is greaterthanthetable't'valuethereis significantdifferenceinpain followingnervegliding exerciseswithTens forcarpal tunnel syndrome.

AnalysisofdependentvariablepainGroupB:

The calculated paired 't' value is 19.179 at 0.001 level. Hence, calculated 't' value is morethan 't' table value, there is significant difference in pain following nerve gliding exerciseswithultrasound forcarpal tunnel syndrome.

DependentvariablepainbetweenGroupAandGroup

Thecalculatedunpaired't'valueis1.000andtablevalue0.001level ofsignificance Hence,the calculated 't' value is more than 't' table value, there is significant difference betweennervegliding exercises with Tensand ultrasound for carpaltunnel syndrome

. The calculated paired 't' value is 11.253 and 'p' value is 0.001 level of significance Hence,the calculated 't' value is more than 't' table value, there is significant difference in FSSfollowingnervegliding exercises with TensforcarpalTunnel syndrome..

Analysisofdependentvariable FSS binGroupB:

The calculated paired 't' value is 27.448 and 'p' value 0.001 level of significance Hence, thecalculated 't' value is more than 't' table value, there is significant difference in FSSfollowingnervegliding exercises withultrasoundforcarpal tunnel syndrome.

DependentvariableFSS betweenGroupAandGroupB:

The calculated unpaired 't' value is 0.318and table value 0.001 level of significance Hence,the calculated 't' value is more than 't' table value, there is significant difference in nerveglidingexercises with Tens andultrasound for carpal tunnelsyndrome.

When comparing the mean values of group A and group B, group A subjects treated withnerve gliding exercises with Tens.showed more difference than group B. Hence, it isconcluded that nerve gliding exercises with ultrasound is more effective than nerve glidingexercises with Tens in reducing Pain and improving functional ability for carpal tunnelsyndrome.

13.DISCUSSION:

In the study was selected for the purpose of the finding the effectiveness of the nerve glidingexercisewith tens andultrasound forpatient withcarpal tunnel syndrome.

So,inthis studyordertoreducepain, and improvefunctionalability.

CTS is a entrapment neuropathy combines phenomena of compression and traction. Nervecompression and traction may cause disorders of the intra neural microcirculation, lesion inthe myelin sheath and the axon as well as alteration in the supporting connective tissue. Theentrapment of a peripheral nerve occurs as a result of passage through an anatomicalcompartment that as become too tight, resulting in altered function with in the nerve anddisfunction\damageof thenerve from thesiteofcompression andbeyond.

Nerve gliding exercises "stretching the adhesions in the carpal tunnel, bordening thelongitudinalareaof contactbetweenthe mediannerveatthetransversecarpalligament.reducing tenosynovial edema, improving venous return from the bundle,and reducingpressureinsidethecanal.

Transcutaneous electrical impulses can reduce the pain signals going to the spinal cord andbrain, which may help relieve pain and relax muscle.they may also stimulate the productionofendorphins and other substances to Stop painsignals in the brain.

Ultrasound increase blood flow, decrease soft tissue information, increased soft tissuehealing,decreasepain, decreaseswelling.

Sina jassemizadeh,et al; this study aimed to compare the short term effects of low levellaser therapy (LLT)and transcutaneous electrical nerve stimulation (TENS)on hand pain andfunction in patient low or moderate levels of carpal tunnel syndrome. the study documentedthat LLT might be effective in reducing pain and improving functions in patient with mild tomoderateCTS.TENS mighthavebeeneffectivein controllingpain inthesepatients.

Bartkowiak et al, stated in their study that there is evidence to support the use of thisstudymaysuggesttheclinicalefficacyofLLLTorultrasoundcombinedwithglidingexercises in patients with mild to moderate CTS. the study concluded ultrasound treatmentproved to be more effective to reduce pain with carpal tunnel syndrome. Both techniques iseffectiveforthis study.

In this study results that nerve gliding exercises with ultrasound is more effective than nerveglidingexercises with Tens forpatient withcarpaltunnel syndrome.

14. CONCLUSION

The study was conducted to compare the effectiveness of nerve gliding exercises with Tensandultrasound forpatient with carpal tunnel syndrome.30subjects wereincluded in thisstudy and wererandomly dividedinto two groups.

The group A was treated with nerve gliding exercises with Tens and Group B treated fornervegliding exercises with ultrasound.From the results, it can be concluded that there is significant difference in reducing pain andimproving functional ability in both groups but when comparing the mean value it is foundout that the group B treated with nerve gliding exercises with ultrasound is more effectivethangroup B nervegliding exercises with tens.

15. LIMITATIONS AND REECOMMENDATIONS

LIMITATIONS:

- Studysamplesizewassmall
- Shortdurationstudyfor4weeks.
- Thestudywasperformed onlyforthesubjectwithcarpaltunnel syndrome.
- Theagegroupselected where25-50

RECOMMENDATIONS:

- Features study with longer duration. pain and disability measures using moreobjectiveoutcome arerecommended.
- Further study with carpal tunnel syndrome using difference technique arerecommended.
- Largesamplesizecanbe analysed

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