Comparative Study of Contralateral Cervical Lateral Glide and Neural Sliders in Athletes with Cervicobrachial Pain Syndrome

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Abstract: - Cervico-brachial pain syndrome is an upper quarter pain condition in which mechanosensitive neural tissue is considered a primary feature. A randomized clinical trial was conducted to determine the clinical effect of two manual therapy interventions. Thirty subjects were randomly allocated to one of two groups. One manual therapy intervention group consisted of contralateral CLG. The other involved neural mobilization using two ended sliders. The treatment period lasted 4 weeks. In both the groups patients received TENS also. Pain intensity and neck disability was measured by Neck Disability Index, before at 2weeks and at 4 weeks of treatment period. The findings suggest that both manual physiotherapy interventions combined with TENS are effective in improving pain intensity and functional disability levels. A group difference was observed favoring contralateral CLG having a significantly lower score.

Key Words: —*Neural Sliders, Athletes, Cervicobrachial Pain.*

I. INTRODUCTION

Cervicobrachial pain syndrome has been described as an upper quarter pain disorder. Pain and symptoms can be referred to the upper limb from somatic structures or radiate to the upper limb through neuropathic mechanisms. Radiating arm pain is commonly derived from the nerve root or trunk. Terms like cervicobrachial pain, cervical radiculopathy and nerve and arm pain are often used synonymously and interchangeably1.

Radhakrishnan reported annual incidence of 83.2 per 1,00,000 population in Minnesota in 1994[2]. CBPS is common in middle age with increased prevalence in 5th decade of life with male is to female ratio 2:3 [2]. Reoccurrence was found to be in 32% of patients with CBPS over a period of 4.9 years [2, 3].

Several large epidemiological studies of CBPS published from 1976 to 1990 were located[3,4, 5]. The prevalence of CBPS has been estimated at 3.3 cases per 1000 [5] with an average age-adjusted incidence rate of 0.8cases per 1000 persons[3].

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There is general agreement that involvement of the C6 and C7 nerve roots secondary to lesions of the C5-6 and C6-C7 motion segments are most common[6,7]. However, whether the C6 or C7 is the most commonly affected nerve root depends on the case series of patients reported, with most favoring the C7 [8, 9] versus C6[10, 11, 12] level, based on surgical or laboratory study findings. It is unclear whether there is a predominance based on sex. Some reports show that CBPS is predominant in men [13, 3] and other reports have shown predominance in women [5].

CBPS is said to be of non-traumatic origin and occurs spontaneously in the majority of cases[14]. One large epidemiological study reported that a history of physical exertion or trauma occurred in only 14.8% of the 561 patients studied [3]. CBPS is most often attributable to a lesion of the nerve root secondary to cervical disc herniation[15] and spondylosis[12,3]. These space occupying lesions are often classified as "soft" or "hard" discs [9].

A number of less common or unusual causes have been reported in selected cases and include -Metabolic disturbances[16], Surgical complications[17,18], Tumor[19], Sarcoidosis[20], Arteritis[21], Athetoid and dystonic cerebral palsy[22], Decompression sickness[23], Carrying heavy baggage[24], Parachuting[25], Ganglion compression[26], non-Hodgkin's lymphoma[27], Vertebral artery tortuosity and loop formation[28].

Apart from cervical disc herniation and spondylosis as the most common causes of CBPS[3] the bony and ligamentous tissues affected by these conditions are themselves pain generators and are capable of giving rise to the radicular or referred symptoms[29,30].

The cervical spine is comprised of seven vertebrae. The articulations between the occiput and the first cervical vertebra (the atlanto-occipital joint) allows for approximately one-third of flexion and extension and one-half of lateral bending of the neck. The articulation between the first and second cervical vertebrae (the atlantoaxial joint) allows for fifty percent of rotational range of motion. The articulations between the second and seventh cervical vertebrae allow for approximately two-thirds of flexion and extension, fifty percent of rotation, and fifty percent of lateral bending[31]. The most severe injuries and greatest wear and tear occur between C4 and C7. The nerve roots passing through the intervertebral foramina in these areas are C5, C6 and C7. Uncovertebral articulations (also known as joints of Luschka) are present in the C3-7 spinal segments, located on the posterolateral border of the intervertebral disc and in the anteromedial portion of the intervertebral foramen[32]. These articulations are not true synovial joints, but can hypertrophy associated with disc degeneration, and result in narrowing of the intervertebral foramen. This foraminal narrowing is a common cause of CBPS[33].

The patient history alone can diagnose CBPS in over 75% of cases. Upper quarter pain involves pain perceived in the neck, shoulder, arm, upper back and/or upper chest with or without headache pain [34].

Cervicobrachial pain due to nerve root involvement radiate depending on root involved. C5 pain occurs in the shoulder and radiates down the ventral arm to below the elbow. C6 radiculopathy is associated with pain down the superior lateral aspect of the arm into the first two digits. C7 pain radiates down the dorsal aspect of the arm, through the elbow and into the third digit. C8 symptoms move down the inferior medial aspect of the arm into the fourth and fifth digits[35,36].

There are several intervention strategies for managing CBPS 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 CBPS, and the benefit of physical therapy and manual techniques in general for patients with neck pain with or without radicular symptoms. Previous researches has been done on treatment of cervical radicular pain with manipulation & mobilization [38,39,40] ; manual physical therapy, cervical traction & strengthening exercises [33,39,40]; using thoracic spine thrust manipulation, soft tissue mobilization & exercise [40,41]; patient education & correction of forward head posture on nerve root pain. [42,43]. But all these elements of the treatment need further studies to prove more effectiveness.

Clinical Neurodynamics is application of mechanics and physiology of the nervous system as they relate to each other and are integrated with musculoskeletal 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, angulations, and compression. If these dynamic protective mechanisms fail, the nervous system is vulnerable to neural edema, ischemia, fibrosis, and hypoxia, which may cause altered neurodynamics[4o,44, 45,46].

When neural mobilization is used for treatment of adverse neurodynamics, the primary theoretical objective is to attempt to restore 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[47,48,49,50]. 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.[47,48, 50,51]

The mechanical interface should be regarded as the most anatomically adjacent structure to the nervous system that can move independently to the system. For example, A dysfunction in intervertebral foramen may affect the corresponding nerve root leading to pathophysiological changes. Contralateral CLG is used in the patients whose symptoms of cervical origin are unilaterally distributed, either cranially, in the neck, scapula or arm. Contralateral CLG is effective in treating cases of CBPS.[49,51,53]

TENS is the application of electrical stimulation to the skin via surface electrodes to stimulate nerve fibers primarily for pain

relief. It is non-invasive, and effective modality to reduce pain in cervicogenic conditions.[54,5]

II. NEED FOR STUDY

The primary need of this study was to identify whether contralateral CLG and NS techniques are effective in reducing pain and disability of patients with CBPS, and, to compare their effects.

2.1 Aim:

To compare the effect of Contralateral Cervical Lateral Glide technique and Neural Slider technique in athletes with cervicobrachial pain.

2.2 Objectives of the Study:

- To study effect of cervical lateral glide in reducing pain and disability in athletes with CBPS.
- To study effect of neural mobilization in reducing pain and disability in athletes with CBPS.

To compare the difference between the effects of cervical lateral glide and neural mobilization in reducing Null hypothesis

There is no significant difference between the effects of contralateral cervical lateral glide treatment and neural mobilization treatment in management of athletes with cervicobrachial pain syndrome.

2.3 Alternate hypothesis:

There is significant difference between the effects of contralateral cervical lateral glide treatment and neural mobilization treatment in management of athletes with cervicobrachial pain syndrome pain and disability in athletes with CBPS.

III. METHODOLOGY

3.1 Inclusion criteria:

- Patient with neck pain radiating into upper extremity with clinical history and physical signs indicating CBPS[35].
- Patients between age group of 30 -50 yr experiencing cevicobrachial pain >2 weeks.
- Both genders included.
- Patient who gave informed consent & were able to attend clinic for treatment & assessment.
- Patient with unilateral UE symptom.
- Patient with cervical instability, cord compression, acute nerve root irritation.
- Patient with evidence of CNS involvement, vertebro-basilar syndrome, Dizziness, Circulatory disturbance in UE.
- Patient with bilateral UE symptoms.
- Traumatic injuries to upper limb and cervical spine, Patient undergone cervical surgeries.
- Known history of high-level spinal cord injury, malignancy & Central pain syndrome (e.g., Fibromyalgia)

Materials required: – Couch, napkin and TENS machine.

3.2 Exclusion criteria:

Fig.1. Treatment couch and napkin

Fig.2. TENS machine

3.3 Procedure:

All subjects were first assessed for diagnosis of CBPS 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, no pillows used. Therapist in stride stsnding facing cephalad, 1 hand stabilizes shoulder (do not depress) and other hand holds wrist with a pistol grasp, elbow at 90º. Perform Glenohumeral joint abduction (90-110º) and external rotation (up to 90°), forearm supination, wrist and finger extension than elbow extension and contralateral cervical flexion. In structural differentiation for proximal differentiation wrist is released and for distal differentiation patient is asked to bring neck to mid line[63].

Following assessment patient were randomly assigned to one of 2 intervention groups by lottery method to receive either cervical lateral glide with conventional PT (Group A) or neural slider with conventional PT (Group B), each consists of 15 patients.

Randomization was done by simple random sampling.

Informed consent has been taken from subjects willing to take part in study.

For measuring outcomes neck disability index was taken by the therapist before any treatment according to subject's response to questions.
Treatment was provided over 4 weeks: 3 sessions per week for 2 weeks and 2 sessions per week for 2 weeks.[51]

Subjects in both groups first received conventional physiotherapy management TENS before the experimental intervention. 10 Hz, 250 ns frequency for 20 min54,55.

Fig.3. Showing starting position of ULTT1

Fig.4. Showing final position of ULTT1

3.4 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. The therapist stood at the end of couch and cradle the head with one hand so that the forearm lies almost under occiput, while other hand performed translatory movement away from the symptomatic side while minimizing gross cervical flexion or rotation[64] .

Movement localized on particular segment by pressure of the palmer surface of index finger just distal to MCP joint. As improvement in condition was demonstrated shoulder was positioned in greater degrees of abduction and elbow in greater ranges of extension.

Dosage - 3 sets of glides for one minute with relevant pause in between.
Maitland's mobilization criteria were followed for grades and progression.

3.5 Description of the treatment characteristics:

Amplitude
Grade 1 Small-amplitude movement at the beginning of the range
Grade 2 Large-amplitude movement without moving into resistance
Grade 3 Large-amplitude movement up to the limit of the range
Grade 4 Small-amplitude movement at the limit of the range.

Frequency
High .2 repetitions/sec
Low 2-3 sec/repetition
Sustained .5 sec/repetition.

3.6 Group B

Subjects in this group received neural slider technique performed as: - Subject in supine lying with neck in neutral position and no pillow was used. Therapist stood by the side of couch facing cephalad. Symptomatic upper extremity is placed in median neurodynamic test 1 position (Elvey) with glenohumeral joint in abduction (90-110 degree) and external rotation, wrist and fingers in extension, forearm in supination. Two ended sliders were given using neck and elbow such as tension applied at one end and letting it go on another end[63].

Dosage- Duration of oscillation was 60 seconds, which was divided in to three, equal burst, 20 seconds oscillations of three sets during each session of the treatment[65].

Fig.5. Showing neural slider using elbow flexion and contalateral neck flexion.

Fig.6. Showing neural slider using elbow extension and ipsilateral neck flexion.

Outcome measures: - Neck disability index**.**

Variables: -

- *Independent variables:* - Neural slider and Cervical lateral glide.
- *Dependent variables:* - Neck Data Analysis Presentation and Interpretation

Table.1. Tabular distribution of age of group A & Group B

GROUPS	MEAN	SD	SIGNIFICANCE
GROUP A	41.73	4.72	P= 0.79
GROUP B	41.26	4.98	t=0.26

The mean and standard deviation of age of group A is 41.73±4.72 and group B is 41.26±4.98, using unpaired t test the t value is 0.26 and p value is 0.79, considered not significant.

GRAPH.1. Graphical presentation of age of group A & Group B.

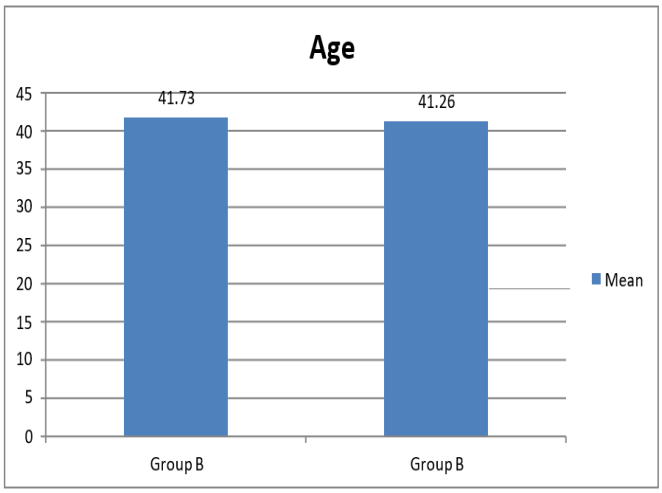


Table.2. Tabular Distribution of Pre-NDI Scores of Group A And Group B.

GROUPS	MEAN	SD	SIGNIFICANCE
GROUP A	48.4	11.3	P= 0.69
GROUP B	49.3	9.7	t=0.39

The mean and standard deviation of Pre NDI scores of group A is 48.4±11.3 and group B is 49.3±9.7, using unpaired t test the t value is 0.69 and p value is 0.39, considered not significant.

GRAPH.2. Graphical presentation pre-NDI scores of group A and group B.

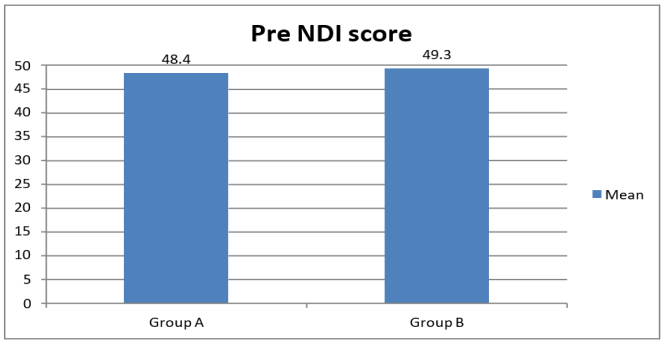


Table.3. Tabular distribution of NDI scores after 2 weeks of group A and group B.

GROUPS	MEAN	SD	SIGNIFICANCE
GROUP A	24.4	7.0	P= 0.015
GROUP B	30.5	5.9	t=2.569

The mean and standard deviation of NDI scores after 2 weeks of group A is 24.4±7.0 and group B is 30.5±5-9, using unpaired t test the t value is 0.015 and p value is 2.569, considered significant.

GRAPH.3. Graphical presentation of NDI scores after 2 weeks of group A and group B.

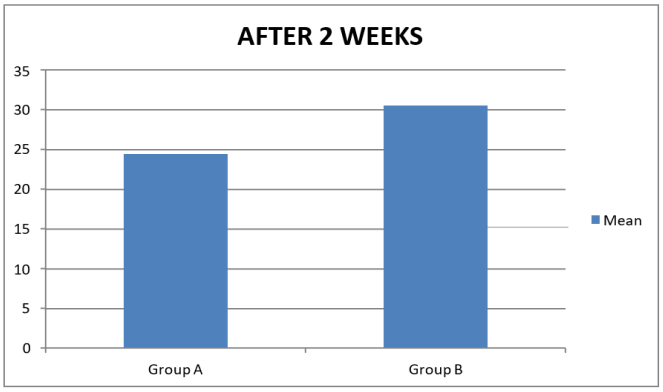


Table.4. Tabular distribution of NDI scores after 4 weeks of group A and group B.

GROUPS	MEAN	SD	SIGNIFICANCE
GROUP A	14.26	4.3	P= 0.0011
GROUP B	22.4	7.4	t=3.65

The mean and standard deviation of NDI scores after 4 weeks of group A is 14.26±4.3 and group B is 22.4±7.4, using unpaired t test the t value is 0.0011 and p value is 3.65, considered extremely significant.

GRAPH.4. Graphical presentation of NDI scores after 4 weeks of group A and group B.

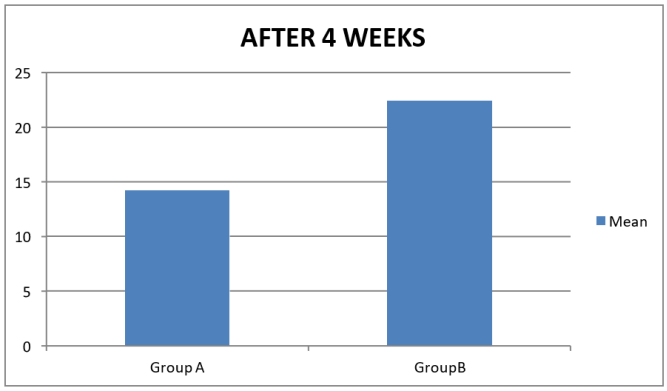


Table.5. Tabular distribution of NDI scores before, after 2 weeks and after 4 weeks of group A

GROUPS	MEAN	SD	SIGNIFICANCE
PRE	48.4	11.3	P= <0.0001
2 WEEKS	24.4	7.09	
4 WEEKS	14.26	4.3	

The mean and standard deviation of NDI scores prior to intervention, after 2 weeks and after 4 weeks of group A is 48.4±11.3,24.4±7.09 and 14.26±4.3 respectively, using repeated measure anova p value is <0.0001, considered extremely significant.

GRAPH.5. Graphical presentation of NDI scores before, after 2 weeks and after 4 weeks of group A.

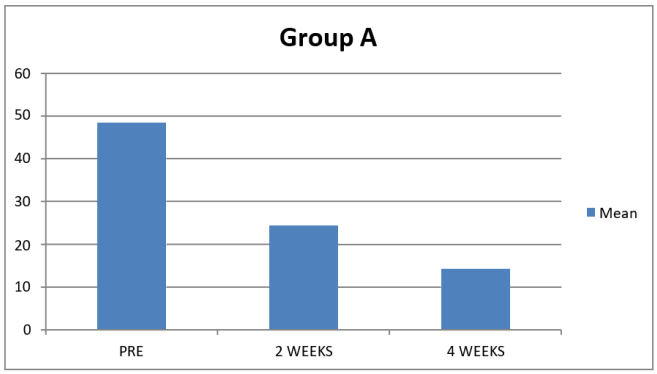
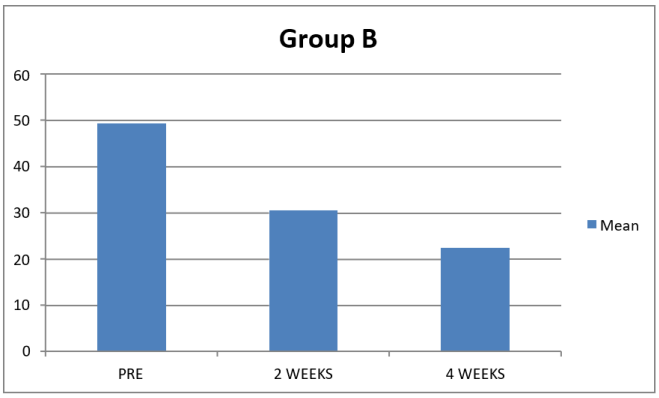


Table.6. Tabular distribution of NDI scores before, after 2 weeks and after 4 weeks of group B

GROUPS	MEAN	SD	SIGNIFICANCE
PRE	49.3	9.7	P= <0.0001
2 WEEKS	30.5	5.9	
4 WEEKS	22.4	7.4	

The mean and standard deviation of NDI scores prior to intervention, after 2 weeks and after 4 weeks of group B is 49.3±9.7, 30.5±5.9 and 22.4±7.4 respectively, using repeated measure anova p value is <0.0001, considered extremely significant.

GRAPH.6. Graphical presentation of NDI scores before, after 2 weeks and after 4 weeks of group B.



musculoskeletal pathomechanics like 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 reduces axonal transport and increase mechanosensitivity[48,50].

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) [61], placebos (manual contact intervention) [60] and control (no intervention) [50] on at least one pain outcome measure.

A study conducted by coppieters et al[48] 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≤0.0003). In this study GROUP A received contra lateral CLG treatment, the NDI scores after 4 weeks shows (p<0.0001) significant improvement over the pre scores.

In present study GROUP B received Neural slider which is also found to be an effective treatment approach for CBPS patients. Though CLG treatment shown greater improvement in reducing pain perception but the radiating pain (i.e. area of pain radiation) was found to be relieved better and earlier with NS technique, but neck pain persist for longer duration. Pain intensity and disability decreased after 4 weeks reduced to a significant level (p< 0.0001).

As highlighted by Sanjiv Kumar [65] in his study analyzing the effects of Mackenzie manipulation, neural mobilization and conventional treatment, concluded that both neural mobilization and Mackenzie manipulation of cervical spine benefited the patients with cervical rediculopathy, improvement in cervical range of motion and VAS scores were more in Manipulation group, while the in neural mobilization group, patients continued with some residual pain on 10th day.

In this study, to understand the efficacy of treatment methods, NDI was done prior, after 2 weeks and after 4 weeks of treatment. The NDI has a fair to moderate test-retest reliability in patients with mechanical neck pain but also for patients with cervical radiculopathy. Validity is tested in different trails by comparing NDI with different instruments-PET, Visual Analogue scale, Northwick Park Neck Pain Questionnaire (NPNQ), Patient-specific Functional Scale (PSFS), Disability Rating Index (DRI). They all had strong correlation coefficients suggesting their content is highly comparable. The NDI has good construct validity. [66,67,68].

Few literatures comparing the cervical mobilization with neural mobilization have been found. Marks M. et al [40] conducted a study to check effectiveness of cervical spine mobilization versus peripheral nerve slider techniques in cervico brachial pain syndrome. 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. Change in elbow range was greater for Group C at follow up. They conclude that initial treatment of mechanical interface is more useful than initial neurodynamic treatment. This study supports finding of present study but as CLG is not

used in cervical mobilization treatment, cannot be related directly.

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 contalateral CLG and NS techniques.

The current study, after analyzing the mean and standard deviation of NDI scores of GROUP A it was found that, mean score of 48.4 ± 11.3 reduced to 24.4 ± 7.09 after 2 weeks that further reduced to 14.26 ± 4.3 after 4 weeks. In GROUP B mean score of 49.3 ± 9.7 prior to treatment reduced to 30.5 ± 5.9 and 22.4 ± 7.4 after 2 weeks and 4 weeks respectively, suggest that the two approaches (contalateral CLG and NS) combined with TENS resulted in an overall reduction in disability reported by subjects. Thus, the Alternate hypothesis is approved.

Comparing mean of NDI scores after 2 weeks of GROUP A i.e., 24.4 ± 7.09 and GROUP B i.e., 30.5 ± 5.9 with p value 0.015 and t= 2.569 gives significant improvement. After 4 weeks scores of GROUP A 14.26 ± 4.3 and that of GROUP B 22.4 ± 7.4, with p value 0.0011 and t = 3.65 suggests better outcome for CLG technique in CBPS patients.

Limitations of this study are duration of patient's symptoms which vary from few weeks to years, which limits the generalization of results.

IV. Conclusion

Both interventions given in conjunction with TENS demonstrated significant improvements in pain and disability as shown on NDI scores and therefore both techniques are effective. On comparing the two interventions, it is concluded that the Contralateral Cervical Lateral Glide technique is more effective than Neural Slider technique for treatment of patients with CBPS. Hence ALTERNATE HYPOTHESIS was accepted.

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