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"AN EXPERIMENTAL STUDY TO ANALYSE THE EFFECTIVENESS OF THORACIC MANIPULATION IN MANAGEMENT OF MECHANICAL NECK PAIN "

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Mechanical neck pain is defined as generalized neck and /or shoulder pain symptoms provoked by maintained neck postures, neck movement, or joint and / or cervical muscle palpation.[1]

Mechanical neck pain affects 45–54% of the general population at some time during their lives and can result in severe disability. The exact pathology of mechanical neck pain is not clearly understood and has been purported to be related to various anatomical structures including, uncovertebral or intervertebral joints, neural tissues, discs, muscular disorders and ligaments.[2]
Injury and degenerative changes affecting the intervertebral disc may result in excessive translation between two adjacent vertebrae during active cervical motion. More amount of translation can cause considerable strain on the annulus fibrosis, increase load on the cervical facet joints which results in pain during active cervical motion.[3]
Symptoms in mechanical neck pain is not completely understood, but it is related to various anatomical structures, particularly zygapophyseal or uncovertebral joints of the cervical spine.[1]

There is a biomechanical link that suggests that a hypomobile spinal motion segment(s) may produce a symptomatic response from an adjacent hypermobile spinal motion segment. Cervical-thoracic and upper thoracic mobility restrictions have been associated with neck pain. Reduced mobility at the cervical-thoracic junction has been shown to be a risk factor for neck pain.[3,1]

To analyze the mechanism of thoracic pain of cervical origin, it is first necessary to know to what the "cervical point of back." Para -T5 or T6 and the cellulagic zone associated with it, corresponds. The cervical point of back seems to correspond to the superficial emergence of the cutaneous branch of the posterior primary ramus of the 2nd thoracic spinal nerve root. Indeed, if the ramus, when it goes around the facet jointT2-T3, is injected with 1ml of 1 % lidocaine, it produces temporary disappearance of

- The spontaneous pain of the patient, which is marked in the acute case.
- The cervical point of back.

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- The adjacent cellulalgic zone , which becomes flexible and painless on "pinching- rolling" [4]

Spinal manipulation or mobilization is commonly used in the mechanical neck disorders. Furthermore several studies have demonstrated that spinal manipulation aimed at the cervical spine is an effective intervention for patients with mechanical neck pain. Therapist must consider the risk benefit ratio of the interventions.[1]

Although effective manipulation in the cervical spine does come with some risk. The risk of vertebrobasilar complication which is extremely low, while variable in studies, it is approximately 6 in 10 million(0.00006%), it is still present.[5]

It has been found that spinal manual procedures could activate descending inhibitory mechanisms resulting in hypoalgesic effect in distant areas. Some authors recommend that because of biomechanical, anatomical and nerve relationships between the cervical and thoracic spine disturbances in the thoracic region could contribute to the maintenance of neck pain. For the reasons, it seems possible that therapeutic interventions directed at thoracic spine may have hypoalgesic or biomechanical effects on the cervical spine.[1]

A number of studies have explored the interaction which suggest that thoracic spine manipulation may result in an immediate decrease in pain and an increase in cervical region of motion in patients with mechanical neck pain but this study examined only the short term effects of spinal manipulative therapy directed at the thoracic spine.[1]

Hence the main intention of this study is to find the benefits of thoracic manipulation in reducing symptoms in patients with mechanical neck pain.

REVIEW OF LITERATURE :

Prevalence of mechanical neck pain :

1. **Bovim G et al (1994)[9]** did a study on neck pain in general population and found that neck pain is a common complaint with a point prevalence of nearly 13 %.
2. **Pierre cote et al (2003)[15]** did a study on the epidemiology of neck pain and found that six months prevalence of neck pain was 54.2 %

Effects of thoracic manipulation :

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3. **John krauss et al (2008)**[3] did a study on the immediate effects of upper thoracic translatoric spinal manipulation on cervical pain and range of motion, a randomized clinical trial and found that spinal manipulation applied to the upper thoracic spine significantly increase cervical rotation range of motion and may reduce cervical pain at end range rotation for patients experiencing pain during bilateral cervical rotation.

4. **Cesar Fernandez-de-las-penas et al (2007)**[1] did a study on changes in neck pain and active range of motion after a single thoracic spine manipulation in subjects presenting with mechanical neck pain ; a case series and found that further controlled studies comparing spinal manipulation vs spinal mobilizations of the thoracic spine are required.

5. **Kristin J Carpenter et al (2009)**[6] did a study on evaluation of outcomes in patients with neck pain treated with thoracic spine manipulation and exercise, a case series and found that neck pain likely to benefit from thoracic spine thrust manipulation.

6. **Hugh Gemmell et al (2006)**[10] did a study on comparative effectiveness of manipulation, mobilization and the activator instrument in treatment of non specific neck pain - a systemic review and found that further high quality research has to be done before a recommendation can be made as to most effective manual method for non-specific neck pain.

Reliability and validity of NDI :

7. **Cleland JA et al (2008)**[11] did a study on psychometric properties of the neck disability index and numeric pain rating scale in patients with mechanical neck pain and found that both NDI and NRS exhibit fair to moderate test- retest reliability in patients with mechanical neck pain.

8. **Vernon H et al (1991)**[13] did a study on the neck disability index a study of reliability and validity. Test-retest reliability was conducted on an initial sample of 17 consecutive "whiplash" injured patients in an outpatient clinic, resulting in good statistical significance (Pearson's r = 0.89, p less than or equal to .05). NDI scores were compared to scores on the McGill Pain Questionnaire, with similar moderately high correlations (0.69-0.70). While the sample size of some of the analyses is somewhat small, this study demonstrated that the NDI achieved a high degree of reliability and internal consistency.

Reliability of VAS :

9. **Polly E. Bijur et al (2001)**[12] did a study on reliability of the visual analog scale for measurement

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of acute pain and found that reliability of the visual analog scale for acute pain measurement as assessed by the ICC appears to be high. Ninety percent of the pain ratings were reproducible within 9 mm.

Reliability of goniometer :

10. **Whitcroft et al (2010)[14]** did a study on Comparison of Methods of Measuring Active Cervical Range of Motion and found that the Universal goniometer aligned on a fixed landmark is most reliable method of measuring neck movement clinically.

OBJECTIVES OF THE STUDY :

- To analyse the effectiveness of thoracic manipulation in reducing pain and disability in patients with mechanical neck pain.
- To compare the effectiveness of thoracic manipulation and isometric exercises in reducing pain and disability in patients with mechanical neck pain.

HYPOTHESIS:

a) Research hypothesis :

- There will be significant reduction of pain and disability when treated with thoracic manipulation in patients with mechanical neck pain.
- There will be significant difference in reduction of pain and disability when treated with thoracic manipulation compared to isometric exercises alone in patients with mechanical neck pain.

b) Null hypothesis :

- There will be no significant reduction of pain and disability when treated with thoracic manipulation in patients with mechanical neck pain.
- There will be no significant difference in reduction of pain and disability when treated with thoracic manipulation compared to isometric exercises alone in patients with mechanical neck pain.

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MATERIALS AND METHODS:

STUDY DESIGN AND SETTING:

STUDY DESIGN: Convenient sampling.

SOURCE OF DATA:

- 30 participants with acute or sub-acute neck pain are recruited into the study based on the inclusion criteria and are invited to participate in the study.

METHODOLOGY :

POPULATION :

- An experimental study with a convenient sample of 30 patients with mechanical neck pain are recruited into the study based on the inclusion criteria. The subjects are then randomised into 2 groups - experimental group (thoracic manipulation) and control group (isometric exercises).

SELECTION CRITERIA :

1. INCLUSION CRITERIA :

- Mechanical neck pain.
- Patients between 20-30 years.
- Both genders are taken.
- Subjects willing to participate who are having mechanical neck pain.

2. EXCLUSION CRITERIA :

- Any conditions that contraindicate the use of manipulation.
- systemic disease or autoimmune disease affecting the musculoskeletal system.
- previous surgery to the cervical spine.
- Thoracic outlet syndrome.
- Spinal stenosis.
- Degenerative and infective conditions affecting the spine.

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- Tumours.
- Diagnosis of cervical radiculopathy or myelopathy determined by their primary care physician.
- Presence of widespread pain- fibromyalgia syndrome.

SAMPLING METHOD AND SAMPLE SIZE :

- Sampling method : Convenient sampling.
- Sample size : 30 subjects

PROCEDURE :

After fulfilling the inclusion criteria, the subjects are recruited to the study and an informed consent was obtained. Patients were examined and screened for the presence of mechanical neck pain. Diagnostic criteria for mechanical neck pain include neck pain without neurologic or vascular deficit, unilateral or bilateral neck pain, discomfort with joint challenge / pressure, restriction of movement of a motion segment (s) identified by static or motion palpation.[8]

Demographic information including age, sex, medical history and location and nature of symptoms are collected.

Active cervical flexion, extension, right and left lateral flexion and rotation are measured in all subjects using universal goniometer on fixed anatomical landmark, pain was assessed using VAS scale, and disability was assessed using a neck disability index.

Manual therapy interventions:

- Seated thoracic distraction manipulation - For the seated thoracic manipulation, the therapist places his or her upper chest at the levels of the spine to be manipulated and grasped the patient, pulling the elbows towards the therapist until the spine is firmly positioned against the therapist's upper chest. Next, the therapist attempts to localise the force by adjusting the patient position, therapist position, and the vector of the arm pull. A high velocity distraction thrust was then performed in an upward direction.

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- Upper thoracic/cervicothoracic junction manipulation - The patient clasps his or her hands across the base of the neck. The patient's arms are pulled downward to create spinal flexion down to the level the therapist attempts to manipulate. The therapist's manipulative hand was used to stabilize the inferior vertebra of the motion segment and his/her body was used to push down through the patient's arm to perform a high velocity, low amplitude thrust.

- Middle thoracic spine manipulation in supine - For the supine middle thoracic thrust manipulation. The patient clasps his or her opposite shoulders with both hands. The patient's arms was pulled downward to create spinal flexion down to the level the therapist's attempted to manipulate. The therapist's manipulative hand were used to stabilise the inferior vertebra of the motion segment and his/her body was used to push down through the patient's arms to perform a high velocity, low amplitude thrust.[6]

Each thrust manipulation was performed twice. Following the manipulative interventions, all patients was instructed to perform isometric exercise. This exercise are performed alternately to both sides within the limit of pain tolerance. Patient performed this exercises for 10 repetitions to each side.

Isometric exercises

- Cervical isometric exercises(Flexor muscle) -

Patient position: seated or standing, with the back erect

Instructions:

a) Place both your palms on your forehead.

b) Push your heads towards your palms. Resist the forward push so as to prevent all head motion.

c) Hold for 4 seconds and then relax.

d) Repeat the exercise, gradually increasing the strength of the contraction force and hand resistance. Do not create pain. Do not hold a static contraction beyond 5 seconds.

- Extensor muscles

Patient position : seated on standing, with the back erect.

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Instructions:

a) Place both hands behind your head.

b) Push your hand back ward against your resisting hands. Prevent all head motion.

c) Hold for 4 seconds and then relax.

d) Repeat the exercise, gradually increasing the strength of the contracting force and hand resistance. Do not create pain. Do not hold a static contraction for more than 5 seconds.

- Side-bending muscles:

Patient position: seated or standing, with the back erect.

Instructions:

a) Place your right hand on the right side of your head, above the ear.

b) Push your head to the right against your resisting right hand. Prevent all head motion.

c) Hold for 4 seconds and then relax.

d) Repeat the exercise, gradually increasing the strength of the contracting force and hand resistance. For the left side bending, reverse directions. Do not hold a static contraction for more than 5 seconds.[7]

Isometric exercise program and manipulative therapy were given for a period of 2 weeks with a frequency of 5 sessions per week and patients were assessed for decrease in pain using visual analog scale, disability using NDI and increase in range of motion using goniometer. The patients are assessed on 1st day, and end of 2nd week and further statistical analysis are carried out to find out the significance.

STATISTICAL ANALYSIS:

- Dependent T test for improvements within groups.
- Independent T test for differences between groups.
- Effect size will be calculated using 'Cohen D coefficient'.

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RESULT

This study demonstrated statistically significant improvements on VAS,NDI and ROM in both the groups with the experimental group showing greater improvements in pain at a P value of 0.0059, disability at a P value of 0.0001 and ROM – flexion at P value of 0.0471, Rom – extension at P value of 0.0044, ROM – right lateral flexion at P value of less than 0.0001, ROM – left lateral flexion at P value of 0.0003, ROM – right rotation at P value of 0.0058, ROM – left rotation at P value of 0.0001

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