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Cervical lateral glide neural mobilization is effective in treating cervicobrachial pain in management of cervical radiculopathy

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Abstract

Cervical radiculopathy is one of the commonest musculoskeletal conditions. The etiology of cervical radiculopathy is poorly understood. In spite of long duration for treatment protocol recurrence rate is common.

Aims & Objective: To compare between cervical lateral glide and neural mobilization (slider median nerve biased in management of cervical radiculopathy

Method: Study have been done on 60 patients, include 11 male and 49 female with mean age of 42.29 years, reported in physiotherapy department of M.Y. Hospital, Indore with complain of neck pain radiating into upper extremity or back. The data was collected by questionnaire form and was analyzed using SPSS 14.0 and graph pad 6.7 version.

Result: Data analysis was performed using SPSS version 16. Due to nature of data and outcome measures non parametric test were used. Wilcoxon signed rank test was carried out to determine if there were statistically significant changes between pre and post test result within the group. To test if there were significant difference between the 2 intervention groups and conservative group, Kruskal-Wallis test was performed. $P \leq 0.05$ was considered to indicate statistical significance. Wilcoxon signed rank test for within group pre and post test difference in VAS score and Disability scores showed significant improvement at p value 0.000 in all the 3 groups. However the mean difference was found to be more for cervical lateral glide treatment (-5.45 points; $p=0.000$) as compared to neural slider treatment (-4.65 points; $p=0.000$) and conventional treatment (-2.6 points; $p=0.000$). Wilcoxon signed rank test for within group pre and post-test difference in Disability scores showed significant improvement at p value 0.000 in all the 3 groups. However the mean difference was found to be more for cervical lateral glide treatment (-34.95 points; $p=0.000$) as compared to neural slider treatment (-27.05 points; $p=0.000$) and conventional treatment (-13.65 points; $p=0.000$). This is further depicted. The between group analysis was done for NDI score, by using Kruskal-Wallis test, showed that there was a statistical significant difference in disability score between the different treatment techniques, $\chi^2(2) = 40.412$; $p=0.000$, with a mean rank disability score of 13.32 for lateral glide treatment, 29.88 for neural slider. Treatment and 48.30 for conventional treatment.

Conclusion: This study compared the effect of contralateral cervical lateral glide and Neural slider techniques in treatment of cervical radiculopathy patients. Both interventions given in conjunction with conventional physiotherapy treatment demonstrated significant improvements in pain and disability as shown on VAS and NDI scores and therefore both techniques are effective over conventional physiotherapy treatment alone. On comparing the two intervention, it is concluded that the Contralateral Cervical Lateral Glide technique is more effective than Neural Slider technique for treatment of patients with cervical radiculopathy

Keywords: radiculopathy, cervical disc herniation, neurodynamic

1. Introduction

Cervicobrachial pain (CP) is a high-incidence and highly prevalent, well-described disabling medical condition^[1] that affects 83 per every 100,000 people in the course of their lives^[1, 2]. It is described in the scientific literature as the presence of pain in the neck that radiates or refers to the arm^[3], and it is considered a common complaint in patients seeking physiotherapy management^[1-3]. The economic burden associated with neck-related disorders was estimated in a 1996 study conducted in the Netherlands to be approximately 686 million US dollars per year^[4]. "Considering the rising costs of health care, it is plausible that these estimates would be higher today,"

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According to Driessen *et al.* [5]. Currently the specific cost related to CP is unknown.

CP gold standard diagnosis is performed through correlative pathological findings in a magnetic resonance imaging procedure [6]. Other helpful tools in the proper diagnosis of CP are the presence of positive outcomes in the Spurling, Upper Limb, and Distraction orthopedic tests and altered results in nerve electro conduction assessment [1]. The classical patterns of pain symptoms related to this condition are caused by the existence of musculoskeletal damage and neuropathic irradiation of pain due to underlying neural tissue injuries of the cervicobrachial anatomical region [3, 7, 8]. There is current evidence of pathologic nerve trunk mechano-sensitivity alterations, central sensitizing, and visco-elastic distortion of the cervicobrachial nervous tissue during the onset of CP symptoms; this constitutes a key point in the proper treatment selection for CP and its adequate implementation [9-14]. A number of less common or unusual causes have been reported in selected cases and include -Metabolic disturbances [16], Surgical complications [10, 11, 12, 13, 14], Tumor [15], Sarcoidosis [16], Arteritis [17], Athetoid [18] and dystonic cerebral palsy [19], Decompression sickness [20], Carrying heavy baggage [21], Parachuting [22], Ganglion compression [23], Non-Hodgkin's lymphoma [24], Vertebral artery tortuosity and loop formation [25]. Therapy techniques such as the cervical lateral glide (CLG) neural tissue mobilization [15, 16]. CLG neural tissue mobilization is a specific form of treatment intended for CP previously described by Elvey and Hall [17] and is capable of achieving a hypoalgesic effect during the onset of CP symptoms through the activation of descending nervous system pain modulation mechanisms, changes in the biomechanical properties of the brachial plexus, and other complex physiologic interactions that are not fully understood. The CLG physical therapy technique consists of controlled movements of the cervical and brachial plexus neural tissue. The hypoalgesic effect produced by CLG is associated with an increase in neural tissue mobility, edema, inflammation, and intra-neural pressure reduction, without any known side effects when applied properly, except for a momentary worsening of symptoms (the only known side effect of CLG) [1, 10, 18, 20]. The patient history alone can diagnose cervical radiculopathy in over 75% of cases [35]. The most common symptom associated with radiculopathy is arm pain or paresthesias in the dermatomal distribution of the affected nerve and motor deficits. C5 pain occurs in the shoulder and radiates down the ventral arm to below the elbow, may show weakness in the deltoids. C6 radiculopathy is associated with pain down the superior lateral aspect of the arm into the first two digits, show weakness in the biceps and flexor carpi ulnaris. C7 pain radiates down the dorsal aspect of the arm, through the elbow and into the third digit C7 weakness occurs in the triceps, as well as the brachioradialis. C8 symptoms move down the inferior medial aspect of the arm into the fourth and fifth digits, causes weakness in the intrinsic muscles of hand [36]. There are several intervention strategies for managing cervical radiculopathy with physical therapy and surgical interventions being the most common. Long-term benefits of surgical interventions are questionable with reported numbers of 25% of people continuing to experience pain and disability at 12 month follow-ups [37]. There is a significant amount of evidence available to support the use of physical therapy interventions for patients with cervical

radiculopathy, and the benefit of physical therapy and manual techniques in general for patients with neck pain with or without radicular symptoms [38, 44]. The nonoperative treatment includes a period (+/- one week, not more) of immobilization with a cervical collar to decrease the compression on the nerve root, cervical traction, medication to reduce the pain, physical therapy and manipulation including massage, stretching, exercises to improve range of motion and eventually ice, heat and electrical stimulation. They must be used together and not separately to show improvement. But all these elements of the treatment need further studies to prove more effectiveness. Neural tissue mobilization and cervical lateral glide are suggested and used treatment protocol for cervical radiculopathy. However very limited clinical trials have been found studying effectiveness of one over another [45, 46]. This study has been conducted to compare effectiveness of contralateral cervical lateral glide and neural sliders.

Aims & Objectives

1. To study effect of cervical lateral glide for management of cervical radiculopathy.
2. To study effect of neural mobilization for management of cervical radiculopathy.
3. To compare effect of cervical lateral glide and neural mobilization in management of cervical radiculopathy.
4. To compare effect of cervical lateral glide and neural mobilization over conventional management of cervical radiculopathy.

Material & Methodology

1. Couch
2. Cotton
3. Hot Packs
4. Ultrasonic-Gel

Methodology

Study design- It is a quasi experimental design consist of 2 experimental groups and one control group.

Sampling method- Purposive sampling.

Subjects

Study have been done on 60 patients, include 11 male and 49 female with mean age of 42.29 years, reported in physiotherapy department of M.Y. Hospital, Indore with complain of neck pain radiating into upper extremity or back.

Inclusion criteria

1. Patient with neck pain radiating into upper extremity with positive upper limb neurodynamic test 1 (median nerve biased) diagnosed on the basis of clinical history, examination & diagnostic test⁶⁸.
2. Patients between age group of 25-60 yr with symptoms from >2 wks to 6 month
3. Both genders
4. Patient who gave informed consent & were able to attend clinic for treatment & assessment
5. Patient with unilateral UE symptoms.

Exclusion criteria-

1. Patient with cervical instability
2. Patient with cord compression
3. Patient with any medical red flag. (ie. spinal tumor, fracture, metabolic disease, RA, osteoporosis, prolonged history of steroid use, spinal infection etc.)
4. Patient with evidence of CNS involvement
5. Patient with vertebro-basilar syndrome
6. Patient undergone cervical surgeries

3. Patient with bilateral UE symptoms
7. Traumatic injuries to upper limb and cervical spine
8. Dizziness
9. Circulatory disturbance in UE
10. Known history of high level spinal cord injury & malignancy
11. Central pain syndrome (eg. Fibromyalgia)
12. Limitation of glenohumeral joint, elbow joint or wrist constraining standard performance of neurodynamic test.

Procedure

Study protocol was reviewed and approved by ethical committee of M.G.M. Medical College, Indore. All subjects were first assessed for diagnosis of cervical radiculopathy on basis of clinical history, detailed neurological examination and diagnostic tests including ULTT 1 (median nerve biased). For testing median nerve, patient was positioned supine with arm down by side. Therapist 1 hand stabilizes shoulder (do not depress) and other hand holds wrist with a pistol grasp, elbow at 90°. Perform Glenohumeral joint abduction and external rotation (90-110°), forearm supination, wrist and finger extension than elbow extension. Test is considered positive if Structural differentiation manoeuvre using wrist (for proximal symptoms) or neck (for distal symptoms) alter symptoms and/ or if there is reproduction of symptoms. Informed consent has been taken from subjects willing to take part in study. Subjects were divided into three groups named A, B and C. each consists of 20 patients.

Group A- Received contralateral cervical lateral glide with conventional physiotherapy. **Group B-** Received median nerve slider technique with conventional physiotherapy. **Group C-** Received conventional physiotherapy treatment. For measuring outcomes visual analogue scale (VAS) and neck disability index were taken by the therapist before any treatment according to subject’s response to questions. Subjects in all 3 groups first received conventional physiotherapy management (TENS, stretching and isometric neck exercises) before the experimental intervention.

Group A

Subjects in this group received contralateral cervical lateral glide which was performed as- The subjects were positioned supine on the treatment couch with head in neutral and slightly off the couch, arm by side, elbow in flexion and hand resting on abdomen or in more abducted position (depends on patient’s pain level).

The therapist stood at the end of couch and applied lateral glide away from symptomatic side at one or more motion segments depends on nerve root involved.

3 sets of slow oscillation into resistance but no pain with 1 minute rest in between sets were given depend on patient’s response and Maitland’s mobilization criteria.



Fig 1: Showing Contra-lateral Cervical Lateral Glide Technique

Group B

Subjects in this group received neural slider technique performed as- Subject in supine lying with neck in neutral position. Symptomatic upper extremity is placed in median neurodynamic test 1 position (Elvey) with glenohumeral joint in abduction and external rotation (90-110 degree), wrist and fingers in extension, forearm in supination. Sliders are given using neck and elbow components i.e. ipsilateral cervical flexion combined with elbow extension and contralateral cervical flexion with elbow flexion in a slow rhythmic manner. Dosages are individualized based on shacklock concept of neuro dynamics. 3 sets of 5-30 repetitions with break of 10 sec to several minutes were given.

Patients were instructed to perform self-neural slider exercises at home, repetition and sets in a day varies from few to many, depends on patient’s response.

Group C

Subjects in this group received conventional physiotherapy management which includes application of TENS for 15 minutes, stretching of tight neck muscles (3 times with 60 seconds hold of each) and isometric neck exercises 10 repetition in each direction with 7-10 second hold. Subjects in all 3 group were given home program consist of postural education, ergonomic advices, shoulder shrugging and chin tuck in exercises and hot water fermentation once daily.

Data Analysis

Data analysis was performed using SPSS version 16. Due to nature of data and outcome measures non parametric test were used. Wilcoxon signed rank test was carried out to determine if there were statistically significant changes between pre and post test result within the group. To test if there were significant difference between the 2 intervention groups and conservative group, Kruskal-Wallis test was performed. $P \leq 0.05$ was considered to indicate statistical significance.

60 patients have been included for this study and were randomly allocated to 3 groups. At baseline, there were no significant difference in age, sex and duration of symptoms. However baseline VAS and Disability scores varies in different groups

Pain

Wilcoxon signed rank test for within group pre and post-test difference in VAS score and Disability scores showed significant improvement at p value 0.000 in all the 3 groups. However the mean difference was found to be more for cervical lateral glide treatment (-5.45 points; $p=0.000$) as compared to neural slider treatment (-4.65 points; $p=0.000$) and conventional treatment (-2.6 points; $p=0.000$). this is further depicted.

Table 1: wilcoxon signed rank test for pre and post-test difference in 3 groups.

Groups	Variable		mean	SD	SEM	Z value	P value ≤ 0.05
Group A	VAS	Pre	7.2	1.36	0.30	-3.962	0.000
		post	1.75	0.78	0.17		
Group B	VAS	Pre	7.8	1.32	0.29	-3.949	0.000
		post	3.15	1.3	0.29		
Group C	VAS	Pre	7.35	1.37	0.254	-4.021	0.000
		post	4.75	1.12	0.25		

The between group analysis was done for VAS score, by using Kruskal-Wallis test, showed that there was a statistical significant difference in pain score between the different treatment techniques, $\chi^2(2)= 37.549$; $p=0.000$, with a mean rank pain score of 14.05 for lateral glide treatment, 30.18 for neural slider treatment and 47.28 for conventional treatment. As the treatment reduces the pain score, the least rank will be considered as most significant. So cervical lateral glide treatment showed most significant pain reduction than neural slider and conventional treatment.

Table 2: Kruskal-wallis test for mean rank of VAS score for 3 groups.

	Group	N	Mean Rank
Vas Post	Conservative Group	20	47.28
	Lateral Glide	20	14.05
	Chart Slider	20	30.18
	Total	60	

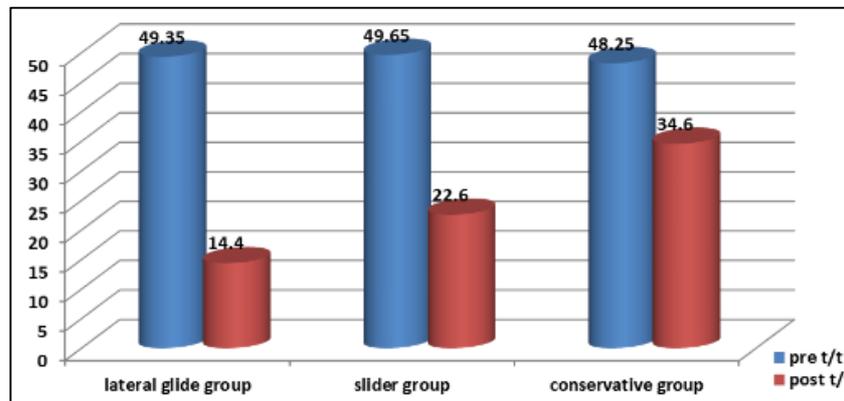


Fig 2: So cervical lateral glide treatment showed most significant reduction in disability than neural slider and conventional treatment

Table 3: Kruskal-wallis test for mean rank of NDI score for 3 groups

Ndi Post	Conservative Group	20	48.30
	Lateral Glide Group	20	13.32
	Neural Slider Group	20	29.88
	Total	60	

Table 4: Kruskal-wallis test for mean rank of NDI score for 3 groups

	NDI_PRE	NDI_POST
Chi-Square	.406	40.412
Df	2	2
Asymp. Sig.	0.816	0.000

Discussion

In this study, 60 subjects within the age group of 25-60 years with unilateral cervical radiculopathy were selected. Initially all the subjects were assessed for pain and disability using VAS and NDI scores respectively. All 60 subjects were divided into 3 groups having 20 subjects in each group. Group A subjects received contralateral CLG technique with conventional treatment, Group B received NS technique with conventional treatment and Group C received only conventional treatment. The statistical analysis of the values showed significant reduction in pain and disability scores in all the 3 groups. On comparison between the groups, group A has more significant reduction in pain and disability than group B and C. so CLG treatment is found to be more effective than NS treatment. In cervical radiculopathy, the musculoskeletal patho mechanics like

Neck disability

Wilcoxon signed rank test for within group pre and post test difference in Disability scores showed significant improvement at p value 0.000 in all the 3 groups. However the mean difference was found to be more for cervical lateral glide treatment (-34.95 points; $p=0.000$) as compared to neural slider treatment (-27.05 points; $p=0.000$) and conventional treatment (-13.65 points; $p=0.000$). This is further depicted. The between group analysis was done for NDI score, by using Kruskal-Wallis test, showed that there was a statistical significant difference in disability score between the different treatment techniques, $\chi^2(2)= 40.412$; $p=0.000$, with a mean rank disability score of 13.32 for lateral glide treatment, 29.88 for neural slider. Treatment and 48.30 for conventional treatment. As the treatment reduces the disability score, the least rank will be considered as most significant.

disc protrusion, spondylitis, overuse etc. produce mechanical stresses to nearby neural structure. Physiological response of neural tissue to mechanical stress is decrease in intraneural microcirculation which leads to axonal hypoxia, and also reduce axonal transport and increase mechanosensitivity [48, 55]. Contralateral CLG and neural slider are neurodynamic techniques used to manage musculoskeletal presentation of peripheral neuropathic pain [67]. It is hypothesized that neural mobilization techniques can have a positive impact on symptoms of radiculopathy by improving intraneural circulation, axoplasmic flow, neural connective tissue viscoelasticity and by reducing sensitivity of abnormal impulse generating sites (AIGS). CLG and NS are maneuvers that attempt to produce a sliding movement between neural structure and adjacent non-neural tissue and thus improving movement of nerve at mechanical interfaces. The effectiveness of contralateral CLG and NS over conventional treatment found in this study can be due to these mechanisms [48, 55]. Contralateral CLG is found to be more effective in producing immediate pain relief compared to NS technique. This finding is supported by many literatures. Studies have proclaimed that lateral glide has a hypoalgesic effect (pain reducing) beyond comparator (therapeutic ultrasound) [49], placebos (manual contact intervention) and control (no intervention) [50] on at least one pain outcome measure. A study conducted by coppiters *et al* [49] to analyze the immediate effects of CLG treatment and therapeutic ultrasound in patient with neurogenic cervico-brachial pain. Following CLG treatment, investigators found decrease in pain intensity from 7.3 to 5.8

($p \leq 0.0003$). In present study mean pain intensity reduces from 7.2 to 1.75 ($p \leq 0.000$) for contralateral CLG treatment. Greater improvement in present study may be because CLG is used with conventional treatment, so may be due to co-intervention used. Cervical mobilization (Group C) was performed using accessory and passive physiologic movement on dysfunctional interface. Second group (Group N) received peripheral neural slider technique. Significant pain reduction in both the groups was found but no between group difference was revealed. Although there are numerous studies that have addressed the issue of manual therapy and neural mobilization in neck pain and radiculopathies, few studies focus on identifying the efficacy of contralateral CLG and NS techniques. CLG directly influences both the articular component of spine and mechanical interface of the nerve root while NS is useful in improving excursion of the nerves. The current study suggest that the two approaches (contralateral CLG and NS) combined with conventional physiotherapy treatment and home exercise programme resulted in an overall improvement in disability and pain scores reported by subjects, with more better outcome for CLG technique in cervical radiculopathy patients. Some shortcomings in the present study have to be taken into account. one of the limitation is small sample size. Outliers had considerable chance of influencing the data analysis and might increases chance of error. Also very wide range of age group is included into study. Different pathology may be involved at different ages which affect pathophysiological process and might affect the result. Future study using larger sample size and more specific age group is recommended. The two experimental techniques are needed to compare with a control group (receiving no physiotherapy treatment) and also without any combination with conventional treatment to provide stronger evidences.

Conclusions

This study compared the effect of contralateral cervical lateral glide and Neural slider techniques in treatment of cervical radiculopathy patients. Both interventions given in conjunction with conventional physiotherapy treatment demonstrated significant improvements in pain and disability as shown on VAS and NDI scores and therefore both techniques are effective over conventional physiotherapy treatment alone. On comparing the two intervention, it is concluded that the Contralateral Cervical Lateral Glide technique is more effective than Neural Slider technique for treatment of patients with cervical radiculopathy.

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