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Effectiveness of Mechanical Lumbar Traction Positional Variations in Patients with Low Back Pain

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ABSTRACT

BACKGROUND: Low back pain (LBP) is one of the most common causes of disability among the general population. Lumbar traction is an application of distraction force to produce a separation of the joint and elongate the soft tissues. Unilateral mechanical lumbar traction focuses on one side of the spine to maximize the effect of traction.
OBJECTIVE: To study the effectiveness of Unilateral Mechanical Lumbar Traction and to compare the effectiveness of Mechanical Lumbar Traction positional variations in patients with low back pain.
METHODOLOGY: 20 Patients with low back pain were selected and divided into two groups based on the selection criteria. Group A received Unilateral Lumbar Traction along with Transcutaneous electrical nerve stimulation and Patient specific exercises and Group B received Conventional lumbar traction along with Transcutaneous electrical nerve stimulation and Patient specific exercises. Numerical Pain rating scale and active lumbar flexion and lumbar extension range of motion using Modified-modified Schober test were used as outcome measures for pre and post treatment.
RESULT: On comparing pre to post intervention values in Group A and Group B, there was significant improvement in terms of pain in group A than group B and Lumbar ROM does not vary significantly between both the groups.
CONCLUSION: The present study concluded that group A (Unilateral mechanical lumbar traction) showed more improvement in terms of pain, but lumbar ROM did not vary between the groups. The study concluded that both the groups showed average improvement in terms of pain and lumbar ROM and there was no statistically significant difference between the groups.

Keywords: Low back pain, Unilateral Mechanical Lumbar Traction, TENS

INTRODUCTION

Low back pain (LBP) is one of the most common causes of disability among the general population, affecting about 70–80% of the population at some point in life [1]. Low back pain (LBP) is defined as discomfort, muscle tension or stiffness above the inferior gluteal folds and below the costal border, with or without associated leg pain [2]. Between 1990 and 2019, the prevalence of disability caused by LBP grew across all age categories, with the 50-54 age group showing the highest prevalence [3]. Numerous anatomical factors, including nerve roots, muscles, fascial structures, bones, joints, intervertebral discs and abdominal cavity organs, might contribute to LBP symptoms [4]. 10% of episodes of LBP are thought to be accompanied by nerve root involvement. An increased incidence of chronicity, work

absence, and higher health care costs have all been linked to nerve root involvement [5]. The erosion of the intervertebral disc, intervertebral joints, and zygapophyseal joints damages the spinal nerve roots [6]. Traction is the application of distraction force to produce a separation of the joint and elongate the soft tissues. In the majority of cases, non-surgical treatment, such as lumbar traction, is advised as an initial option for patients with nerve root involvement [5,7]. Body position has been reported to have a substantial impact on traction results. Among the various positional choices available for traction, Unilateral pelvic traction is recommended when a stronger force is desired on one side of the spine. It is documented that patients with scoliosis, unilateral joint dysfunction, unilateral lumbar muscle spasm and unilateral facet joint dysfunction may do quite well with this approach [8]. To the best of our knowledge, there are hardly any studies done on comparing and contrasting the effectiveness of Unilateral Mechanical lumbar traction with Conventional Mechanical lumbar traction.

LITERATURE REVIEW

A K M Rezwan, Tofajjol Hossain, Md.Abir Hasan et al. conducted an experimental study on effectiveness of intermittent mechanical traction. The subjects were divided into two groups, where Group A received intermittent mechanical traction and Group B received manual traction. The pre and post assessment was taken through VAS scale. The study concluded that for patients with signs of lumbar disc herniation, treatment with intermittent mechanical traction for lumbar spine was more useful for the reduction of pain and to improve functional activity.

Journal of Scientific Reports, IJSAB International, 2021

Meszaros TF, Olson R, Kulig K et al. conducted a study on the effect of 10%,30%, and 60% Body Weight Traction on the Straight leg raise test of symptomatic patients with low back pain on 10 subjects with complaints of low back pain or radicular symptoms with a positive unilateral SLR test below 45°. The pain-free mobility of the lower extremity in the SLR test position was measured prior to and immediately following 5 minutes of static traction in the supine position. And the study concluded that the group who received 30% and 60% of body weight traction had improved mobility of lower extremity during SLR test [9].

Journal of Orthopaedic and Sports Physical Therapy, 2000

William E. Prentice in the textbook of "Therapeutic modalities for Physical Therapists" stated that when the traction is applied to a patient in the supine position, hip position was found to affect vertebral separation. As hip flexion increased from 0 to 90 degrees, traction produced a greater posterior intervertebral space separation. Unilateral pelvic traction is recommended when a stronger force is desired on one side of the spine. Patients with protective scoliosis, unilateral joint dysfunction, or unilateral lumbar muscle spasm with scoliosis may do quite well with this approach.

The McGraw–Hill Medical Publishing Division, 2nd edition; 379–80.

Tousignant M, Poulin L, Marchand S et al. conducted a study on the Modified-Modified Schober Test for range of motion assessment of lumbar flexion in patients with low back pain; a study of criterion validity, intra- and inter-rater reliability and minimum metrically detectable change. The objective of the study was to estimate the psychometric

properties of the Modified-Modified Schober test. The study compared the range of motion measurements of lumbar flexion in low back pain patients using the MMST with measurements calculated on X-rays, and compared the measurements taken by two independent examiners. And the study concluded that among the sample of LBP patients, the MMST showed moderate validity but excellent reliability and minimum metrically detectable change[10].

Disability and Rehabilitation, 2005

Childs JD, Piva SR, Fritz JM et al. conducted a study on responsiveness of the numeric pain rating scale in patients with low back pain. Determination of change on the NPRS during 1 and 4 weeks were examined and change in the NPRS from baseline to the 1 and 4-week follow-up was compared to the average of the patient and therapist's perceived improvement using the 15-point Global Rating of Change scale. And the study concluded that clinicians can be confident that a 2-point change on the NPRS represents clinically meaningful change that exceeds the bounds of measurement error[11].

Spine, 2005

Marchand Serge, Charest Jacques, et al. conducted a study to know whether TENS is a placebo effect on chronic low back pain. Forty–two subjects were randomly assigned to 1 of 3 groups which included TENS, placebo–TENS, and no treatment. And VAS pain ratings were taken before and after each treatment session to measure the short–term effect of TENS. And to measure the long term effects, patients rated their pain at home every 2 hours throughout a 3–day period before and 1 week, 3 months and 6 months after the treatment sessions. The study concluded that TENS should be used as a short–term analgesic procedure in a multidisciplinary program for low back pain rather than as an exclusive or long–term treatment[12].

Pain,1993

MATERIALS & METHODS

STUDY DESIGN: Experimental

CRITERIA FOR SAMPLE SELECTION:

The patients will be selected for the study based on the following criteria.

INCLUSION CRITERIA:

- Duration of Low back pain between 2 to 6 months
- Aged between 25 and 50 years
- Gender: Male and Female
- Positive Unilateral Straight leg raise test between 45°- 60°

EXCLUSION CRITERIA:

- Pregnancy
- Vertebral fractures
- Spinal tumors
- Spondylolisthesis
- Lumbar canal stenosis
- Piriformis syndrome
- Neurological deficits
- Previous history of spinal surgery

SAMPLE SIZE: 20 participants

TREATMENT DURATION: 25–30 minutes for 7 sessions

OUTCOME MEASURES:

- Numerical pain rating scale – for pain assessment.
- Modified - Modified Schober test – for assessing the active lumbar flexion and extension range of motion.
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PROCEDURE AND TREATMENT

The group A and group B were assessed with Numerical Pain Rating Scale and Modified–Modified Schober test

Patients in Group A received Unilateral Lumbar Traction along with Transcutaneous electrical nerve stimulation and Patient specific exercises

Step 1: Patient's body weight was calculated and the traction weight was set accordingly. Patients were lying supine. Desired hip–knee position was obtained.

Step 2: The pelvis harness was applied with the upper belt at or just above the level of iliac crest and the rib belt is then applied over the lower rib cage and the straps were positioned along the lower extremity on the desired side of lumbar traction and hooked to the traction device

Step 3: Intermittent traction was set at 30–sec hold time and 10–sec rest time for 10 minutes with traction weight at 1⁄3rd of patients body weight

Followed by Transcutaneous electrical nerve stimulation application for 10 minutes and Patient specific exercise were taught. Patients were treated for 7 sessions.

Figure 1: Unilateral Mechanical Lumbar Traction

Patients in Group B received Conventional lumbar traction along with Transcutaneous electrical nerve stimulation and Patient specific exercises

Step 1: Patient's body weight was calculated and the traction weight was set accordingly. Patients were lying in supine. Desired hip–knee position was obtained.

Step 2: The pelvis harness was applied with the upper belt at or just above the level of iliac crest. The rib belt is then applied over the lower rib cage and the straps were positioned between the lower extremity

Step 3: Intermittent traction was set at 30–sec hold time and 10–sec rest time for 10 minutes with traction weight at 1⁄2 of patient's body weight

Followed by Transcutaneous electrical nerve stimulation application for 10 minutes and Patient specific exercise were taught. Patients were treated for 7 sessions.

Figure 2: Conventional Mechanical Lumbar Traction

DATA ANALYSIS AND RESULTS

Statistical analysis of the data was done using SPSS 20.0. Descriptive statistics were calculated and summarized which includes mean, standard deviation, frequency and percentage. Inferential statistics had been carried out in the study. Pre post comparison was done using paired t test and between group comparison was done using unpaired t test. Level of significance was set at 5%.

Table 1: Pre post comparison of NPRS in group A and group B

NPRS		Mean	Std. Deviation	Average improvement	t value	p value
Group A	Pre	7.200	1.398	3.00	8.216	P<0.001
	Post	4.200	1.032			
Group B	Pre	6.900	1.595	1.6	5.237	P<0.05
	Post	5.300	1.828			

The comparison between pre and post NPRS is shown in the above table. In group A, the average pre NPRS was 7.2±1.398 and post NPRS was 4.2±1.032 with an average improvement of 3 and p<0.001. In group B, the average pre NPRS was 6.9±1.595 and post NPRS was 5.3±1.828 with an average improvement of 1.6 and p<0.001. The analysis shows statistically significant improvement of NPRS in group A and group B

Graph 1: Pre post comparison of NPRS in group A and group B

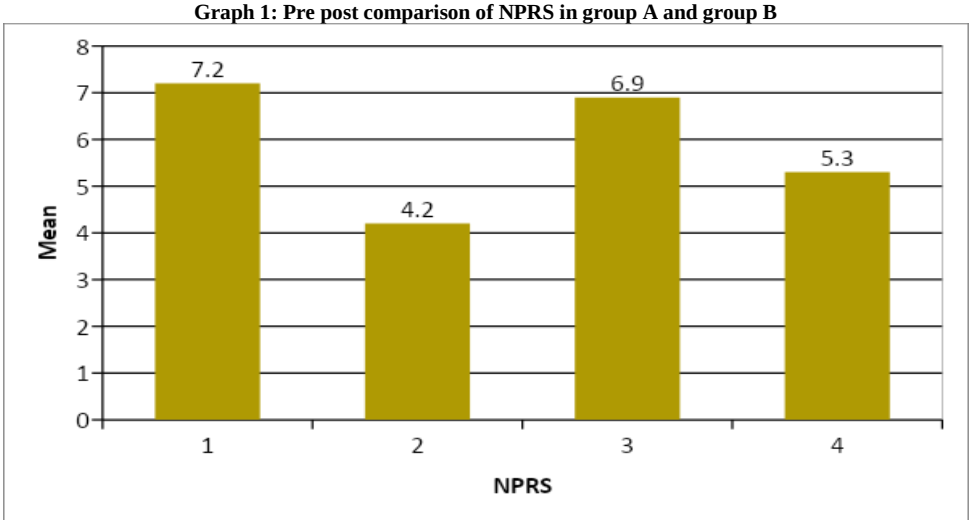


Table 2: Pre post comparison of lumbar flexion ROM in group A and group B

Lumbar flexion ROM		Mean	Std. Deviation	Average improvement	t value	p value
Group A	Pre	19.490	1.131	2.31	4.634	P<0.05
	Post	21.800	1.873			
Group B	Pre	19.050	1.234	1.2	6.466	P<0.001
	Post	20.250	1.419			

The comparison between pre and post lumbar flexion ROM showed that in group A, the average pre lumbar flexion ROM was 19.49±1.131 and post lumbar flexion ROM was 21.8±1.873 with an average improvement of 2.31cms and p<0.05. In group B, the average pre lumbar flexion ROM was 19.05±1.234 and post lumbar flexion ROM was 20.25±1.419 with an average improvement of 1.2cms and p<0.001. The analysis shows statistically significant improvement of lumbar flexion ROM in group A and group B

Graph 2: Pre post comparison of lumbar flexion ROM in group A and group B

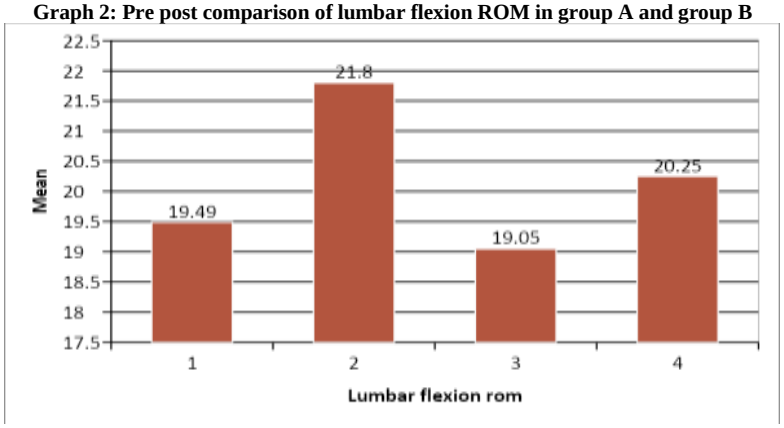
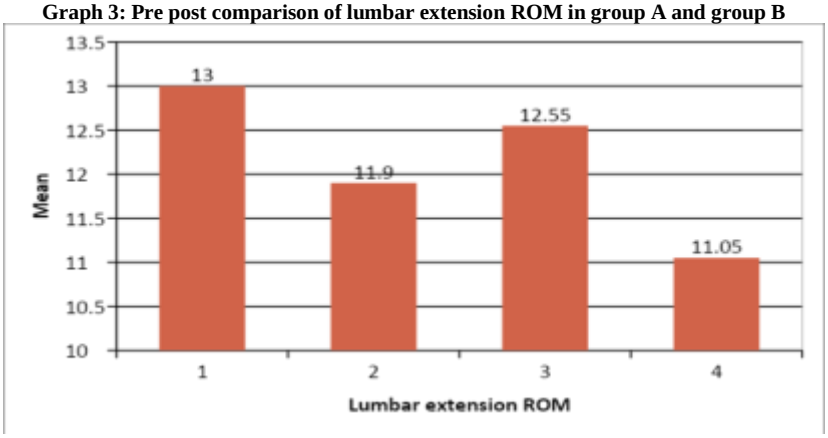


Table 3: Pre post comparison of lumbar extension ROM in group A and group B

Lumbar extension ROM		Mean	Std. Deviation	Average improvement	t value	p value
Group A	Pre	13.000	1.080	1.1	2.23	p>0.05
	Post	11.900	1.776			
Group B	Pre	12.550	1.116	0.8819	5.379	P<0.001
	Post	11.050	1.065			

The comparison between pre and post lumbar extension ROM depicted that in group A, the average pre lumbar extension ROM was 13±1.080 and post lumbar extension ROM was 11.9±1.776 with an average improvement of 1.1cms and p>0.05 which is not statistically significant. In group B the average pre lumbar extension ROM was 12.55±1.116 and post lumbar extension ROM was 11.05±1.065 with an average improvement of 1.2cms and p<0.001. The analysis shows statistically significant improvement of lumbar extension ROM in group B.

Graph 3: Pre post comparison of lumbar extension ROM in group A and group B



DISCUSSION

Low back pain is one of the major causes of disability among the general population. This study was conducted to examine the effectiveness of mechanical lumbar traction positional variations in patients with low back pain.

On comparing Group, A and Group B, the t value of lumbar flexion ROM was 2.087, the t value of lumbar extension ROM was 0.545, and the t value of NPRS was 2.941 which showed average improvement in NPRS and is significantly more in group A than group B. Lumbar flexion ROM and lumbar extension ROM does not vary significantly between group A and group B.

The possible physiology of relieving pain by traction is due to the separation of vertebrae

as it removes the pressure or contact forces from an injured tissue by a distraction force. It increases peripheral circulation by a massage effect, reduces muscle spasm and stiffness[13]. Generally, the neutral spine position allows for the largest intervertebral foramen opening, and the position of choice is usually supine.

Patient positioning for traction should be varied according to a patient's needs and comfort. Unilateral pelvic traction also has been recommended when a stronger force is desired on one side of the spine by just hooking only one side of the pelvic harness to the traction device. To maximize the traction effects on the patient, different positioning can be encouraged.

CONCLUSION

The conclusion of this study was based on the pre post mean measures of Modified-Modified Schober test for active Lumbar Flexion ROM and active Lumbar Extension ROM, and Numerical Pain Rating Scale within and between Group A and Group B, which concluded that there was improvement seen in both the groups, significant difference was seen in group A in terms of pain than group B and there was no significant difference seen in both groups in terms of lumbar ROM.

Implications to Practice

As this study showed significant improvement in participants who received Unilateral mechanical lumbar traction in terms of pain, it can be used in treatment protocol of low back pain to maximize the traction effects.

Declaration by Authors

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Conflict of Interest: The authors declare no conflict of interest.

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