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Original Research Article

SHORT TERM EFFECTS OF HIGH VELOCITY LOW AMPLITUDE THRUST MANIPULATION TO THORACIC SPINE AND MYOFASCIAL RELEASE THERAPY ON MECHANICAL NECK PAIN, DISABILITY AND CERVICAL RANGE OF MOTION

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ABSTRACT

Background: Mechanical neck pain is a common complaint yet no gold standard treatment exists for such cases. This study was undertaken to find out the effects of myofascial release therapy and high velocity low amplitude thrust manipulations to the thoracic spine and exercises on mechanical neck pain, disability and cervical range of motion (ROM) because of the biomechanical alignment of the thoracic and the cervical spine. High velocity low amplitude (HVLA) thrusts at the thoracic spine have been shown to have minimal risk to patients and also to be an effective intervention for spinal pain while Myofascial Release Therapy (MFR) is a, hands-on approach. It is a form of manual therapy technique that has a profound effect upon the musculoskeletal system.

Purpose of the Study: To find out additional effects of MFR and HVLAT to thoracic spine on Mechanical neck pain, disability and cervical ROM.

Materials and Methods: Total 30 subjects in between age group 18 to 45 years old with mechanical neck pain, restricted cervical ROM were included in the study. The participants were explained their role in the study and a written consent was taken from them and were equally divided into two groups-GROUP A and GROUP B and a pre and post assessment was done with numerical pain rating scale (NPRS), neck disability index questionnaire (NDI) and cervical ROM using universal goniometer. A single blinded study was conducted where Group 'A' received MFR and HVLAT on thoracic spine with exercises and Group 'B' received HVLAT on thoracic spine and exercises. On the 6th day post assessment was done.

Results: NPRS and NDI and cervical ROM show a significant p value (< 0.005) within the group A and B post intervention. The p value for NPRS, NDI and cervical flexion ROM in between the 2 groups is significant (< 0.005). Cervical Extension, Lateral flexion,rotation lacks its significance between the 2 groups.

Conclusion: The combination of MFR and thoracic HVLAT manipulation with exercises is more effective on pain and functional abilities in the short term than HVLAT with exercises alone in patients with mechanical neck pain.

KEY WORDS: HVLAT, Mechanical Neck Pain, Myofascial Release Therapy, Restricted Neck Range Of Motion, Connective Tissue Massage.

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INTRODUCTION

Neck pain is a regular complaint of the general population which leads to significant burden on the population. It has been reported that about 15% of men and 23% of women experience pain at some point of their lives and about half of them experience continuous unremitting pain [1, 2].

Mechanical neck pain commonly arises insidiously and is generally multifactorial in origin, including one or more of the following: poor posture, anxiety, depression, neck strain, and sporting or occupational activities. In an estimated 50–80% of cases involving back or neck pain, an underlying pathology cannot be definitively determined [5]. As a consequence, neck pain is responsible for a large proportion of physical therapy visits [3]. Left with poorer quality trials as a guide, Physical Therapists approach the management of this pathology with a plethora of interventions such as manual therapy (MT), therapeutic exercises, manual/mechanical traction, modalities, massage, and functional training [5]. There is little evidence, however, for their accepted use [4].and yet there is no gold standard for treating such cases [1]. This lack of quality evidence largely stems from the poorly understood clinical course of neck pain in conjunction with the inconclusive results related to the efficacy of commonly used interventions [2,8,9,10].

One approach to conservative treat-ment of neck pain includes cervical mobilization and thrust manipulation. The potential for complications caused by thrust manipulation of the cervical spine, has been extensively discussed in the literature [2,14]. Moreover, the literature has recommend-ed avoiding manual therapies at terminal ranges of motion [4] and cautioned against the use of cervical thrust manipulation due to the perceived risk. Alter-natively, thoracic spine thrust manipula-tion may effectively address mechanical neck pain.[4]. The rationale to include HVLA thrust manipulation and/or nonthrust mobiliza-tion to the thoracic spine in the treatment of patients with neck pain comes from the theory that disturbances in joint mobility in the upper thoracic spine may be an un-derlying contributor to musculoskeletal dis-orders in the cervical spine [17]. Furthermore, several studies[17] have reported a significant association between decreased mobility in the cer-vicothoracic junction (C7-T2) and the presence of mechanical neck pain[6].

Massage is used to treat persistent neck pain. However, studies of its effectiveness on neck pain have generally been short-term and inconclusive. Massage techniques included Swedish techniques, facial or connective tissue release techniques, cross fibre friction, and myofascial trigger point techniques. Massage therapy is a manual manipulation of soft tissues to promote health and well-being. It can be used to relieve stress, alleviate pain, increase fluid mobilization and soft tissue mobility [7,8,9].

Hence, this study will demonstrate the effects of myofascial release therapy, high velocity low amplitude thrust manipulation to thoracic spine along with deep cervical flexor muscles exercises and high velocity low amplitude thrust (HVLAT) manipulation to thoracic spine along with deep cervical flexor muscles exercises only on mechanical neck pain, disability and cervical Range of motion.

MATERIALS AND METHODS

Participants were patients with the complaints of mechanical neck pain for physical therapy at Sancheti hospital in Pune, India. Mechanical neck pain was defined as generalized neck or shoulder pain provoked by sustained neck postures, neck movement, or palpation of the cervical musculature for a duration of more than 3months.

Exclusion criteria were as follows: (1) contraindica-tion to neck manipulation (e.g. fracture, osteoporosis, Prolapsed intervertebral disc, spinal canal stenosis) (2) history of whiplash, (3) history of cervical surgery, previous cranio-cervical or thoracic surgery. (4) diagnosis of cervical radiculopathy or myelopathy pain of vascular or neurological origin, patients with systemic, degenerative and arthritic conditions, neurological deficits including nerve root signs, (5) diagnosis of fibromyalgia syndrome (6) being younger than 18 or older than 55 years of age. Informed consent was obtained from each patient before participation in the study. The study was ap-proved by the Ethics and Research

Committee

Outcome measures: The primary outcome measure was neck pain intensity, disability and CROM as secondary outcomes. Patients provided demographic and clinical information and completed a number of self-report measures at baseline, which included a numeric pain rating scale (NPRS) to assess neck pain intensity [12], the Neck Disability Index (NDI) to measure self-perceived disability [13]. Once patients completed the self-report measures, they underwent cervi-cal-range-of-motion (CROM) testing. The NPRS (range, 0 to 10, with 0 as no pain and 10 as maximum pain) has been shown to be a reliable and valid tool for the assessment of pain[12]. The minimal detectable change (MDC) and minimal clinically important difference (MCID) for the NPRS have been reported as 1.3 and 2.1 points, respectively[11]. The NDI consists of 10 questions ad-dressing functional activities [13].There are 6 potential responses for each item, ranging from no disability (0) to total dis-ability (5). The NDI is scored from 0 to 50, with higher scores indicating greater disability. MacDermid et al recently concluded that the MDC and the MCID for the NDI were 5 and 7 points out of 50, respectively[14].

CROM testing was assessed with the patient sitting comfortably on a chair, with both feet flat on the floor, hips and knees at 90° of flexion, and buttocks po-sitioned against the back of the chair. A CROM goniometer was placed on the top of the head, and patients were asked to move their head as far as possible, with-out pain, in a standard fashion (flexion, extension, right lateral flexion, left lateral flexion, right rotation, and left rotation). The CROM goniometer has been shown to exhibit intratester reliability between 0.87 and 0.96 in subjects with neck pain [15]. A recent study reported that the standard error of measurement across the 6 cervical movements ranged from 1.6° to 2.8°, whereas the MDC ranged from 3.6° to 6.5°15. All outcomes were collected at base-line and 6 days after the intervention by an assessor blinded to the treatment allocation of the patients. Patients were blinded to their treatment allocation and uninformed of what intervention the other group would receive.

Allocation: Following the baseline examination, patients were randomly assigned to re-ceive CTM and HVLAT or HVLAT alone intervention directed at the thoracic spine. Concealed allocation was performed us-ing a computer-generated randomized table of numbers created prior to the start of data collection by a researcher who was not involved in either recruitment or treatment of the patients. Individu-ally, sequentially numbered index cards containing the randomly assigned inter-vention group were folded and placed in sealed, opaque envelopes. A second therapist, blinded to baseline examina-tion findings, opened the envelope and proceeded with the treatment according to the group assignment. All patients re-ceived the intervention on the day of the initial examination.

The participants were divided into 2 groups:

Experimental group: Subjects were given connective tissue massage to lower cervical spine, upper thoracic spine, upper trapezius, levator scapulae and rhomboids. Deep cervical flexor muscle exercises along with high velocity low amplitude thrusts were also given. The patient sits with his or her back exposed to the therapist who first observes the contours of the skin and then palpates the subcutaneous tissues, either by a series of small symmetrical finger pulls (the skin and subcutaneous tissues are lifted at a tangent away from the underlying fascia) or by long pulling strokes that pass over the whole length of the back. Treatment commences with a series of short strokes over the thoracic and cervical regions of the spine, Short paravertebral strokes precede those passing from the transverse to the spinous processes. Once developed into longer strokes, the massage then fans out from the line of the vertebrae to follow the intercostal spaces towards the scapulae and the occiput [10].

The thrusts were given in prone position. The therapist placed both his hands on the patient's upper thoracic spine and the patient was asked to take a deep breath in and exhale. The high velocity low amplitude thrust was performed on exhalation [17,16]. High velocity low amplitude thrusts were given by a trained manual therapist. The exercises to be performed were explained to the patient and demonstrated by the therapist. These exercises included, isometric exercises for the DCF muscles i.e. isometric flexion, isometric extension (chin tucks), isometric bilateral side flexion. Cervical Range of motion exercises i.e. cervical flexion, extension, lateral flexion, bilateral rotations. Stretching exercises included upper trapezius stretch and levator scapulae stretch and pectoralis minor stretch and scalenes stretch. The isometric exercises were done 10 times each with 5 seconds hold. The range of motion exercises were done 10 times and the stretching exercises were done 3 times each with a 20 seconds hold.

Control group: Patients were given above mentioned exercises and HVLAT on thoracic spine.

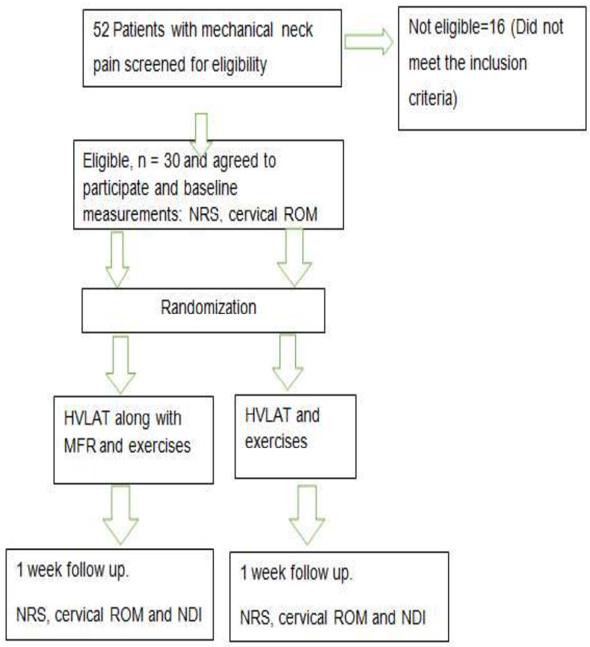


Fig. 1: High velocity low amplitude thrust directed to the thoracic spine given in Prone position.

Fig. 2: Connective tissue massage to lower cervical spine, upper thoracic spine, upper trapezius, levator scap, rhomboids.

Fig. 3: Connective tissue massage to lower cervical spine, upper thoracic spine, upper trapezius, levator scap, rhomboids.

Fig. 4: Connective tissue massage to lower cervical spine, upper thoracic spine, upper trapezius, levator scap, rhomboids.

Fig. 5: Connective tissue massage to lower cervical spine, upper thoracic spine, upper trapezius, levator scap, rhomboids.

Fig. 6: Connective tissue massage to lower cervical spine, upper thoracic spine, upper trapezius, levator scap, rhomboids.

RESULTS AND TABLES

Fifty-two consecutive patients were screened for eligibility, thirty patients satisfied the eligibility criteria, agreed to partici-pate, and were randomized to MFR and HVLAT (N=15) or HVLAT (N=15). None of the above participant reported any adverse effects after the treatment.

Numerical Pain Rating Scale: The Wilcoxon Test used to compare the participants in the experimental group pre and post intervention indicated a significant p value (< 0.005). the p value for the participants in the control group when compare with the same test as above resulted as significant. The Mann Whitney test indicated a significant p value (< 0.005) with the participants in the experimental group post intervention than the participants in the control group.

Neck Disability Index: NDI was significant, when compared within the group, for both the participants in the experimental groups and the control group when compared with the Wilcoxon Test. The p value analysed with the Mann Whitney test was less than 0.05 in between the groups, that is experimental and control groups post intervention indicating a significant p value.

Cervical Range of Motion: The Paired T test analysed within the group pre and post intervention data indicating a p value less than 0.005 for the participants in the experimental group and p value greater than 0.005 for the participants in the control group. A significant p value was reported for cervical flexion only with the Unpaired t test used for comparison and analysis of the post intervention data of the participants in the experimental and the control group.

Table 1: Comparison of pre and post intervention data within the control group.

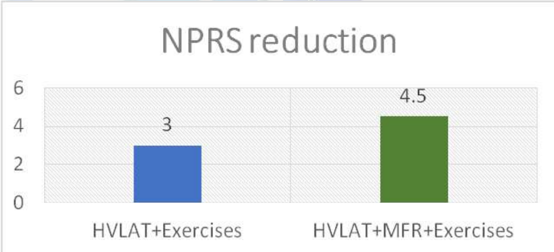
Variable	Pre	Post	p value
NPRS	7 ±1.2	7±1.3	0.001
NDI	27 ±2.7	15.5 ±3.2	0.001
Flexion	30 ±9.5	37.5 ±9.4	0.0001
Extension	30 ±10.1	36.5 ±8.7	0.0001
Side rotation right	30 ±8.9	37.5 ±8.9	0.0001
Side rotation left	30 ±5.7	36.5 ±5.1	0.0001
lateral flexion right	40 ±6.3	45.5± 6.4	0.0001
lateral flexion left	32.5 ±8.7	40 ±8.2	0.0001

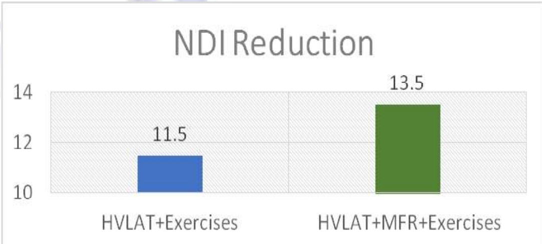
Table 2: Comparison of pre and post intervention data within the experimental group.

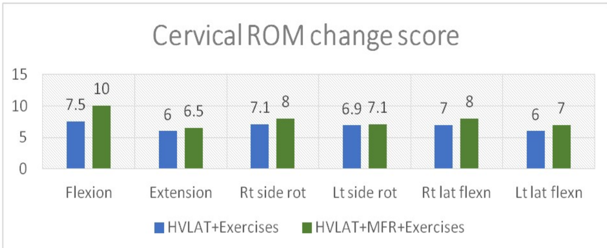
Variable	Pre	Post	p value
NPRS	7.5± 1.2	3± 1.1	0.0001
NDI	27± 3.3	13.5 ±3.1	0.001
Flexion	28 ±11	37.5 ±9.3	0.0001
Extension	37.5 ±11	31.5 ±8.9	0.039
Side rotation right	35± 10.5	42 ±8.9	0.0001
Side rotation left	40 ±6.7	42.5± 8.2	0.0001
lateral flexion right	27.5± 10	36± 9.4	0.0001
lateral flexion left	27.5 ±12	30± 11	0.001

Table 3: Comparison of the post intervention change score average of the experimental and the control group.

Variable	control (post)	experimental (post)	p value
NPRS	7±1.3	3± 1.1	0.0001
NDI	15.5 ±3.2	13.5 ±3.1	0.0001
Flexion	37.5 ±9.4	37.5 ±9.3	0.006
Extension	36.5 ±8.7	31.5 ±8.9	0.026
Side rotation right	37.5 ±8.9	42 ±8.9	0.0001
Side rotation left	36.5 ±5.1	42.5± 8.2	0.0001
lateral flexion right	45.5± 6.4	36± 9.4	0.074
lateral flexion left	40 ±8.2	30± 11	0.01







DISCUSSION

The results of this study demonstrated that patients who had mechanical neck pain benefited from Myofascial release therapy and thoracic spine HVLA thrust along with the conventional treatment which included isometric exercises, range of motion exercises and stretching exercises. The results of this study are consistent with the previous studies done so far[3]. The above results have also shown a significant reduction in pain to 30% while NDI reduction score was 27%. The changes in cervical range of motions for flexion is 61% and for extension is 51%. Lateral flexion right and left was 58% and 54% respectively. And for rotation toward the right and left was 52% and 52% respectively. The above results have also shown a significant change in the cervical range of motion.

There was improvement in range of motion in all plane of the cervical spine movement but the range was not complete, the end ranges were still restricted. In some of the literatures, the biomechanical connection between the thoracic and cervical spine is very well supported. Spine is structurally and functionally inter-related. Alterations in one part of the spine can cause compensatory or beneficial changes in the other parts of the spine. Due to manipulation of the thoracic spine, the biomechanical relationship between the thoracic spine and cervical spine improves thus causing reduction of mechanical stress on the pain generators [17]. Muscles adjacent to and opposite to the site of manipulation elicit a response due to manipulation. Evidence also reports EMG responses in distinct areas(cervical spine) of the body in response to thoracic spine manipulation [2].

Muscles, ligaments and bony linkages can cause thoracic dysfunctions which can give rise to pain in the cervical region or alterations in the cervical spine range of motion. Myofascial connectivity or muscles and ligaments that cross more than one joint exert their action onto that bony segment or other parts of the body. In the spine, there are many muscles which span multiple joints like longus colli, splenius capitis and nuchal ligament which can cause thoracic dysfunction or derangement which can lead to cervical spinal musculoskeletal disorders [2]. The exact cause of these effects is still not known but the possible mechanism can be; unlocking of the facet joints of the thoracic spine which happens in high velocity low amplitude thrust which causes biomechanical change at the thoracic spine, which reduces the muscle spasm occurring in these muscles thus reducing the pain and increasing the range of motion at the cervical spine. This can be the justification for reduction in pain and improvement in range of motion at the cervical spine.

Myofascial Release (MFR)is a hands-on approach to healthcare. It is a form of manual therapy technique that has a profound effect upon the musculoskeletal system because Myofascial release (MFR) is an approach that focuses on freeing restrictions of movement that originate in the soft tissues of the body. It is a form of soft tissue therapy that is intended to reduce pain and increase mobility in patients that are suffering from chronic pain conditions. Secondly by applying pressure and administering fascial release to areas of the body, this therapy aims to improve the health of fascia tissue. Fascia is a connective tissue along with tendons, ligaments, bones, and muscles. A slow gentle pressure allows the body's tissue to reorganize, release physical restrictions and release the body's unconscious holding and bracing patterns [18]. This technique produces heat and increases blood flow which releases tension from fibrous band of connective tissue and thus results in softening, elongation and realignment of the fascia and removing restrictions or blockages in the fascia. It is theorized that the alterations in the tissue texture and tension resulting from myofascial release come from dynamic changes in the connective tissue and neuromuscular systems of the body. [18]. This study proves the efficiency of myofascial release therapy and mobilizing/ manipulating the thoracic spine for mechanical neck pain and range of motion of the cervical spine. Hence, it also proves that treatment given to the remote segment which is nonspecific and non painful has a beneficiary effect on the local painful part.

Based on the added clinical benefit, clinicians should consider implementing MFR along with thoracic spine thrust manipulation in the plan of care for individuals with mechanical neck pain.

While, there are some limitation to this study i.e. small sample size. A large sample size would have been selected in order to see a better effect of myofascial release in subjects with mechanical neck pain and also, we only examined the short-term follow-up; therefore, it is not known if the benefits of HVLAT and MFR would be maintained in the long term.

Further scope of this study is to find out effects on a larger sample population and to study the long-term effects on mechanical neck pain, disability and range of motion of the cervical spine.

CONCLUSION

The combination of myofascial release therapy and thoracic HVLAT manipulation is appreciably more effective in the short-term than HVLAT alone in patients with mechanical neck pain.

ABBREVIATIONS

MFR- Myofascial Release therapy
ROM – Range of motion
HVLAT – High velocity low amplitude thrust

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Conflicts of interest: None

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