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EFFECTS OF NEURAL MOBILIZATION ON MEDIAN AND ULNAR NEURAL FLEXIBILITY AND PINCH STRENGTH IN COMPUTER OPERATOR INDIVIDUALS

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ABSTRACT:

Intensive computer work can increase the risk of developing neuromusculoskeletal symptoms and disorders in the upper extremities. Repetitive microtrauma or overuse injuries may often affect upper extremities of the long term computer users. Upper limb neural tissue tension tests (ULLT) is a good tool for assessment of early affection of the neural tissue. Many studies done on neural mobilization for peripheral nerve entrapment syndrome, because presence of abnormal neural tension in computer operators may be an early marker of impending radiculopathy during degenerative changes of spine in the later stages of life. Identification of these symptoms and correction of the adverse tension in the early stages may serve as prophylaxis for the later stage of life.

AIM OF THE STUDY:-

To find out the effects of neural mobilization in median and ulnar neural flexibility and pinch strength for the computer operators.

OBJECTIVES OF THE STUDY:-

- To evaluate the effects of neural mobilization on median neural flexibility by upper limb tension test 1.
- To evaluate the effects of neural mobilization on ulnar neural flexibility by upper limb tension test 4.
- To evaluate the pinch strength using pinch metre

METHODOLOGY:-

A total 51 subjects were included in the study with the age group of 25 to 45 years they are evaluated and diagnosed as loss of neural flexibility by doing ULLT for both dominant and non dominant hand. And pinch strength is evaluated by using pinch metre. All the subjects were screened for inclusion and exclusion criteria after finding their susceptibility informed consent was taken. Initially baseline values of demographic details like age, ULLT, pinch grip strength were taken and given neural mobilization for 3 weeks and then post values of ULLT, Pinch strength were taken.

RESULT:-

The pre, and 3rd week experimental mean values, t-test and p values of all the outcomes that is ULLT, and pinch strength shows significance (0.05) in pre and 3rd week.

CONCLUSION:-

Hence, the study concludes that neural mobilization for median and ulnar nerve to be more effective on neural flexibility and improving the pinch grip strength in computer operators individual.

KEYWORDS:

COMPUTER OPERATORS, PINCH STRENGTH, PINCH METER, UPPER LIMB TENSION TEST, NEURAL MOBILIZATION, FLEXIBILITY FOR MEDIAN AND ULNAR NERVE.

INTRODUCTION

The term flexibility means the elasticity of soft tissues that cross or surround joints (muscles, tendons, fascia, articular capsule, ligaments, nerves, blood vessels, skin), and is absolutely necessary for painless movement of the body.[1]

The computer workstation has become common in individuals both at work and home and is now used routinely for many purpose including data entry, word processing, telecommunication, web browsing, purchasing, inventory, designing testing, entertainment. Most of the computer operators type upto 60 words per minute for more than 6 hours a day(i.e more than 1,50,000 key strokes per day) .workers commonly spend long periods in static posture at computer workstations with only minimal need to reposition the trunk ,neck and arm.[2]

The carpal tunnel syndrome is common, with an estimated population lifetime cumulative incidence rate of 8%[3]In a

study of 485NSAP patients, shoulder protraction and forward head position were reported in a majority of patients (78% and71% respectively) [2]. Poor upper body posture (e.g.rounded shoulders, head forward) has also been reported to increase the incidence of neck and shoulder pain.[4]

In static posture the body and its segments are aligned and maintained in certain positions. In an analysis of muscular forces in Sitting position it was described that erect active sitting required more energy as compared to the slouched forward bend relaxed sitting as the line of gravity passed anteriorly to the spine. In this position the passive tension on the neural tissue is increased.[5]

In addition to sitting and doing computer work, poor posture, chronic misalignment, can lead to limited nerve mobility. Office workers, cashiers, medical professionals, assembly-line workers, mechanics, drivers—anyone who repeats the same physical procedure many times—are vulnerable to nerve problems The same dailyactivities that can shorten and tighten muscles sitting working at a computer with the shoulder rounded forward can also inhibit the mobility of peripheral nerves.Nerve problems may be signaled by weakness, fatigue, numbness, tingling, burning, restrictions in range of motion, changes in reflex speed, swelling, or even feelings of heaviness or coldness. The nerves most commonly involved in these symptoms are the median nerve, ulnar nerve, radial nerve—all located in the arms. Continued irritation of these nerves may result in several common diagnoses: carpal tunnel syndrome (compression of the median nerve, running through the wrist), cubital syndrome (compression of the ulnar nerve, running through the elbow), thoracic outlet syndrome (compression or shortening of the nerves in the upper chest).[6]

The symptoms of Work Related Musculo Skeletal Diseasesincluding pain, swelling, tingling, numbness, paresthesia, stiffness, restricted range of motion and loss of strength . WMSDs caused by static poor posture, repetitive movement, use of force and prolong contraction of muscles ,that lead to tendon, muscle, and support structure changing continuously thereby affecting the neural tension causing adverse neurodynamics or nerve function loss or nerve injury. Therefore, the relief of neural tension is extremely important . The abnormal nerve tension affects the mechanical function of nerve. We can detect the mechanical function of the nervous system in the upper limb such as ULNT1 .[7]

However, the responsible pathology and the pathophysiological mechanisms are insufficiently understood. In addition, there is no consensus with regard to physical findings that may reflect symptoms. The involvement of the nerves in "non-specific" upper limb disorder, e.g. in computer operators, is suggested by various observations: The demonstration of an elevated threshold to vibratory stimulation; abnormal upper limb tension tests ; reduced nerve mobility[8]

Mainly upperlimb Peripheral nerves are susceptible to mechanical compression, friction, and repeated tension Upper limb pain and dysfunction are frequent complaints associated with computer work. "Technological diseases" – Carpal Tunnel Syndrome (CTS), a Mouse Shoulder (MS) and Cervical Pain Syndrome (CPS). Within past a few decades rapidly increased automation of offices.Musculo skeletal problems are caused by occupational exposure and are marked with direct professional relation due to the increased incidence of this disease on specific workplaces which may be caused by one or more causal factors present in workplace today, these diseases are considered as professional diseases risk factors of radiculopathy are activities that put excessive or repetitive load on the spine.[9]

Butler has shown that adverse tension in the nervous system can impair its mobility and elasticity ,and painful problems can arise as a result. He refers to the tissues that surround neural structure as the mechanical interface. The assessment of neural mechanics and neural tension is an important component of the clinical examination. Neural Provacation (or neural tension) tests assess the mobility of neural tissue in the extremities and spinal canal. Positive adverse neural tension tests suggest poor mobility of neural tissue. Many factors cause hypomobility of neural tissue, including scar tissue, tight muscles, ectopic bone growth and adhesions within nerves.[10] Neural tension was used to describe dysfunction of the peripheral nervous system. Neurodynamics is now a more accepted term referring to the integrated biomechanical, physiological, and morphological functions of the nervous system. it is vital that the nervous system is able to adapt to mechanical loads, and it must undergo distinct mechanical events such as elongation, sliding, cross-sectional change, angulation, and compression. If these dynamic protective mechanisms fail, the nervous system is vulnerable to neural edema ischaemia, fibrosis, and hypoxia, which may cause altered neurodynamics[11]

To evaluate the mechanosensitivity of the median and ulnar nerve neurodynamic test for the upper limb were designed. A test is considered positive if symptoms of pain and paraesthesia can be reproduced and symptoms can altered by structural differentiation.[5]

There is ample evidence to support the notion that neurodynamic tests elongate the nerve bed and that this elongation is associated with nerve gliding. Combinations of movements in which elongation of the nerve bed at one joint is simultaneously counterbalanced by a reduction in the length of the nerve bed at an adjacent joint have been promoted. These techniques are commonly referred to as "sliding techniques." In contrast, the term "tensioning technique" is used to refer to techniques that aim to mobilize a nerve by elongation of the nerve bed. The clinical assumption is that a sliding technique results in a larger longitudinal excursion of the nerve than a tensioning technique, and that a sliding technique is associated with a minimal increase in nerve tension. Verifying these assumptions is important, as it has been

argued that sliding techniques are less aggressive and may be more appropriate for more acute conditions, provided that mobilization is indicated.[12]

Neural mobilization technique has some effects as restoration of elasticity and movement of the nervous system (NS), which promotes return to its normal functions. thereby allowing reduced intrinsic pressures on the neural tissue and thus promoting optimum physiologic function. [13]The hypothesized benefits from such techniques include facilitation of nerve gliding, reduction of nerve adherence, dispersion of noxious fluids, increased neural vascularity, and improvement of axoplasmic flow. Improvements were observed in terms of reduction in pain, improved grip strength, better extensibility and quality of life[11] [14]The fine movements performed by the hand, such as grip and manipulation of objects, are essential to the daily life and some tasks require maintenance of handgrip strength for a long period of time, causing a series of diseases. Muscle performance (force generation) depends on nerve conduction, motor unit firing characteristics and the number of motor units. Altered nerve physiology can affect muscle function. [13]

Pinch is a type of prehension pattern that uses two or three fingers to manipulate items in coordination with thumb movements, without the contact of the palm. The finger pinches include pulp pinch, lateral pinch, tripod pinch, and five-finger pinch. Pinch strength(PS) is the measurable ability to exert force with fingers and is commonly measured in hand and finger function evaluations using Manual Muscle Strength Testing (MMST). In addition to MMST, grip and PS measurements with dynamometers have been used to measure the outcome of peripheral nerve function. [15]

"when hand strength increased, the ability to do the basic daily activities also increased".[16] The Jamar™ dynamometer and the Preston pinch gauge are the commonest equipment used in the assessment of power grip strength and pinch strength respectively, and they have been proven to be the most reliable and accurate equipment for measuring power grip and pinch strengths. With a valid and reliable testing procedure, data of grip strength can be generated for clinical usage and research purpose. [17]

NEED OF THE STUDY

Maintenance of prolonged posture with relative similar upper extremity activities provoke reduced mobility in neural tissue. Presence of abnormal neural tension in desktop workers population may be an early marker of impending radiculopathy during degenerative changes of spine in later stages of life. Identification and corrections of adverse tension in early stage may serve as prophylaxis for the later course of life

So there is few studies done on neural mobilization on upperlimb (median and ulnar) alone. Hence need of present study is to find out the effects of neural mobilization for median and ulnar nerve in computer operators by finding their neural flexibility and pinch grip strength

AIM OF THE STUDY

To find out the effects of neural mobilization for ulnar and median neural flexibility and pinch strength for computer operators

OBJECTIVES

1. To evaluate the effects of neural mobilization on median neural flexibility by upper limb tension test 1 in computer operators

2. To evaluate the effects of neural mobilization on ulnar neural flexibility by upper limb tension test 4 in computer operators

3. To evaluate the pinch strength for musclessupplied by median and ulnar nerve using pinch metre

HYPOTHESIS

NULL HYPOTHESIS

There is no significant difference neural mobilization for median and ulnar nerve flexibility and pinch strength in computer operators

Alternate hypothesis

There is significant difference neural mobilization for median and ulnar nerve flexibility and pinch strength in computer operator

MATERIALS AND METHODOLOGY

MATERIALS:

Foot rest

High couch

Drape sheet

Pinch meter

METHODOLOGY

Study setup: the study was performed in the department of physiotherapy in SVIMS University, Tirupathi, AP.

Study design: experimental design

Sampling method: Purposive sampling

Study duration: 3 weeks

Sample size: 51 subjects

INCLUSIVE CRITERIA:

- Age 25-40 years
- Muscle spasm around neck
- desktop users working more than 4 hours a day
- Bike riders

EXCLUSIVE CRITIERIA:

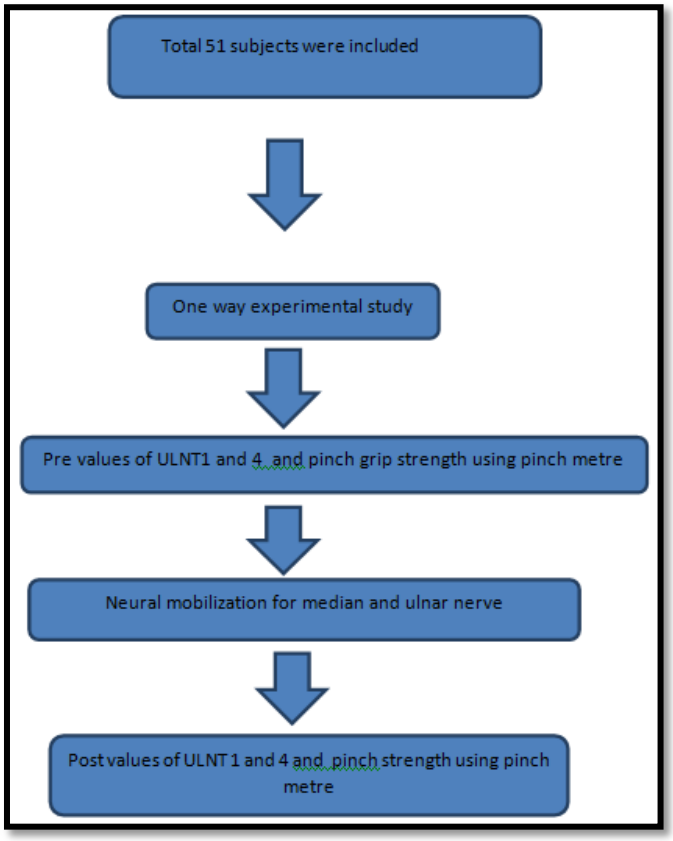
- Any cervical pathology
- Diabetes mellitus

- Hormonal imbalance
- Vitamin D deficiency
- Metabolic disorders
- Any local joint pathology

OUTCOME MEASURES:

- Upper limb tension test 1
- Upper limb tension test 4
- Pinch strength for muscles supplied by median and ulnar nerve using pinch metre

STUDY ALGORITHM



METHODOLOGY:

A total 51subjects were included in the study with the age group of 25 to 40 years they are evaluated and diagnosed as decreased neural flexibility by ULLT .All the subjects were screened for inclusion and exclusion criteria after finding their susceptibility informed consent was taken. Initially baseline values of demographic details like age, ULLT, pinch strength were taken

TABLE1. ULLT1: MEDIAN NERVE BIAS

JOINT	MOVEMENT
Shoulder girdle	Depression
Shoulder joint	Abduction
Forearm	Supination
Wrist and finger	Extension
Shoulder joint	Lateral rotation
Elbow	Extension

The sensitizing component for ULLT1 cervical lateral flexion away from the testing side, and the desensitizing test is lateral flexion towards the testing side.

- **TABLE 2.ULLT 1B: MEDIAN NERVE BIAS**

JOINT	MOVEMENT
Shoulder girdle	Depression
Shoulder joint	Abduction 10*
Elbo	Extension

Arm	Lateral rotation
Forearm	Supination
Wrist and finger and thumb	Extension

- The sensitizing test is cervical lateral flexion from the testing side or shoulder abduction. The desensitizing test is the lateral flexion towards the testing side or release of the shoulder girdle depression.

TABLE 4. ULLT 3: ULNAR NERVE BIAS

JOINT	MOVEMENT
Wrist and finger and thumb	Extension
Forearm	Pronation
Elbow	Flexion
Shoulder girdle	Depression
Shoulder joint	Abduction
Arm	Medial rotation

- The sensitizing test is cervical lateral flexion away from the testing side and flexion towards the symptomatic side to desensitize.Normal responses to the upper limb tension test have only been investigated for the ULLT1. The normal response for this test includes the following deep ache or stretch in the cubital fossa extending to the anterior and radial aspects of the forearm and hand definite tingling in thumb and first three fingers. A stretch feeling over the anterior aspects of the shoulder.

PINCH METRE

- Pinch strength was tested first, followed by tip to tip pinch, key (lateral) pinch. For each of the tests of hand strength, thesubjects were seated with their shoulder adducted andneutrally rotated, elbow flexed at 90°, forearm in mid proneposition, and wrist between 0° and 30° dorsiflexion andbetween 0° and 15° ulnar deviation .The scores of three successive trials were recorded for eachhand.

- **INTERVENTION**

Neural mobilization

Neural mobilization was performed from the position at whichthe computer operators did not feel discomfort, during the test.At the end of the predicted amplitude, slow and consecutive oscillationof the involved extremities was performed for one minute,with the individual being given three minutes of rest in only onesession. The computer operator was positioned in dorsal decubitus, with depressionof scapular waist, elbow extension, wrist, fingers and thumb,shoulder abduction and external rotation for mobilization of themedian nerve. Finally, for the ulnar nerve,the computer operator was positioned at dorsal decubitus, with medial rotationand glenohumeral abduction, elbow flexion,extended wrist and pronatedforearm. The elbow was completely flexed and shoulder depressionwas performed by the examiner. The head of the computer operator was atinclination to the opposite side during all types of mobilization

The patient was in supine lying position, arms by the sides, shoulders flush with the edge of the plinth, no pillow should be used, and body should be straight. The therapist was stride standing, faced the patient's head and parallel to the patient with the near hip approximating the bed. The near foot is placed forward the therapist's near hand presses above the patient's shoulder, using the knuckle as a fulcrum to prevent scapular elevation and distal hand fingers wrap around the patient's fingers, distal to the patient's metacarpophalangeal joints.

Neural mobilization has been provided for roughly 12-15 minutes for every session including 30 sec hold and one-minute rest. Thewhole treatment was given for 10 sessions for 3 weeks.

PINCH METRE

To ensure the safety of participants and the pinch gauge, the operator mounted the Jamar® hydraulic pinch meter on a table such that it was immobile during the testing process. The participants were instructed to grasp the pinch gauge with the thumb, index finger, and middle finger, such that the pulp of the thumb was positioned over the pinch gauge, the index and middle finger positioned below it. Each participant was then asked to apply maximum voluntary pinch force thrice, prior to and after SRP and the highest reading was considered. The operator encouraged the participants to squeeze as hard as possible during each trial by saying “go, go, stop” as use of consistent instructions is important for standardization of test protocol. The contraction time was no more than two seconds.

STATISTICAL ANALYSIS AND RESULT

In my study, IBM SPSS inc. 20.0 version was used to analyze the statistical values.to analyze the significance of pinch grip strength in computer operators was tested by using pinch metre,and ULNT for neural flexibility.

All the subjects were completed the entire study protocol for 3 weeks in the training session. For statistical analysis, unpaired t –test and one sample t-test was applied to the outcome measure that is pinch grip strength for experimental group. Descriptive measures of central

tendency like mean, standard deviation, have been reported along p-value.

	PRE-TEST VALUE		POST-TEST VALUE				
	Mean	Mean±STDEV	Mean	Mean±STDEV	DF	t-Value	t-Value
Pinch strength for median nerve (Rt)	4.72	4.72±1.02	10.74	10.74±0.88	235	40.39608	0.05
Pinch strength for median nerve (Lt)	4.00	4±1.15	10.36	10.36±0.74	248	30.36968	0.05
Pinch strength for ulnar nerve (Rt)	2.92	2.92±0.79	8.33	8.33±0.78	65	16.11325	0.05
Pinch strength for ulnar nerve(Lt)	2.67	2.67±0.65	7.83	7.83±0.72	62	17.37897	0.05

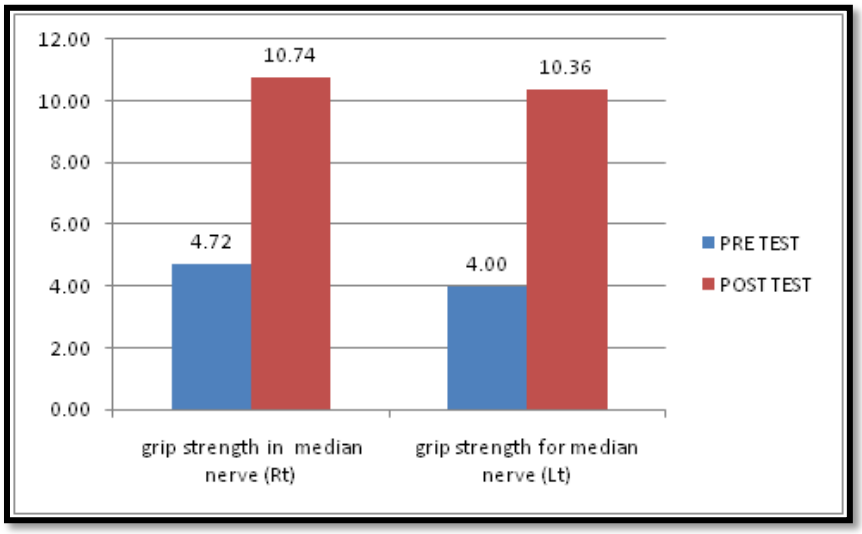
RESULTS

Mean value of pinch strength in median nerve right before and after test was 4.72 and 10.74 with reference to p-value is 0.05

Mean value of pinch strength in median nerve left before and after was 4.00 and 10.36 with reference to p-value is 0.05

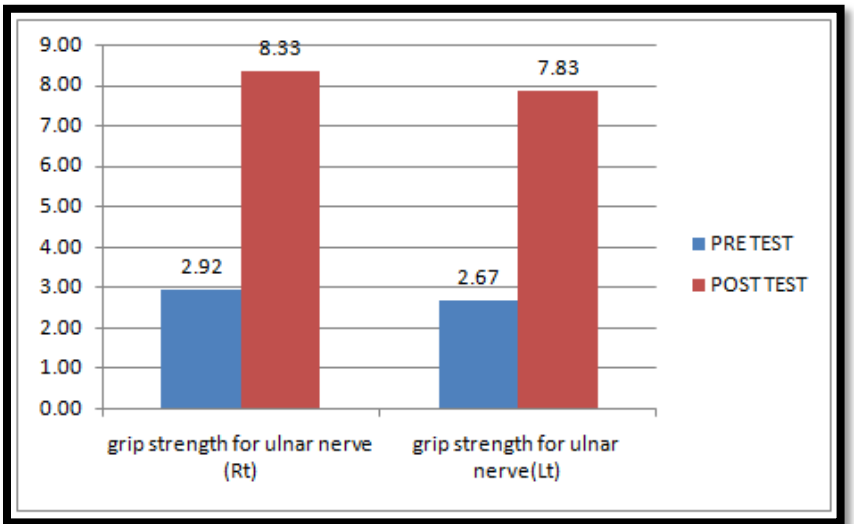
Mean value of pinch strength in ulnar nerve right before and after was 2.92 and 8.33 with reference to p-value is 0.05

Mean value of pinch strength in ulnar nerve left before and after was 2.67 and 7.83 with reference to p-value is 0.05



RESULT:

TABLE1 SHOWS MEAN AND STANDARD DEVIATION OF PRE AND POST VALUES OF PINCH STRENGTH IN MEDIAN NERVE FOR RIGHT AND LEFT



RESULTS

TABLE-2 SHOWS THAT THE MEAN AND STANDARD DEVIATION OF PRE AND POST VALUES OF PINCH STRENGTH FOR ULNAR NERVE (RT AND LT) IN COMPUTER OPERATORS

DISCUSSION

The aim of the present study is find out the effect of neural mobilization for median and ulnar neural flexibility and pinch strength for computer operators.

As per the inclusion criteria,51 computer operators with ULLT positive were taken for the study, and received neural mobilization for 3 weeks

Pre and post intervention mean values of pinch strength for median [Rt&Lt] and ulnar nerve[Rt&Lt] (from table.1)

In the present study it has been reported that neuralmobilization showed in mean value of median nerve right 4.72±1.02[pre intervention] to 10.74±0.88[post intervention] and mean value of median nerve left 4±1.15[pre intervention] to10.36±0.74[post intervention] ,and mean value of ulnar nerve right 2.92±0.79[pre intervention] to8.33±0.78[post intervention] ,mean value of ulnar nerve left 2.67±0.65[pre intervention] to 7.83±0.72[post intervention].

Mean values of data reveals an improvement between pre and post but significant changes are not noted.The literature supports that neural mobilization has beneficial effect in improving neural flexibility and pinch strength in computer operators.

DeranOskayPT,et al,(2009) the study doneonSeven patients with CTS ,and this study concluded that case series demonstrated that conservative treatment of CTS may be beneficial for selected patients with mild to moderate symptoms. The treatment included neurodynamic mobilizations, including sliding techniques and tensioning techniques, which are thought to enhance ulnar nerve gliding and restore neural tissue mobility. [18]

Priscila de souza Valente et al(2014) study done on 17 subjects. The study concluded that neural mobilization brachial plexus got no efficacy to gain range of motion of the lowerlimbs in asymptomatic individuals. However the overall results showed earned flexibility to reach the left finger. [19]

Dr. Dabholkar Tejashree etal The study Concluded that Neural tissue mobilization is effective in improving pinch & grip strength

Neural mobilization is advocated for treatment of neurodynamic dysfunction Following a systematic review of the literature examining the therapeutic efficacy of neural mobilisation, 10 RCTs discussed in 11 studies were retrieved. A majority of these studies concluded a positive therapeutic benefit from using neural mobilization.

Nervous tissue mobilization helps to re-established the dynamic equilibrium of neural tissue and normalize the physiological function .Vesicle clustering increases in responses to applied stretch. (Scott siechen et al.PNAS2009). F- Actin polymerization (Scott Siechen et al. PNAS2009)is seen with stretch. One possible effect of stretch on axons is the enhanced ion flux through stretch sensitive ionchannels (GlogauerM,etal.J of cell sci 1997-98). In particular, ca2+ influx can trigger increased Actin polymerization, force generation, regulation and downstream signalling cascades, as well as mediate vesicle localization under the membrane from which they are released.Muscle stretch thus might enhance the release of neurotransmitters either by elevating internal calcium concentrations or by increasing the sensitivity of transmitter release to calcium in the nerve terminal.(BM Chen and Grinnell SCIENCE 1995). Non neural component-During a neural tissue mobilization there is a stretch of the muscular component, which leads to an increase in the initial length of the muscles and hence there is a better contraction. (FrankStarling's Law- The force of contraction is proportional to the initial

length)[20]

Repetitive flexion and extension in the wrist significantly increase the fluid pressure in the tunnel through thickening of the synovial tissue that lines the tendons within the carpal tunnel. The median nerve can usually move up to approximately 9.6 mm to allow the wrist to flexion, and to a lesser extent during extension. Long-term compression of the median nerve can inhibit nerve gliding, which may lead to injury and scarring. When scarring occurs, the nerve will adhere to the tissue around it and become locked into a fixed position, so that less movement is apparent. The primary aim of the neural mobilization is a restoring the dynamic balance between the relative movement of neural tissues and surrounding mechanical interfaces, thereby allowing reduced intrinsic pressures on the neural tissue and thus promoting optimum physiologic function. [21]

Patrícia Fátima de Oliveira Martins state that Stretch breaks in the work setting improve flexibility and grip strength and reduce musculoskeletal complaints. [22]

Apoorva Subil Likhije etal (2017)study done on 40 subjects. The study concluded that no immediate or short term effect of neural mobilization on grip strength in asymptomatic subjects but, it is seen to improve neural tissue extensibility and vibration threshold.[14]

This study mainly serves as a prophylaxis treatment for cervical radiculopathy and some occupational technological diseases such as mouse shoulder, cervical brachial pain etc. by finding out the abnormal neural tension through upperlimb tension test and pinch strength by pinch metre.Hence stretching or mobilizing the neural tissue at appropriate age may be the precautionary for future problems.

CONCLUSION

The present study accepts alternate hypothesis and rejects null hypothesis. Hence, the study concludes that neural mobilization is effective on median and ulnar neural flexibility and pinch strength in computer operetors

LIMITATIONS AND RECOMMENDATIONS

LIMITATION OF THE STUDY:-

Small sample size

There is lack of control group

The results cannot be generalized to individual age

Needs to do comparative study

Duration of treatment 10 session only

RECOMMENDATIONS:

The further study is recommended to study on BMI;on other conditions

The further study is recommended to study the other outcomes also

The further study is recommended to study on other workers

The further study is recommended to study on other nerves

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