

Effect of muscle energy techniques and facet joint mobilization on spinal curvature in patients with mechanical neck pain: A pilot study

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Abstract

Neck is one of the most common site of musculoskeletal symptom manifestations. An impaired spinal curvature is a common finding in patients with mechanical neck pain. A pre-post quasi experimental pilot study was conducted at Fauji Foundation Hospital from January-March 2017, in which 12 patients with mechanical neck pain and straightening of the cervical spine were included and treated for 7 consecutive sessions consisting of muscle energy techniques (MET) in combination with facet joint mobilization. The objective of this study was to determine the effects of MET and facet joint mobilization on spinal curvature and functional outcomes in patients with neck pain. Outcome measurement tools that were included comprised of pain severity, neck disability index (NDI), cervical lordosis which was measured via x-ray based posterior tangential method, goniometry for cervical range of motion (ROM) and modified sphygmomanometer dynamometry (MSD) for isometric muscle strength. A significant difference was observed in pre and post treatment scores for all outcomes ($p < 0.05$); demonstrating an effective combination therapy in terms of improved spinal curvature, pain, disability, ROM and isometric muscle strength.

Keywords: Cervical lordosis, Facet joint, Manual therapy, Mobilization, Muscle energy techniques, Neck pain, Range of motion.

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Introduction

Poor posture results in abnormal stress on joints and soft tissues of the body and it is associated with musculoskeletal discomfort.¹ Neck is the most common site of discomfort, with an occurrence of 75.7% amongst the healthy young adult population^{1,2} and an

upsurge in the aforementioned condition can eventually lead to neck pain. Three-quarters of the population experience neck pain at least once in their life time according to literature,³ with a 12 month prevalence of around 30-50%.⁴ Cervical lordosis and forward head posture are inversely proportional to each other.⁵ Healthy young adults with chronic mechanical neck pain have an increased forward head posture and decreased cervical lordosis as compared to pain-free individuals.⁶ According to a study conducted by Motiallah T et al, forward head posture is associated with chronic neck pain and upper trapezius trigger points.⁷ Moreover, a study conducted by Haughi LJ et al showed that forward head posture was also associated with decreased range and increased pain on cervical backward bending, as it resulted in locking of the cervical facet joints, and perhaps that is the reason why facet joint mobilization can potentially have positive effects in terms of pain and ROM in patients with forward head posture.⁸ Cervical lordosis may decrease due to trauma, disc pathology or poor posture.⁹ Straightening of the cervical spine has a significantly positive association with cervical range of motion, and a negative association with age,⁵ frequency of headache,¹⁰ pain, discomfort¹¹⁻¹³ and disability.⁵

It is imperative to understand that a poor spinal configuration can lead to abnormal stress, and according to Wolff's and Davis' law, both bone and soft tissues can remodel in response to stress.^{14,15} Thus, it is very important to adopt a biomechanical perspective in the management of mechanical neck pain.¹⁴ Cranio-vertebral angle, Cobb's angle and posterior tangent angle are different methods used for quantitative measurement of spinal curvature in sagittal plane.⁸ Cranio-vertebral angle is also frequently used to quantify forward head posture, signifying that the cervical lordosis and forward head posture are inversely proportional to each other and can be used as interchangeable outcomes.^{5,10} Evidence suggests that the forward head posture and cervical lordosis are clinically relevant outcomes for the management and prognosis of neck pain,^{11,16} thus

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improving the biomechanics and alignment of the cervical spine is very important in patients with mechanical neck pain. For this reason, the study was conducted to determine the effects of muscle energy techniques and facet joint mobilization in the management of mechanical neck pain in a biomechanical perspective by observing the effects on cervical lordosis in addition to other clinical outcomes including neck pain, disability, cervical range of motion and isometric muscle strength.

Patients and Methods

A pre-post quasi experimental pilot study was conducted at Fauji Foundation Hospital, rehabilitation department from January-March 2017, on 12 patients with mechanical neck pain selected via a non-probability purposive sampling. Participants were treated for seven consecutive sessions. Patients having neck pain ranging from 4-8 on 'Numeric Pain Rating Scale' (NPRS), straightening of the cervical spine and range of motion were included in the study, after receiving the informed consent. Patient having recent history of trauma or surgery, active inflammation, vertebro-basilar insufficiency and cervical myelopathy were excluded. Each patient received 10 minutes of heat therapy in combination with 'Trans-Cutaneous Electrical Nerve Stimulation' (TENS), followed by 3-5 repetitions of post-isometric relaxation MET¹⁷ in combination with facet joint mobilization, including three sets of 15 repetitions of Unilateral Postero-Anterior (UPA) glides on the tender segments^{18,19} and 5 repetitions of extension 'Sustained Natural Apophyseal Glides'(SNAGs) on the hypomobile segments. Outcome measurement tools included cervical lordosis which was measured through x-ray based posterior tangential method,¹¹⁻¹³ goniometry for cervical range of motion (ROM), 'modified sphygmomanometer dynamometry' (MSD) for Isometric muscle strength, NPRS for pain²⁰ and 'Neck Disability Index' (NDI) for neck disability.²⁰ Pre and post-treatment analysis was done using non parametric tests of significance (Wilcoxon) on SPSS vr. 21.0.

Table-1: Pre and post scores of neck pain (NPRS), disability (NDI) and cervical lordosis.

Variables	Base Line Median ± IQ	Follow up Median ± IQ	P-Value
Neck Pain (NPRS)	8.0±1.0	2.0±1.5	0.026
Cervical Lordosis	26.0±10.0	37.0±6	0.027
Neck Disability (NDI)	39.9±28.8	6.0±8.0	0.028

Table-2: Pre and post scores of cervical range of motion and isometric muscle strength.

Variables	Base Line Median ± IQ	Follow up Median ± IQ	P-Value
Cervical Range of Motion			
Flexion	20.0±17.5	65.0±13.0	0.028
Extension	40.0±49.0	75.0±15.5	0.028
Rotation Right	42.0±24.0	90.0±12.50	0.028
Rotation Left	40.0±40.0	90.0±15.5	0.027
Lateral Flexion Right	28.0±11.5	42.0±17.5	0.027
Lateral Flexion Left	30.0±16.5	48.0±5.0	0.027
Isometric Muscle Strength			
Flexion	22.0±36.0	70.0±27.50	0.028
Extension	20.0±31.0	60.0±19.0	0.027
Rotation Right	28.0±21.5	60.0±11.5	0.027
Rotation Left	28.0±24.5	60.0±14.0	0.027
Lateral Flexion Right	28.0±21.5	68.0±12.5	0.027
Lateral Flexion Left	28.0±24.5	60.0±14.0	0.028

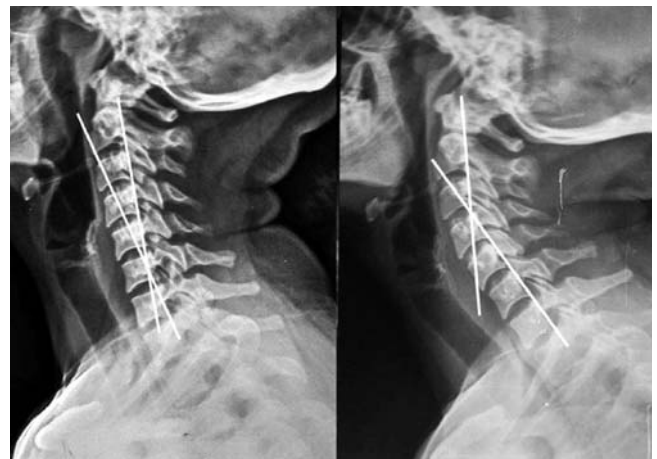


Figure: Pre (left) & Post (right) treatment X-ray of a 33 year old female showing an improvement in cervical lordosis from 160 to 320 measured via posterior tangential method after 7 consecutive treatment sessions.

Results

Mean age of the participants was 39.5±4.96 years, mean weight was 82.0± 9.6 kg while the mean height was 5.6±0.5 feet. Eight out of the twelve patients used computer on a regular basis and four out of the twelve patients experienced a new episode of neck pain. A significant difference was observed in pre and post treatment pain scores, cervical lordosis and neck disability (Table-1 and Figure-1), as well as in the cervical range of motion and isometric muscle strength (p<0.05) (Table-2).

Discussion

An increase in the forward head translation and a

decrease in the lordosis is associated with neck pain,^{6,11-13,16} which resulted in an emphasis on restoration of cervical lordosis as an important outcome measurement tool.^{13,16} A biomechanical correction approach can lead to normalization of spinal curvatures and a decrease in the compressional and tensional stress on joints and soft tissues of the body,²¹ thus alleviating patient's signs and symptoms. In Upper Crossed Syndrome and forward head posture, global mobilizers of the cervical spine become hypertonic and short which necessitates inhibition and stretching for the correction of spinal curvature. A study conducted by Motiallah T et al⁷ stated an association between forward head posture with chronic neck pain and upper trapezius trigger points. For this reason, MET was used in the current study as it focuses on both active and passive components of the muscle tone, and thus it not only inhibits the muscle but also increases the length of the muscle unlike the conventional stretching. Moreover, a study conducted by Haughi LJ et al⁸ illustrated that the forward head posture is associated with decreased range and increased pain on cervical backward bending as it results in locking of the cervical facet joints. Perhaps, this is the reason why facet joint mobilization can have positive effects in terms of pain and ROM in patients with forward head posture. Hence, these methods were used in the current study. Results of the present study portrayed a significant improvement in cervical lordosis with manual therapy in patients with mechanical neck pain, similar to previous studies conducted by Harrison et al which depicted an improvement in cervical lordosis with the use of spinal manual therapy in combination with mechanical traction.^{11,13} However, it is not completely known if the spinal manual therapy or traction was the cause of improvement in the participants. On the contrary, a study conducted by Shilton et al²² in 2015, showed no significant difference in cervical lordosis after 4 weeks of spinal manipulation in patients with neck pain. Moreover, the current study also demonstrated an improvement in pain, ROM, disability and isometric muscle strength in patients with mechanical neck pain.

Conclusion

It can be concluded that the current study demonstrates the use of conservative physical therapy management of neck pain, majorly consisting of muscle energy techniques and cervical facet joint mobilization to be effective in improving the cervical lordosis, pain, disability, ROM and isometric muscle strength.

Recommendations

A randomized controlled trial with a statistically calculated sample size should be conducted, comparing the effects of muscle energy techniques and facet joint mobilization with conventional physical therapy management or a randomized controlled trial with control groups should be carried out to identify if the effects are solely due to the treatment modality or if they are somehow attributable to the natural progression of the condition.

Disclaimer: The current study was conducted as a pilot study to the clinical trial ID: NCT03136250, registered at clinicaltrials.gov (National Institute of Health, US), approved by the Foundation University Islamabad (FUI), Ethical Review Committee letter # FF/FUMC/217-Phy/16.

Conflict of Interest: None.

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