Effect of Cervical Lateral Glide over Neural Tissue Mobilization for Median Nerve In Case Of Patients with Cervico-Brachial Pain Syndrome

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Abstract

Background: Certain type of upper quarter pain and dysfunctions are thought to be associated with neural tissue disorders. The term cervico brachial pain syndrome (CBPS) has been coined to describe this upper quarter pain in which neural tissue sensitivity to mechanical stimuli is a primary feature. However, it is unaccompanied by neurological deficits like altered deep tendon reflexes, paresthesia, motor weakness. It has been suggested that enhanced mechanosensitivity of upper limb peripheral nerve trunks may contribute to pathology of CBPS.

Purpose: To investigate the effects of Cervical Lateral Glide technique over neural mobilization for median nerve in subjects with Cervico brachial pain syndrome.

Materials and Methods: 20 subjects were included according to inclusion and exclusion criteria. Random sampling was done and all the subjects were divided into 2 groups. Group A was given cervical lateral glide and Group B was given neural tissue mobilization for median nerve for 14 days. The subjects were assessed for their pain and disability at day 0, 7 and 14 with pressure algometer, VAS and DASH as the outcome measures.

Result: Within group data from the subjects was analyzed by Friedman’s test and Mann Whitney U test was used to analyze between group data. Within group data shows significant result for both cervical lateral glide as well as neural tissue mobilization (p <0.05) whereas between group data shows insignificant result (p >0.05).

Conclusion: The finding of this study suggests that neural tissue mobilization for median nerve as a treatment technique is much more effective than cervical lateral glide in cervicobrachial pain syndrome.

Keywords: Cervicobrachial pain syndrome, cervical lateral glide, neural tissue mobilization, median nerve
Introduction

Upper quarter pain involves pain perceived in neck, shoulder, arm, upper chest or upper back region with or without associated headache\(^1\). The term Cervico brachial pain syndrome (CBPS) has been coined to describe this upper quarter pain in which neural tissue sensitivity to mechanical stimuli is a primary feature\(^1\). However, it is unaccompanied by neurological deficits like altered deep tendon reflexes, paraesthesia, motor weakness \(^2\). It has been suggested that enhanced mechanosensitivity of upper limb peripheral nerve trunks may contribute to pathology of CBPS\(^1\) and certain clinical provocation test has been employed as means of identifying neural tissue involvement in these patients\(^3\),\(^4\),\(^5\). Over past decade various treatment approaches have been advocated if once the presence of restricted neural tissue has been identified. The technique which restore the dynamic balance between the relative movement of neural tissue and surrounding mechanical interface are – Cervical lateral glide, Neural stretches or Neural mobilization.

Elvey in 1986\(^6\) recommended that cervical lateral glide would allow the movement of structures within the intervertebral foramen without undue tension being applied to the neural tissues. Since its description CLG has been used extensively as a technique to improve neural mobility. It involves the passive technique where the anatomic tissues or structures surrounding the affected neural tissue are gently mobilized with controlled and gentle oscillatory movements. Treatment can be more progressive by using the mobilizing technique in a similar way but involving movement of surrounding anatomic structures and the affected neural tissues together in the oscillatory movement. Passive movement of the pathologic neural tissue without movement of its surrounding anatomic tissue should be avoided and any stretching of the affected neural tissue is contraindicated. Its effectiveness has been proved in chronic CBPS by Elvey and Hall in 1997\(^7\), in lateral elbow pain by Vicenzino in 1996\(^8\) and in neurogenic CBPS by Coppieters et al in 2003\(^9\). The other technique is Upper limb neurodynamic test which assess the mobility of upper quadrant neural tissue by applying a sequence of movement that mechanically elongates the nerve being tested\(^9\),\(^6\),\(^5\). Butler (2000)\(^10\), suggest that the upper limb neurodynamic test also produce movement of nervous system in relation to interfacing structures. These are the structures that are anatomically related to the neural tissues and have potential to restrict the normal neural mobility\(^11\). The median neurodynamic test \(^1\) moves almost all the nerves between neck and hand including median, radial, ulnar nerve, brachial plexus, spinal nerve roots and cervical nerve roots and hence is capable of provoking symptoms in the distribution of nerve while testing and also in treating CBPS\(^12\). There are different methods of delivering neural mobilization including Tensioning and Sliding\(^10\),\(^13\),\(^14\). Sliding technique involves combination of movement that result in elongation of nerve bed at one joint while reducing the length of nerve bed at adjacent joint\(^15\),\(^16\). These technique suggested to be less aggressive in nature compared treatment which provide inherent safety as demonstrated by the manufactures guidelines. The safety also supported by many physical therapist practitioners in the field\(^12\),\(^15\),\(^16\).

to tensioning technique which involve increasing distance between each end of nerve bed by elongation\(^14\). Though these treatment approaches has been increasingly popular in clinical practice but there is very limited studies available which reported the effect of
cervical lateral glide on this particular condition and our primary aim is to study the effectiveness of cervical lateral glide in subjects with cervicobrachial pain syndrome.

**Material and Methods**

A total of 30 subjects participated with no history of any neurological deficit, dyesthetic pain, cervicogenic headache, dizziness, soft tissue inflammatory conditions like tendonitis, tenosynovitis, capsulitis, & bursitis, rheumatic condition, Injury to spinal cord, tumor, circulatory disturbances. The whole study was conducted with the permission of institutional ethical committee for using human subjects as a sample and a consent form was signed from each individual. All the subjects were collected using randomization method and had age ranging between 30-55 years. Outcome measures were Pain pressure threshold, VAS, DASH.

Procedure –

The subjects after being chosen according to the criteria, was divided into two groups using a randomization method with n=10 in each group. After subjects being assigned to either group, i.e. group A and B, they undergo pretest measurement of outcome measures namely – Visual analogue scale, Disability of arm, shoulder and hand, Pain pressure threshold.

All the subjects in Group A undergone cervical lateral glide and in other group neurodynamics for median nerve was applied. A hot pack in the neck region was common in both the groups.

**Application of Cervical Lateral Glide**

The subject was positioned in supine, the shoulder slightly abducted with a few degrees of medial rotation, and the elbow flexed to approximately 90 such that the hands were resting on the subject’s chest or abdomen. The physiotherapist gently supported the shoulder over the acromial region with one hand while holding and supporting the head and neck. The technique involved a gentle controlled lateral glide to the contralateral side of pain in a slow oscillating manner up to a point in range where the first perception of resistance was felt by the therapist (and before the onset of pain). This was determined to be the treatment barrier.

**Fig 1 Application of cervical lateral glide**

Subjects characteristics of both groups presented in table (1). There were no significant differences between both groups regarding age, body mass index (BMI) and mean duration after stroke onset (P>0.05).
**Application of Neural tissue mobilization:**
The subjects were positioned supine in front of therapist, patient's thumb and finger tips were supported and some of the weight of the arm was taken by the therapist's thigh. Shoulder abduction was done till symptom starts appearing approximately 100 degrees, then wrist extension with stabilization of shoulder followed by wrist supination, lateral rotation of shoulder elbow extension was done till symptom start coming. Laterally flex the neck away from the side, making sure that whole neck was laterally rotated and not just the upper cervical spine. (Fig 3)

VAS, DASH and Pain threshold are our outcome measures and we used them on day 0, day 7 and day 14 of our treatment session.

In VAS, we draw a 10 cm long horizontal line and asked the subject to mark a point according to the severity of their pain. It helped us in noticing or measuring the improvement in the severity of pain of the subject.

In DASH, patient filled a questionnaire. Questionnaire consists of thirty questions for disability of arm, shoulder and hand and patient had to answer according to the severity of their disability from no difficulty to unable on the above mentioned days and according to it we score the subject’s disability.

Next is Pain Pressure Threshold - In this pain pressure threshold was measured with algometer along the course of median nerve at 3 points. (Fig 2)

1\textsuperscript{st} point was just medial to the brachial artery at the level of elbow joint in the cubital fossa.

2\textsuperscript{nd} point was between the two heads of pronator teres muscle.

3\textsuperscript{rd} point was at the level of wrist just medial to the radial artery.

This procedure was applicable to both the groups and then readings were taken.

**DATA ANALYSIS**
Mann’s Whitney tests were performed between group A and B using SPSS 15 software. Friedmann test was used to analyzed within group data of starting, 7\textsuperscript{th} and 14\textsuperscript{th} day. P value was set at 0.05 level

**RESULT**
The test was done to compare readings at day 0, day 7 and day14. The results between groups show insignificant difference (p> 0.05) for all the variables except VAS and DASH from day 0 to day 14.
Table 1: A comparison between variables in three sessions

| VARIABLE  | DAY 0 | DAY 7 | DAY 14 |
|-----------|-------|-------|--------|
| Elbow P1  | 0.940 | 0.570 | 0.545  |
| Elbow P2  | 0.762 | 0.880 | 0.427  |
| Forearm P1| 0.705 | 0.791 | 0.734  |
| Forearm P2| 0.596 | 0.520 | 0.791  |
| Wrist P1  | 0.677 | 0.940 | 0.733  |
| Wrist P2  | 0.472 | 0.449 | 0.705  |
| VAS       | 0.343 | 0.402 | 0.041  |
| DASH      | 0.198 | 0.053 | 0.041  |

Fig 3: shows in between group analysis for elbow P1.

Fig 4: shows in between group analysis for elbow P2.

Fig 5: shows in between group analysis for forearm P1.

Fig 6: shows in between group analysis for forearm P2.
DISCUSSION

There are numerous studies that have addressed the issue of manual therapy in chronic neck pain, utilizing mechanosensitivity of neural structures. The present study attempted to identify the efficacy of two active manual therapy techniques in case of subjects with cervicobrachial pain syndrome. One technique followed the principles of neural tissue stretching by utilizing neural tissue mobilization for median nerve and other technique focused on joint mobilization in the form of cervical lateral glide. The study revealed that each of the approach (neural tissue mobilization and cervical lateral glide) combined with hot pack in the neck region resulted in overall improvement in disability and pain. This is also consistent with other studies that have individually demonstrated the efficacy of neural stretches and cervical lateral glide.

Both the group showed improvement when compared with in group from day 1 to day 14 but when between group comparisons was done for cervical lateral glide and neural tissue mobilization, neural tissue mobilization showed greater improvement than cervical lateral glide. The pain and disability in the subjects was may be due to adhesion in the nerve root caused by inflammatory reactions in the nerve root. The adhesions can be due to...
edema which leads to reduced mechanical interface and restrictions in nerve gliding and sliding. Dilley A. et al.\textsuperscript{12} described the pathology behind it that is when nerve is inflamed minimal elongation of <3% or locally applied pressure can trigger ectopic impulse generation which may lead to provocation of pain and other symptoms. According to Elvey (1985)\textsuperscript{6} any inflammatory process affecting a nerve root can lead to the development of fibrous tissue, causing adhesions that result in dysfunction, mobility deficit, and generating pain during movement and resulting in changes in flow with subsequent hypoxia, edema and demyelination. Therefore, this would be the reason for treating the nerve with passive movement; however, the therapeutic effects are only explained in general terms, such as preventing the formation of adhesions around the nerve, reducing edema and finding a response of variations in beneficial physiological pressure\textsuperscript{6}. Mc Lellan and Swash (1976)\textsuperscript{18} found that the median nerve slide up to 2cm in relation to interfacing tissues in upper arm of volunteers during wrist and neck movements. Nerve is an elastic structure which has capability to glide and slide and allows a smooth and complete movement without any restriction\textsuperscript{18}. It has been noticed that median nerve can elongate itself up to 20% to allow smooth movements from elbow to wrist eg. elbow flexion to elbow extension. Also Millesi (1995)\textsuperscript{19} pointed out that the median nerve has capability of adapting to nerve bed made 20 % longer from wrist and elbow flexion to wrist and elbow extension. But due to some pathology in the nerve or in the nerve\textsuperscript{33} bed, it is not able to elongate to its full length leading to pain and disability\textsuperscript{20}. During neural mobilization various physiological changes takes place within the mechanical interface of nerve and changes the intraneural mechanics. The improvement is may be due to blood flow, axonal transport, or temperature and remyelination of nerve may also take place. Also there may be fluid movement in the mechanical interface with gliding movement which reduces the probability of adhesions in the nerve. In support of this, Cynthia L et al (2011)\textsuperscript{21} showed significant dye dispersion after mobilization in the experiment limb indicates that there was a treatment effect due to intervention. Physiological changes due to blood flow, axonal transport, or temperature, thus pointing to be purely the mechanical effects of neural mobilization. The response to the mobilization appeared to be due to intraneural mechanics. The mechanism responsible for dye dispersion with mobilization may include fluid movement with intrafascicular gliding, and /or transverse contraction of the nerve as it lengthens. Maintaining healthy nerve functioning using neurodynamic techniques may occur by promoting uninterrupted axonal transport, thereby preventing deposition of mechanosensitivity elements, the presence of which results in pain and limited neural movement. The ability to mechanically induce fluid dispersion by means of neural mobilization is a substantial finding as it sheds light on the physiological benefits of this technique that could ultimately influence neurophysiological functions. Clinical conditions resulting in loss of active motion may prohibit more active participation in mobilization\textsuperscript{21}. Kikukawa et al (2003)\textsuperscript{22} reported that microtubules were depolymerized by stretching, which can affect axonal...
transport. When nerve fascicles are stretched, its cross sectional area is reduced, intrafascicular pressure increases, nerve fibers are compressed and microcirculation is compromised and pressure received by nerves will affect the edema and demyelination\textsuperscript{23}. However, it is described that the peripheral nervous system has considerable regeneration powers\textsuperscript{24}. Sabbahi et al (1997)\textsuperscript{26} stated that improvement in the neural excitability caused by neural mobilization may be explained by re-myelination that might take a period of time possibly few days to few weeks.

Also Cleland et al (2004)\textsuperscript{26}, if the etiology of symptoms originates from the intraneural edema, the changes in intra neural pressure that accompany the neural mobilization may be sufficient to disperse the edema, thus alleviating the hypoxia and reducing the associated symptoms. In addition, there is the hypothesis that nerve movement within pain free variations can help to reduce nerve compression, friction, tension, therefore decreasing its mechanosensitivity.

MW Coppieters (2008)\textsuperscript{11} stated that it was assumed that neurodynamic tests or their components induce nerve movement by elongation of nerve bed (the tract formed by the structures surrounding the nerve). Lengthening of nerve bed may elongate the nerve which may result in an increase in tension and intraneural pressure. Sliding technique in neurodynamics has been theorized to play a role in dispersion of inflammatory products and limiting fibroblastic activity\textsuperscript{19}. Also Sabbahi et al. (1997)\textsuperscript{26} reported that neural mobilization causes movement of adhered nerve and dura matter with restoration of normal mechanics of surrounding connective tissue accompanied with pain reduction\textsuperscript{25}. In support of this, Beneciuk\textsuperscript{11} reported that neural mobilization utilizing tensioning technique had an immediate hypoalgesic effect on C-fibres mediated pain perception by inhibition of temporal summation perception. It also reduces intraneural swelling and circulatory stasis by altering intraneural pressure associated with these techniques\textsuperscript{26}. Quick NE et al also stated that there is an increase in the blood flow velocity with in radial artery and increase in skin temperature of hand following neurodynamic testing procedures\textsuperscript{30, 31}.

The study also shows significant results for cervical lateral glide technique. Cervical lateral glide does not focus on only one particular nerve root rather on the whole nerve root and its mechanical interface get mobilized. The improvement may also be due to decrease in the tone of the nearby muscles. Also stretching of nerves allows the fluid movement which helps in dispersing irritating chemicals and also increases vascularity and axonal transport. Allison et al (2002)\textsuperscript{3} analyzed the effect of cervical lateral glide treatment technique as a part of a wider approach directed to the peripheral nervous system and its surrounding structures in patients with neurogenic pain\textsuperscript{16}. Cowell and Phillips\textsuperscript{19} stated that cervical lateral glide is capable of producing beneficial effects on pain, functional disability as well as mobility in the subjects with cervicobrachial pain syndrome\textsuperscript{2}.

It was also reported that following cervical lateral glide, the available ROM, area of symptom distribution and elicited pain intensity showed a significant improvement when compared to the condition before treatment\textsuperscript{33}. Kenneally et al (1988)\textsuperscript{36} stated that the interpretation of changes in ROM and pain intensity is quiet simple as the fact that symptoms were elicited in larger areas than
the distribution of median nerve. These symptoms may be referred from nervi-nervorum that innervate the median nerve and brachial plexus or may be due to involvement of other nerve segments especially if there is any neuroanatomical variations, triggering a mechanosensitive ectopic impulse generating site or stimulating the nervi-nervorum. MW Coppieters (2004) also stated that cervical lateral glide treatment effect was not bound to the innervations area of median nerve. There is a decrease in the symptoms both inside and outside the median nerve distribution following cervical lateral glide treatment.

Authors’ Zusman et al (1994) and Katavich et al (1998) also suggested for the possibility that spinal manual therapy may result in a reduction of muscle tone. In our study cervical lateral glide technique may have reduced the tone of the muscles supplied by the emergent nerves, including the biceps brachii muscles.

The hypothetical reduction in tone may have allowed greater reduction in the pain and increase in mobility. Vicenzino et al (1996) demonstrated that there is an average increase of 70% for neurodynamic test for radial nerve and increase in pain threshold and grip strength when lateral glide was performed on patient with lateral epicondylalgia.

Rempel D et al (1999) stated minimal pressure on a nerve may cause important changes in vital physiological processes like intraneural microcirculation and axonal transport. Cervical lateral glide illustrated the benefits of a movement based treatment approach of patient with peripheral neurogenic pain. Central nervous system has capability to control the transmission of nociceptive impulses and potential activation of pain inhibitory system but Butler stated various hypothesis that explain the effects of treatment like reducing mechanical forces on nerves dispersing irritating chemicals and fluids in and around nerves and neurons, enhancing vascularity and stretching scar tissue.

On comparing both the interventions it has been found that cervical lateral glide (CLG) does not involve the specific targeted structural tissue or impairments. Rather it involves all the surrounding nerves and tissues whereas neural tissue mobilization (NTM) specifically targeted the neural structure involved. It is also notable that the number of treatment sessions required for NTM group were less when compared to CLG group in progression of improvement. It was noticed that NTM group required fewer sessions for the optimum benefit and had a better carry over effect as compared to the CLG group. All these facts proved my null hypothesis true that neural tissue mobilization is more effective than cervical lateral glide in treating subjects with cervicobrahrial pain syndrome.

**Study Limitation**

This study has certain limitations also that need to be considered. The criteria for checking the stretch response was subjective so the response was not much controlled by examiner. Secondly, in CLG group we mobilize all the nerves from cervical spine to brachial plexus, not particularly median nerve. The amount of shoulder depression, wrist and finger extension was also not measured; human errors in reproduction of sensitization could have come into play.

In future the study can be a separate groups for male and females with adequate sample size to compare the effects in male and female. The study can be done taking large
group of population. The duration of the intervention could be increased. The use of pressure biofeed back can be made for measuring the amount of shoulder depression, wrist and finger extension

**Conclusion**

This study confirmed that neural tissue mobilization had better carryover effect as compared to cervical lateral glide and also it showed steady improvement in the pain and disability so subjects showed much faster improvement. Hence, the finding of this study suggests that neural tissue mobilization for median nerve as a treatment technique is much more effective than cervical lateral glide in cervicobrachial pain syndrome.

**Conflict of Interest:** None Declared

**Acknowledgement:**

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