Compare the effectiveness of McKenzie Techniques and Isometric Strengthening Exercise in Patients with Cervical Radiculopathy

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Abstract

The current study was focused on to Compare the effectiveness of McKenzie Techniques and Isometric Strengthening Exercise in Patients with Cervical Radiculopathy. It was an experimental study design. A convenience sample of 30 subject with cervical radiculopathy randomly assigned into two groups like group A and B. The Group A subject received McKenzie Technique (MT), Hot Pack and Postural Correction. The Group B subject received Isometric Strengthening Exercise (ISE), Hot Pack and Postural Correction. Both the groups were treated for four week.

Instrumentation For Data Collection: Instrumentation for Data Collection is Visual Analogue Scale(VAS) – for Pain and Functional rating index (FRI) – For functional limitation/disabilities

Results: Comparison of VAS &FRI between groups was done by using ANOVA. No significant difference was found from 0 to 1 week ($P>0.05$). But significant difference found at 2 to 4 weeks in all 2 groups. ($P<0.05$)

Keyword: McKenzie treatment, Isometric strengthening exercise, Hot Pack, Visual analogue Scale (VAS) and Functional Rating index (FRI)

Introduction

Neck pain is one of the most common persisting symptoms in the general population with an estimate lifetime prevalence of 67% among adults of age group 20 to 69 years. Limited range of motion and a subjective felling of stiffness may accompany neck pain, which is often precipitated or aggravated by neck movements or sustained neck postures. Headache, brachialgia, dizziness and other signs and symptoms may also be present in combination of neck pain. [1]

Cervical radicular syndrome is a general term describing a set of symptoms. This symptom complex may arise from several causes, including nerve root irritation, myofascial pain syndromes, and soft tissue injuries. This review will concentrate on cervical syndromes that are caused by radiculopathy.

Cervical radiculopathy or "radiculitis" particularly associated with intervertebral disc rupture as a cause of "brachial pain" was not distinguished from other causes of upper extremity pain attributed to "neuritis," "fibrositis," and "myalgia" in the early 20th century.' As early as 1936, however, there were descriptions of shoulder girdle, arm, and precordial pain attributed to "cervical arthritis" resulting in "irritation or inflammation of the cervical spinal roots."' Cervical disc herniation resulting in cord compression and myelopathy was recognized as a syndrome in the early 20th century, but was initially attributed to spinal cord tumors termed ' 'chondromas. ' '3s4 This syndrome of cord compression was defined as a ruptured disc by Mixter and Aye? in 1935, shortly after the report by Mixter and Barr in 1934'j of disc herniation as the etiology of "sciatica" in the lumbar region. [2]

The McKenzie method was introduced in Sweden in 1985 and came to be frequently used in the 1990. as a treatment modality for patients with mechanical problems of the spine. Today, physiotherapists in primary care often employ this procedure as both a diagnostic tool and a treatment model. A randomized clinical trial involving patient with neck pain and comparing treatment effect of the McKenzie method, General exercise and Ultra sound. Study found that McKenzie treatment is favorable than other. [3]

The McKenzie protocol has been commonly used in low back conditions may be employed in the treatment of mechanical neck pain in three syndromes as postural, Dysfunction and Derangement. Postural Syndrome is caused by mechanical deformation of soft tissue, as a results of certain postural stresses. The treatment is correction of postural. The dysfunction syndrome is caused by adaptive shortening of certain

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structure due to poor postural habits. The treatment is stretching of shortened structures and postural correction. The derangement syndrome defined as change in the position of intervertebral discs and alters the position of two adjacent vertebrae. It is treated by neck retraction exercise. [4]

Aims and Objectives

To compare the effectiveness of McKenzie techniques and Isometric Strengthening Exercise in patients with cervical radiculopathy.

Statement of Question

Is McKenzie techniques more effective than Isometric Strengthening Exercise?

Hypothesis

Experimental Hypothesis

The McKenzie techniques on cervical radiculopathy will be very effective than strengthening exercise.

Null Hypothesis

The McKenzie techniques on cervical radiculopathy will not be very effective than strengthening exercise.

Review of Literature

Anatomy of Neck

There are total seven cervical vertebrae in which first, second and seven is called atypical and third to sixth are typical. The atlas is first cervical vertebrae supports the head. The axis is second cervical vertebrae is an axle for rotation of the atlas and head around the strong dens. The seventh cervical vertebrae has a long spinous process than other cervical vertebrae.

The atlanto axial joint is formed by the articulation of atlas and axia has three synovial joints, a pair between laterl mass and a median comlex between the dese of axis and anterior arch and transverse ligament of the atlas. The atlanto occipital joints are formend by the superior aspect of each concave facet of lateral mass of atlas articulates with occipital condyle. The bone are connected by anterior capsule and posterior atlanto occipital membranes. The movements of these joints are flexion with a little lateral flexion and rotation. [5]

The movement of the cervical spine is produced by following muscle as-

- ➢ Flexion-Sternocleiidomastoid, Scalenus anterior, Para vertebral muscle.
- ➢ Extension- Splenius, Semispinalis, Rectus Capitis posterior, Upper Trapezius, Intrinsic, Erector spinae.
- ➢ Rotation- Sternocledomastoid, Small Intrinsic
- ➢ Lateral flexion- Scalenus anticus, Scalenus medius, Scalenus posterior, Small Intrinsic, Sternocledomastoid. [6]

(Fig. 2.1)

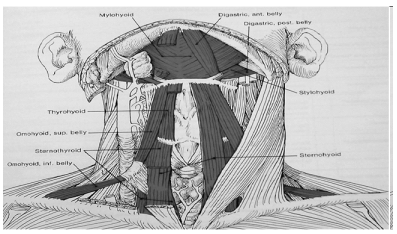


Fig. 2.1 Anterior view of cervical muscle

biomechanics of Cervical Spine

The cervical spine is a miracle in design and structure as if moves in various planes. It supports the head and provides musculoskeletal stability. The line of gravity fall anterior to these articulations, a force must be the posterior neck Muscles to hold the head erect .[7]

The cervical spine is best considered in three sections: upper cervical spine (Occiput-C3), mid cervical spine (C3-C5) and lower cervical spine (C5-C7).Disorder of the upper cervical spine frequently results in headache. Disorders of the midd- cervical spine are most commonly synovial type disorders and pain from

these level may be referred upward or downward. The lower cervical spine involves synovial joint structures and inter-vertebral disc. Cervical discogenic disorders occur most frequently in the lower cervical spine.[8]

All movements in cervical spine are relatively free because of the saddle like joint. The motion of flexion and extension, lateral flexion and rotation are permitted in the cervical region. The cervical spine is most freely in the upper cervical area and is progressively restricted downward. [9]

Punjabies quantitively determined three dimensional movements of the cervical spine. Bhalla & Simmons in their study of vertebral movement C2 through T1 found that the greatest range of movement occurred at C4-C5. Likewise found greater ROM at mid cervical than at than seventh cervical spine. Lind et al showed largest intersegmental range of flexion and extension motion occurs between C4 to C5 and C5 to C6. [10]

Pathomechsnics of Neck Pain

The cervical structure can be affected by specific causes such degenerative disease, trauma and /or inflammatory disorders and that neck pain can result. The neck pain also causes due to mechanical disorders including those arises from habitual postures and degenerative involvement, have been referred as nonspecific neck pain. These non-specific neck pain problem result from poor posture in termed of sustained, long term abnormal physiological loads on neck. Both Haughie & Mckenzie have suggested that these load compromise pain-sensitive and imbalance in the upper quarter of the body.[11]

Authors Statements

Nwuga and Nwuga et al compared the MacKenzie approach to the Williams approach to determine which was effective in decreasing pain and restoring spinal range of motion in patient with low back pain. They concluded that the MacKenzie approach was more effective in decreasing the patient's level of pain and in restoring range of motion. [12]

Stankovic and Johnell et al Compared the effect of the MaKenzie method of treatment with patient education in mini back school in patient with low back pain. They concluded that treatment according to MacKenzie principal was superior to mini back school.[13]

Gorel.Kjellman et al they had done a study on neck pain by giving treatment with McKenzie exercise, General exercise and by Ultrasound and they found that the McKenzie treatment was more favorable than general exercise and control group. With a more rapid improvement in pain intensity during the first three weeks.[14]

Sundeep Rathore et al in his study on the patients with neck and ridiculer pain found that repeated neck retraction was shown to result in a significant decrease in peripheral pain and decreased nerve root compression. McKenzie method was successful in the treatment of neck pain due to postural syndrome, dysfunctional syndrome and derangement syndrome. Neck retraction on cervical spine advocated by McKenzie in treatment of derangement syndrome, causes extension of lower cervical segments and alleviates stress on posterior annulus and thereby relieves pain.[4]

Peason and Walmsley et at they carried out a trial to find the effectiveness of neck retraction exercise. Neck retraction are one of the numerous techniques used by Physical therapist to assess and treat patients with neck pain. This maneuver is advocated by McKenzie as an assessment and patient self-treatment technique. They concluded that there was no improvement in the range of retraction but statistically significant change in resting neck posture was found.[15]

Mark & Dennis et al support McKenzie original definition of centralization as a clinical phenomenon occurring in patients with acute spinal syndromes. The centralization pain pattern commonly was observed for patient with neck pain with and without referred symptoms.

Centralization is a clinical phenomenon observed during mechanical assessment of patients with pain in the neck or back. The centralization phenomenon (CP) as normally described by McKenzie was defined as a rapid change in the location of pain from a distal or peripheral location to a more proximal or central position. They concluded that centralization is a clinically induced phenomenon on several during McKenzie, mechanical assessment and treatment. Centralization results in rapid and proximal change in pain location throughout treatment. [16]

Thomas R.Highland and Dreisinger et al they have done study on changes in isometric strength and range of motion of the motion of the isolated cervical spine after eight weeks of clinical rehabilitation. They found that all groups showed significant gain in average strength, range of motion and decreased pain. The test and training of the isolated cervical spine muscles is a safe and viable method of clinical assessment and treatment of a variety of cervical spine disorder.[17]

Chukuka S.Enwemeka et al6 they have observed that patient with neck pain and spasm of the upper fibers of the trapeziue muscle often assume a forward head position. Neck pain is often accompanied by protective muscle spasms, which develop pressure within the homonymous muscle, thus producing ischemia, more pain and abnormal neck posture. He concluded that posture correction is most effective in reducing pain and muscle spasm.[18]

SimoTaimela at el they compare the effective of a multimodal treatment emphasizing Proprioception treating (active) with activated home exercise and recommendation of exercise in patient with nonspecific chronic neck pain. He concluded that the application of active treatment (active & home) was related to reducing of pain.[19]

Alan Jordan et al done treatment including a combination of active and passive elements. The passive elements were Hot Pack for a duration of 20 minutes, continuous US (3w/cm2 for 5 minutes) and manual traction. The active element included instruction of the home exercise program. The treatment protocol was given for six weeks. They found that self- reported improvements for pain and disability show approximately 50% reduction.[20]

Draper and Harries et al a couple of studies have shown that a 15 minutes hot pack application prior to ultrasound had an additive heating effect. It was suggested that the ultrasound treatment duration can be decreased 30 to 5 minutes when tissues are preheated with hot pack.[21]

Methodology

Study Design

It is an experimental study design. A convenience sample of 30 subjects with cervical radiculopathy was solicited from the physiotherapy department of DIBNS. The total subject divided into two groups A and B in which each groups have 15 subjects. The Group A subjects were received McKenzie treatment, Hot Pack and Posture Correction. The Group B subjects were received Strengthening exercise, Hot Pack and Postural Correction. All two groups were treated for four weeks. In group A subjects with mean and standard deviation of age, height and weight were 30.7). The patients were selected according to inclusion and exclusion criteria. Inclusion Criteria:- Patient with cervical radiculopathy (duration two month or more) with or without radiation., Age Group - 25-50 years, Weight -50to 80 kg., Atraumatic origin, VAS : 4-7, FRI : 40-70% and Exclusion Criteria- Subjects with a history of severe trauma such as fracture, Congenital disorder of cervical spine, Patient with neurological deficit, Spondylolisthesis, Tumour, Spinal surgery, Pott's spine, Rheumatoid Arthritis Disorder, Ankylosing Spondylosis, Vertebro- Basilar Insufficiency and Cardiac Problem. Instrumentation for Data Collection- VAS and Functional Rating index (FRI)

Protocol

The study made of 45 subjects who were randomly divided into three groups A and B. prior to participation all subjects were informed about the study and an informed consent was taken.VAS and FRI were taken for all the subjects before starting the study. The Group A subjects were received McKenzie treatment, Hot Pack and Postural Correction. The Group B subjects were received Strengthening exercise, Hot Pack and Postural Correction. All two groups were treated for four weeks.

Procedure

McKenzie Exercise

McKenzie exercise is one of the numerous techniques used by physical therapists to assess and treat patients. McKenzie exercise used in the form of neck retraction exercise. The patient is instructed to move the head backwards as far as possible but at the same time maintain forward facing position. It is important that the movement is made to the maximum. On completion the patient returns to the neutral rest position. The movement is done for four sets of 10-15 repetitions with 1-2 minutes rest between each set.

First Week

The patient was lying in supine position, chin was trucked in or head was retracted. A small pillow was used under the occiput to maintain slight flexion. The patient was asked to pull his head and neck posterior into a position in which head was directly over the shoulder girdle. The end position was maintained for one second and then allowed to relax into a resting posture. This procedure was done for 4 sets of 10 to15 repetitions and 1 to 3 minutes rest between each set.

Second Week

In sitting position, progression was given by the addition of neck extension with chin trucked overpressure in the end of motion by the therapist. This procedure was done for four sets of 1 to 2 minutes rest was given in between each set. [Fig: 3.1]

Third Week

In supine lying, head was kept out of the couch. The retraction and extension exercise with traction was performed by the therapist. The traction and extension was maintained throughout the range of motion. [Fig: 3.2]

Fourth Week

The patient was asked to come in sitting, progression was done by addition of first retraction with lateral flexion, then neck rotation, and finally combined retraction and neck flexion with overpressure performed by the therapist. This procedure was done for four sets of 10 to 15 repetitions and 1 to 2 minutes rest was given in between each set.[22]

Fig: 3.1: Neck Extension Exercise with chin tucked in Sitting Position

Fig: 3.2: Neck Extension and Retraction Exercise with Traction of Neck in Supine Position

Isometric Strengthening Exercise

The patient was in sitting position. These were initially done with the neck in neutral postures and with a therapist resisting flexion, extension, lateral flexion and rotation by the therapist. Contraction were held for 5 seconds/repetitions and repeated 10 times, with 3 seconds rest in between them. These exercises were done for 2 sets with 1 to 2 minutes rest in between each set. Placement of therapist hand for each movement is as follows:-

1. Flexion: - The therapist placed his hand on the forehead of patient and the patient was asked to press

the forehead in to the palms of the therapist in a nodding fashion. [Fig. 3.4]

2. Side Flexion: - The therapist placed his one hand on the side of the patient's head and the patient was asked to press the therapist hand in a side flexion fashion.
3. Extension: - The therapist placed his one hand on the back of the patient's head, near the top of the head. The patient was asked to press the head on the therapist hand. [Fig. 3.4]
4. Rotation:- The therapist placed one hand against the region just superior and lateral to the eye. The patient was asked to turn the head to look one's own shoulder.[Fig. 3.3]

Fig. 3.3: Isometric Exercise For Rotation In Sitting Position

Fig. 3.4: Isometric Exercise For Extension In Sitting Position

Fig. 3.5: Isometric Exercise for Flexion In Sitting Position

Fig. 3.5: Application of Hot pack in neck region

Hot Pack

The position of the patient was supine lying the hot pack was wrapped in towel with thickness of about 6-8 layers before being applied it the neck area. The hot packs were stored in hot water kept at about 72-750 C (1580-1670 F) inside a thermostatically controlled hot pack containers. The hot pack was initially hearted for two hours and 30 minutes reheated between each use. Lahmann et al (1996) state that after 8 minutes application of hot pack the skin temperature was reached its maximum. The pack was left in place for 20 minutes. [23 & 24]

Postural Correction

The patients in all groups were given postural correction and postural awareness as home program. The postural correction was recommended as axial extension or neutral neck position. These were done to correct neck position for patient with neck pain and spasm of upper trapizius. The postural awareness program consists of the following points

Reading Posture

1. Neck should not be kept in one position for prolong time.
2. Adjust the height of reading table such that the books are at the level of eyes and arms are comfortably place. Avoid slouching lower back and shoulders. Sit tall with whole back against chair back and head erect.
3. Computer and TV screen should be at proper height and distance.
   Position & height of monitor should be within 200.

Sleeping Posture

1. Avoid big pillows: they make neck rest higher than body causes it to bend forward.
2. Use pillows of adequate height that aligns the head and neck at the same level of body. The pillows should support the head and neck fully and should extend up to shoulders.

Data Analysis

Data was analyzed using SPSS software 12.0 version. Variable i.e. age weight and height of group A and B were analyzed by using one way ANOVA. One way ANOVA was used to analyze the variable i.e VAS and FRI at 0,1,2,3 and 4 week between the 2 groups. Post hoc analysis using Tukey HSD was used for pair wise compression of VAS and FRI at 0,1,2,3 and 4 weeks between the 2 groups. The significant level of this study was 0.05.

Results

The age, weight and height of subjects in groups A and B were compared by using analysis of variance. There was no significant difference found in age, weight and height between the 2 groups ($P>0.05$) (Table 5.1)

Comparison of VAS between groups was done by using ANOVA. No significant difference was found

from 0 to 1 week (P>0.05). But significant difference found at 2 to 4 weeks in all 2 groups. (P<0.05) (Table 5.2)

Comparison of FRI between groups was done by using ANOVA. There was no significant difference found at 0 and 1 weeks (P<0.05). But significant difference was found at 2 to 4 weeks in all 2 groups. (P<0.05) (Table 5.2)

Comparison of VAS between the 2 groups i. e. groups A and B was done by Post Hoc test using Tukey HSD at 0 to 1st week . There was insignificant difference between the groups. Also there was no significant difference was found at 2 and 4 weeks between A & B (P>0.05) (Table 5.3)

Comparison of FRI between the 2 groups i.e groups A and B was done by using Post Hoc test (Tukey HSD) at 0 to 1 week. No significant difference was found between the groups (P>0.05). Also no significant difference was found at 2 to 4 week between A & B. (P>0.05) (Table 5.4).

Table 5.1 Demographic data

Variable	f- value	p-value
Age	1.776	0.491
Weight	1.165	0.322
Height	2.687	0.080

Source: Data Collected by Researcher

Table 5.2 Comparison of VAS and FRI between groups 0 to 4 weeks

Variable	Week	f- value	p-value
VAS	0	0.024	0.976
	1	0.160	0.853
	2	5.615	0.007
	3	10.635	0.000
	4	12.860	0.000
FRI	0	0.209	0.812
	1	0.929	0.403
	2	9.086	0.001
	3	13.899	0.000
	4	12.293	0.000

Source: ibid

Table-5.3 post Hoc Tests for VAS between groups A and B from 0 to 4 weeks.

Variable	Group (i)	Group (j)	Mean Difference (i-j)	Std. Error	Signification (p-value)
VAS 0 week	1	2	0.06667	0.34975	0.980
	1	3	0.06667	0.34975	0.980
VAS 1 week	1	2	0.06667	0.36048	0.981
	1	3	-0.13333	0.36048	0.927
VAS 2 week	1	2	-0.73333	0.34303	0.094
	1	3	-01.13333	0.34303	0.005
VAS 3 week	1	2	-0.73333	0.34733	0.100
	1	3	-1.60000	0.34733	0.000
VAS 4 week	1	2	-0.73333	0.38490	0.150
	1	3	-1.93333	0.38490	0.000

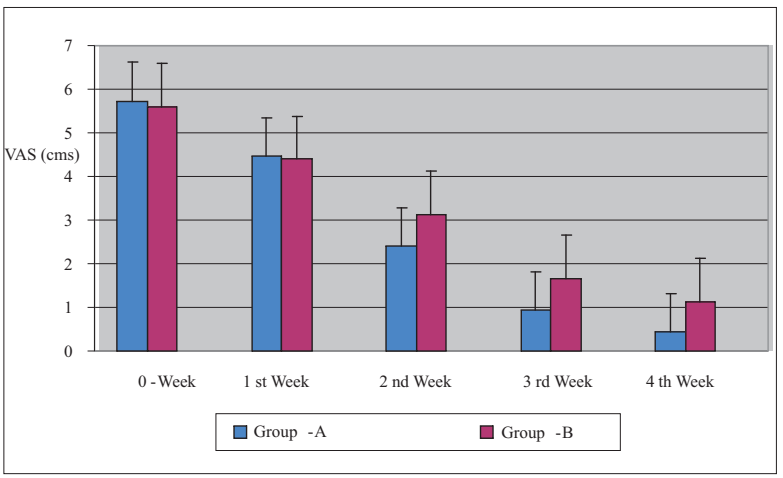
Source: ibid

Table-5.4 Post Hoc Tests for FRI between groups A and B from 0 to 4 weeks.

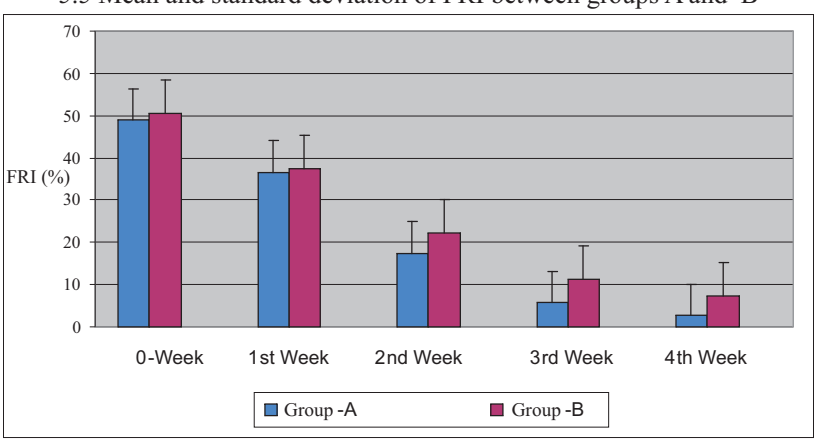
Variable	Group (i)	Group (j)	Mean Difference (i-j)	Std. Error	Signification (p-value)
FRI 0 week	1	2	-1.73333	2.80461	0.811
	1	3	-1.33333	2.80461	0.883
FRI 1 week	1	2	-0.86667	2.59197	0.940
	1	3	-3.40000	2.59197	0.379
FRI 2 week	1	2	-4.66667	3.14052	0.308
	1	3	-13.20000	3.14052	0.000
FRI 3 week	1	2	-5.66667	2.94104	0.144
	1	3	-15.33333	2.94104	0.000
FRI 4 week	1	2	-4.73333	3.12254	0.294
	1	3	-15.13333	3.12254	0.000

Source: ibid

5.4 Mean and standard deviation of VAS between groups A and B



5.5 Mean and standard deviation of FRI between groups A and B



Discussion

The McKenzie method of treatment was more effective or successful than isometric strengthening exercise with a more rapid improvement in pain intensity during third and fourth week. The purpose of this study was to find-out whether any clinically observable improvement in neck pain, occurs after performance of McKenzie exercise in comparison to other isometric strengthening exercise.

The present study showed that the McKenzie treatment is effective in improvement of neck pain after a rehabilitation protocol of four sets 10-15 repetitions per day four weeks in comparison to other groups, which had followed the other protocol.

Clinically, McKenzie method of treatment i.e. neck retraction exercise were used to decrease or centralize a patient's pain and to help the improvement of individual neck posture. According to McKenzie, patient in whom pain decrease and pain centralizers as a result of performing neck retraction are classified as having posterior or poster lateral disc derangement.

Sundeep Rathore et al McKenzie postulated that neck flexion would cause a movement of the nucleus pulpose to a more posterior position due to increase mechanical compression on the anterior surface of the intervertebral disc that increase peripheral pain and nerve root compression. But McKenzie has advovated neck retraction, causes extension of the lower cervical segment and may alleviate stress on the posterior annulus and thereby relive pain. If patient with neck pain and nerve root compression. The McKenzie method of treatment has been successful in the treatment of cervical radiculopathy in short term.[4]

Sufka et el analyzed a small cohort of patients, reported a complete centralization occurrence rate of 83% in patients with neck pain. But there were symptomatic reduction in radicular pain reporting a centralization occurrence rate of 85% in patients with acute pain.[6]

G.Kjellaman and B.Oberg et al McKenzie treatment was more favorable than general exercise and the ultrasound in control group, with a more rapid improvement in neck pain intensity during the first 3 week.[3]

Chukuka S. Enweneka et al neck pain is often accompanied by protective muscle spasm which developed pressure within the homonymous muscle, thus producing ischemia, more pain and abnormal neck posture. They showed that postural correction was effective in reducing neck pain and muscle spasm other studies have showed that spasm of the sternocliedomastoid and perhaps temporomandibular pain may be reduced by postural correction.[18]

Thomas R, Highland and Dreisinger et al studied the changes in isometric strength and range of motion of the isolated cervical spine after 8 weeks of clinical rehabilitation. They found that all group showed significant gain in average strength, range of motion and decreased pain.[17]

In my study there was significant reduction of radicular neck pain through McKenzie treatment within the groups. The group A showed more improvement that other group B.

Future Research

1. Future research can be carried out with increased number of patients to analyze the effectiveness of McKenzie protocol.
2. The future research can also be carried out with increased duration of treatment protocol and increased VAS (Visual Analogous Scale) and FRI (Functional Rating Index)

Relevance to Clinical Practice

The present study proved that the McKenzie protocol is more successful than isometric exercise. So we can apply the McKenzie protocol to the patient having radicular pain in clinical practice. McKenzie protocol (neck retraction) that causes extension of the lower cervical segments and may allevate stress on the posterior annulus and thereby relive pain. In patients with radicular pain, repeated neck retraction is shown to result in a significant decrease nerve root compression.

Limitations

If the number of subjects had been more, results would have been better enhanced.

Conclusion

In the present study, there was significant difference between the McKenzie treatment, and Isometric

strengthening exercise treatment for cervical radicular pain. The McKenzie protocol has been found to be more beneficial than the Isometric Strengthening Exercise.

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