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Original Research Article

IMMEDIATE EFFECTS OF HIGH VELOCITY LOW AMPLITUDE THRUST MANIPULATION OF THE THORACIC SPINE ON MECHANICAL NECK PAIN, DISABILITY AND CERVICAL RANGE OF MOTION

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ABSTRACT

Background: Neck pain is a common complaint of the general population yet there is no gold standard for treating such cases. This study was undertaken to find out the immediate effects of high velocity low amplitude thrust manipulations of the thoracic spine along with the conventional therapy on mechanical neck pain, disability and cervical range of motion because of the biomechanical relationship 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.

Purpose of the study: The purpose of this study is to find out the immediate effects of HVLA thrust of thoracic spine on mechanical neck pain, disability and cervical range of motion.

Materials and Methods: The study was conducted in Sancheti hospital, Pune. Total 50 subjects in between age group 18 to 60 years old with mechanical neck pain, restricted cervical ROM were included in the study. This study was performed with random sampling technique (lottery method). The participants were explained their role in the study and a written consent was taken from the patients. Numerical pain rating scale (NPRS) and Neck Disability Index (NDI) were explained to the patient and the scores pre and post intervention was used as the outcome measures. Along with this goniometric evaluation of cervical ROM pre and post intervention was also used as the outcome measure.

Results: NPRS and cervical ROM showed a significant p value (< 0.005) within the experimental group post intervention. The p value for NPRS and cervical ROM in between the group is significant (< 0.005). NDI lacks its significance both within the group and in between the group.

Conclusion: HVLA thrust of the thoracic spine was effective in immediately reducing mechanical neck pain and improving cervical range of motion.

KEY WORDS: HVLA thrust, mechanical neck pain, restricted neck range of motion, thoracic dysfunction.

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INTRODUCTION

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].

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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]. Individuals with neck pain often have significant disability which leads to reduced efficiency and substantial economic burden.

Research states that human body is structurally and functionally interrelated. Any type of mechanical stresses, injury or asymmetry can lead to changes in other parts of the body which can either be related or unrelated to the source [3].

Neck pain interferes in activities of daily living of some individuals which can become chronic. This neck pain is most of the cases is mechanical in nature. Physical therapists use several interventions and modalities like joint mobilisation/manipulation, traction, and therapeutic exercises. There are many studies that have been identified favouring the effects of thoracic spine thrust manipulations over non-thrust manipulations, modalities like infrared radiation therapy (IR), transcutaneous electrical nerve stimulation (TENS), soft tissue massage in both acute and sub acute cases, however there are studies that have been found with contradictory results [4].

As described in previous studies there exists a muscular, ligamentous and bony link between the cervical and thoracic spine, thoracic spine mobility restriction can be associated with chronic neck pain. Also some authors have described thoracic somatic dysfunction as the potential causative factor of mechanical neck pain [4].

Therefore this study was intended to find the effects of high velocity low amplitude thrusts at thoracic spine on the neck pain, disability and restricted range of motion of the cervical spine. The present study will demonstrate the effect of mobilizing the remote spinal (thoracic) region to have positive effect on cervical region pain.

MATERIALS AND METHODS

The study was conducted in Sancheti hospital, Pune. Total 50 subjects in between age group 18 to 60 [5] years old with mechanical neck pain, restricted cervical ROM were included in the study and those with prolapsed intervertebral disc; any type of fractures of the vertebra; pott's spine patients, patients with any systemic conditions like hypertension; cardiovascular conditions like myocardial infarctions, stenosis; arthritic conditions like rheumatoid, osteoarthritis; Impaired sensations or reflexes; spinal canal stenosis were excluded in the study.

This study was performed with random sampling technique (lottery method). The participants were explained their role in the study and a written consent was taken from the patients. Numerical pain rating scale (NPRS) and Neck Disability Index (NDI) [3] were explained to the patient and the scores pre and post intervention was used as the outcome measures. Along with this goniometric evaluation of cervical ROM pre and post intervention was also used as the outcome measure [9].

The participants were divided into 2 groups:

Experimental group: subjects were given deep cervical flexor muscles exercises and high velocity low amplitude thrusts.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 [3,6]. 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 [7].

These exercises includes, 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 includes Upper trapezius stretch and Levator scapulae stretch.

The isometric exercises will be done 10 times

each with 5 second holds. The range of motion exercise will be done 10 times and the stretching exercises will be done 3 times each with a 20 seconds hold.

Control group: Patients were given above mentioned exercises only.

RESULTS AND DISCUSSION

Out of the total potential participants 25 were included in the control group randomly (lottery) after obtaining their written consent to participate in the study. None of the above participant reported any adverse effects after the treatment.

Numerical Pain Rating Scale: The Willcoxen Test used to compare the participants in the experimental group pre and post intervention indicated a significant p value (< 0.005). But the p value for the participants in the control group when compare with the same test as above resulted as non 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. (Table: 1, 2, 3)

Neck Disability Index: NDI was not significant, when compared within the group, for both the participants in the experimental groups and the control group when compared with the willcoxen Test. The p value analysed with the Mann Whitney test was greater than 0.005 in between the groups, that is experimental and control groups post intervention indicating a non significant p value. (Table: 1, 2, 3)

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

	Pre (Mean±SD)	Post (Mean±SD)	P values
NPRS	5.7±(2.03)	3.4±(1.47)	0.0001
NDI	32.3±(4.83)	30.8±(4.14)	1
Flexion	35.3±(12.98)	44.5±(7.27)	0.0001
Extension	42.88±(10.92)	52.7±(7.62)	0.0001
Lateral flexion right	34.4±(7.3)	38.4±(4.04)	0.002
Lateral flexion left	33.8±(8.75)	36.6±(6.35)	0.0001
Rotation right	69.3±(15.28)	76.8±(13.8)	0.0001
Rotation left	71.7±(15.23)	80.2±(12.51)	0.0001

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

	Pre(Mean±SD)	Post (Mean±SD)	P values
NPRS	5.56±(2.06)	5.4±(1.9)	0.755
NDI	31.7±(3.12)	31.76±(3.1)	0.992
Flexion	39.2±(8.17)	40.32±(7.7)	0.125
Extension	49.5±(12.3)	49.7±(12.5)	0.175
Lateral flexion right	35.3±(6.6)	35.8±(6.3)	0.043
Lateral flexion left	36.4±(5.8)	36.2±(5.5)	0.09
Rotation right	76.9±(16.4)	77.4±(16.5)	0.037
Rotation left	78.6±(15.9)	82±(9.5)	0.297

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

	Experiment (post)	Control (post)	P values
NPRS	2.32	0.16	0.0001
NDI	1.52	0	0.46
Flexion	9.2	5.28	0.0001
Extension	9.84	6.11	0.0001
Lateral flexion right	4	3.76	0.0009
Lateral flexion left	3.16	3.03	0.0056
Rotation right	7.52	7.47	0.0001
Rotation left	8.52	1.11	0.0001

Cervical Range of Motion: The Paired T test analysed w6ithin 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 with the Unpaierd t test used for comparison and analysis of the post intervention data of the participants in the experimental and the control group. (Table: 1, 2, 3)

DISCUSSION

When the percent improvement in the average of pre and post interventional data of the experiment group was calculated, it indicated 41% change. The results of this study demonstrated that patients who had mechanical neck pain benefited from thoracic spine HVLA thrust along with the conventional treatment which included isometric exercises, range of motion exercises and stretching exercises of the trapezius and levator scapulae muscles. The results of this study are consistent with the previous studies done so far that have demonstrated the effectiveness of thoracic spinal manipulation along with cervical spine thrust and non thrust manipulation plus exercises in patients with mechanical neck pain [3]. The significance of this study is that along with its long term benefits as proved in previous researches, HVLA thrust of the thoracic spine has an immediate

beneficial effect on pain in patients with mechanical neck pain.

The above results have also shown a significant change in the cervical range of motion. The improved percentage for flexion is26% and for extension is 23 %. Lateral flexion right and left was 12% and 9% respectively. And for rotation toward the right and left was 11% and 12% respectively. The improvement in the percentage of these pre and post readings is quiet considrable as the study is based on immediate effects. 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. Positive effects were shown to occur immediately after the intervention of thoracic spinal manipulation along with the conventional treatment [8].

Neck disability index concluded to be insignificant. To make a change in this disability index there might be a need to increase the intervention period and recovery time. Hence it lacks in its immediate effects. This is one of the limitations of the study that it is based on onetime assessment so long term effects of high velocity low amplitude thrust of the thoracic spine cannot be studied.

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 [3].

Muscles adjacent to and opposite to the site of manipulation elicit a response due to manipulation. Evidence also reports EMG responses in distinct areas of the body in response to spinal manipulation [4].

Muscles, ligaments and bony linkages can cause thoracic dysfuntions which can give rise to pain in the cervical region or alterations in the cervical spinal movements. 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 [4].

The exact cause of these effects is still not know but the possible mechanism can be; unlocking the facet joints of the thoracic spine which happens in high velocity low amplitude thrust 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 because of the biomechanical changes at the thoracic spine.

This study proves the efficiency of mobilizing/ manipulating the thoracic spine for mechanical neck pain and range of motion of the cervical spine .i.e. mobilizing/ manipulating a nonspecific, non painful part to have an effect on the painful part than to directly activate the painful part of the body.

Further scope of the study is to find out the immediate effects on a larger sample population and to study the short term and the long term effects of thoracic thrust mobilizations/ manipulations on mechanical neck pain, disability and range of motion of the cervical spine.

CONCLUSION

High velocity low amplitude thrusts of the thoracic spine was effective and has immediate effects on reducing mechanical neck pain and increasing cervical range of motion.

ABBREVIATIONS

HVLA – High velocity low amplitude
ROM – Range of motion
HVT – High velocity thrust

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