

## Radial Nerve Mobilization Reduces Lateral Elbow Pain and Provides Short-Term Relief in Computer Users<sup>§</sup>

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**Abstract:** *Study Design:* Prospective Experimental Study.

*Background:* Computer users may be at risk of lateral elbow pain. It is theorized that adverse mechanical tension can arise in the radial nerve with sustained keyboarding due to sustained static work of the elbow extensor muscles. Neural mobilization has been suggested as a potential treatment.

*Purpose:* The purpose of this study was to evaluate the effect of neural mobilization of the radial nerve on a single occasion in terms of its ability to reduce lateral elbow pain.

*Methods and Analysis:* Forty-one computer professionals (Mean age 46.7; S.D. 12.77), who had experienced lateral elbow pain for a mean of 2.87 months were recruited. The participants rated the pain using a verbal, numeric rating scale (NRS). Radial nerve tension was tested using the Upper limb Tension Test (ULLT) for radial nerve in both upper extremities. The radial nerve was mobilized using a series of 8 oscillations and repeated 3 times with a one minute rest in between. The NRS and ULLT were repeated after treatment and the scores compared using a paired t-test by the first author.

*Results:* The mean NRS scores decreased significantly from 5.7 (1.1) to 3.8 (1.4) ( $p < 0.000$ ;  $t$  value=8.07).

*Conclusion:* A single session of 3 neural mobilization resulted in a reduction of pain in computer users with lateral elbow pain. A long-term randomized trial is needed to determine the effects sustained over-time.

**Keywords:** Butler's technique of neural mobilization, lateral elbow pain, neural tension testing, numerical rating scale.

### INTRODUCTION

Extensive computer use is common for many individuals either for occupational, social or recreational tasks. Thus, the cumulative amount of time spent on a keyboard may be substantial for many individuals resulting in an increase in concerns for upper extremity disorders related to "overuse". The involvement of the peripheral nervous system in "non-specific" upper limb pain and dysfunction in computer operators has been suggested in previous reports and studies [1-8].

Numerous impairments such as increased threshold to vibratory stimulation, tension in the nerves, reduced nervous mobility, mechanical allodynia, pathological change in axonal flare reaction, and reduction in muscle strength have

been reported in computer users who have experienced pain. These impairments can be related to involvement of the peripheral nervous system [9]. A study among 485 injured workers of which 70% were computer users, found that although upper extremity disorders typically present with distal symptoms in the beginning; the disorder is actually a combination of diffuse neuromuscular illness with the proximal upper-body impairments that affect distal function. The authors supported the concept that posture related neurogenic compression is a key factor in work-related upper extremity disorder [5].

Lateral elbow pain is one of the most common musculoskeletal problems reported by computer professionals and has been attributed to several causes [10-15]. For example, in a detailed examination of injured workers who were predominantly computer users, 7% of patients were identified as having radial tunnel and 33% were identified as having lateral epicondylitis [9]. The patho-anatomic mechanisms behind symptoms of lateral elbow pain are unknown, but local vascular abnormalities [16], thermographic changes [17], and minor nerve entrapment [18-20] have been investigated. Nerves move in relation to their surrounding connective tissues [21,22]. Entrapment of a nerve can restrict nerve movement

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<sup>§</sup>This study was approved by the Health Sciences Research Ethics Board (HSREB) of the Tamil Nadu Dr. MGR Medical University, Chennai, India.

and can cause ischemia, pain, inflammation, axonal degeneration, vascular compromise, leading abnormal tension in the nerve called “adverse mechanical tension” [23-25]. Injured or inflamed peripheral nerves usually have increased sensitivity to mechanical loading [26].

Peripheral nerves are susceptible to mechanical compression, friction, and repeated tension [27]. If sufficient mechanical stimuli are exerted upon the nerve to cause damage; the damaged cells will release number of chemical agents, including bradykinin, histamine and prostaglandins. These chemical agents are capable of directly stimulating the nociceptors found within the connective tissue layers of the nerve [28]. Compression can also result in structural damage, blockage of axoplasmic flow, and impairment of blood flow resulting in ischemia, all of which will result in altered function of the nerve [29-33]. In addition, chemicals released from non-neural tissues are capable of mediating an inflammatory response, stimulating nociceptors within the connective tissue of nerves [30]. Lateral elbow pain in some cases is related to compression of the radial nerve at the radial tunnel [34,35]. Nerve tension testing, which causes mechanical tension on a nerve is expected to increase pain from the nerve [36]. There is support for this concept immediately following neural tension, positioning in people without any pathology there is an increase in the threshold of sensory reception touch; and decreased threshold for pain [37]. David Butler described nerve tension testing positions and mobilization techniques for the nerves of the upper extremity [38].

Techniques that restore the mobility of a nerve that has restricted longitudinal movement are often called “neural mobilization techniques” [24, 25]. When neural mobilization is used for treatment of adverse neural tension, the primary theoretical objective is to restore the dynamic balance between the relative movement of neural tissues and surrounding tissue interfaces. This will in turn reduce intrinsic pressure on neural tissues and promote optimum physiologic function [39]. Based on this premise for this intervention one might expect improved mobility of the nerve and visceral structures following neural mobilization. Hence, the purpose of this study is to analyze the short-term effect of radial nerve mobilization in reducing lateral elbow pain.

## MATERIALS AND METHODOLOGY

### Study Design: Prospective (Pre-Post) Study

*Selection and Description of Participants:* Participants were recruited by one of the authors from various multinational companies in Chennai, India. The eligibility criteria for this study was: subjects must present with a new episode of lateral elbow pain; were working on computers for a period of 6 to 8 hours per day; were experiencing lateral elbow pain and radiating pain of 2 to 6 months duration; were aged between 18 and 60 years. The exclusion criteria was, if any of the screening tests of shoulder abduction and hand behind back showed a lack of movement or pathology that could limit the mechanical application of the neural tissue tension test; predominant systemic illness; neurological disturbance or psychiatric; or history of a traumatic fracture of the spine which resulted in permanent

neurological deficit. People who underwent spinal or upper limb surgery were also excluded.

### Demographics

The study included 20 males and 21 females (n=41). 35 individuals were right hand dominant and 6 were left hand dominant. Recruited participants provided an informed consent form as approved by the research Ethics Board of the Tamil Nadu Dr. MGR Medical University, Chennai, India.

### Outcome Measure

Pain was measured using Numeric Rating Scale for pain (NRS-P). The NRS-P is a 10cm long line calibrated from 0 to 10 where no pain is recorded as 0 and severe pain as 10. The NRS has been shown to have 0.64 to 0.86, good to excellent test-retest reliability [40].

### Procedure

All participants were informed of the protocol before participating in the study. Pain was measured using NRS-P and then the mobilization was completed.

### Mobilization

The participants were positioned in a supine lying position. The physiotherapist assumed a standing position. The shoulder girdle was depressed, elbow extended, arm internally rotated, wrist, thumb and fingers were flexed. These movements stressed the radial nerve, and then shoulder depression was maintained with elbow flexion and wrist extension [25,27,41]. The wrist and fingers were fixed prior to the elbow extension test that was performed gently, extending the elbow for approximately 2 seconds just into the range where the participant felt only the tension but no pain and then flexing the elbow. Three sets of 6 to 8 oscillations were performed. NRS-P was re-assessed to ascertain change. Measurements were performed by a single physiotherapist.

### Statistical Analysis

Statistical analysis was performed using the SPSS software. A paired test of significance was performed to find out the difference in pre and post-test means of pain scores. The level of statistical significance was set at  $p < 0.05$ .

## RESULTS

There was an immediate reduction in the pain reported by the participants post-intervention. The mean NRS scores decreased significantly after the intervention from 5.7 (1.1) to 3.8 (1.4) ( $p < 0.000$ ;  $t \text{ value} = 8.07$ ).

## DISCUSSION

This study found immediate reduction in lateral elbow pain after radial nerve mobilization in computer users. This provides preliminary support for the usage of neural mobilization techniques in the treatment of lateral elbow pain.

Participants did not have severe upper extremity problems upon enrollment in the study since they were currently working. However, they did have signs and symptoms that we attributed to neurogenic impairment

because of the distribution and behavior of pain and the response to neural tissue provocation tests. Mechanical reproduction of symptoms that are detected by changing tension in neural tissues while not influencing the non-neural structures was used as a strategy to identify the symptoms. However, work-related upper extremity disorders have been shown to be multifactorial. It can be difficult to distinguish neurogenic symptoms from other potential physical and psychological contributors to their symptoms, which are out of the scope of this study.

The upper limb tension tests have moderate to substantial reliability [41]. Yaxley and Jull found that the neural tension test with a bias towards the radial nerve reproduced symptoms in 55% of lateral elbow pain cases [40]. This supports the use of radial nerve mobilization with patients complaining of lateral elbow pain. This study indicates that the mobilization of the radial nerve alters pain threshold in the periphery and these effects reduce pain in the short-term in patients with lateral elbow pain. This is because, as neural tension decreases, pain is decreased related to movement or bodily position restoring normal movement.

While this study provides initial support for short-term impacts of radial nerve mobilization for computer users with neurogenic type lateral elbow pain, but our findings were tempered due to our study limitations. The most substantial limitation is that the evaluation, treatment and assessment of outcome were not separated but rather provided by a single therapist. As such the measurement of motion was subject to provider bias. This effect was countered to some extent by the use of the patient reported numeric pain rating scale. While this measure was provided by patients and was verbally reported to the therapist, therefore, there is potential for social desirability bias. No physical performance tests were performed to indicate whether short-term changes in motion and pain were associated with increased function. Finally, since we only evaluated the impact of a single session, this provides no evidence about the long-term effects of this treatment. Long-term studies are required to see whether such an approach would reduce the incidence of upper extremity disorders, particularly at the radial tunnel. Since work related lateral elbow pain is multifactorial, a measure of multiple outcomes and evaluation of the effectiveness of an overall program and their individual components should be used.

## CONCLUSION

The results of the study indicate that the mobilization of the radial nerve resulted in a significant short-term relief in the lateral elbow pain of computer users.

## CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

## ACKNOWLEDGEMENTS

Declared none.

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Received: May 5, 2014

Revised: September 13, 2014

Accepted: September 17, 2014

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