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Effect of Adding Mulligan Segmental Traction to Conventional Therapy on Pain and Function in Subjects with Chronic Mechanical Low Back Pain: An Experimental Study

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Abstract: ***Background: Low back pain (LBP) is an extremely common health problem and a leading cause of disability.It affects day-to-day activities and also the performance at work-place. Aim and Objectives: This study is done to find out the additional effect of Mulligan Segmental Traction with conventional therapyon pain by visual analogue scale (VAS) and function by Modified Oswestry disability questionnaire (MODQ) in chronic mechanical low back pain Methodology: total24 subjects (12 in each group)having chronic Mechanical LBPwere recruited. They were allocated into2 Groups and groupA is treated with Mulligan Segmental Traction along with conventional therapyand groupB Received Only conventional therapy. Outcome Measures: VAS and MODQ RESULT: statistical analysis was done for within groups as well as betweengroups. In within group. In within groups statistically significant difference was found for VAS with paired t test (p=0.001) and for MODQ with Wilcoxon signed ranked test (p=0.002). In between groups statistically significant difference found for VAS with unpaired t test (p=0.001) and MODQ with Mann Whitnney U test (p=0.002). Conclusion: In this study adding Mulligan Segmental traction technique to conventional therapy is more effective in reducing pain and improving function in subjects with chronic mechanical low back pain.***

Keywords: Mechanical low back pain, Mulligan Segmental Traction, Pain, Function

1. Introduction

Low Back Pain affects day-to-day activities and also the performance at work-place. [(1)] Fear of pain result in activity limitations, (e.g., lifting, walking, squatting, prolonged sitting positions, reaching and twisting), participation restriction (e.g., work, recreation activities, family and community) and functional disability.[(2)]

Almost 80% persons in modern industrial society will experience back pain at some time during their life time. [(3)] Approximately 10% will go on to develop chronic and disabling low back pain. [(4)] LBP is a very common problem among adolescents, with an incidence that is the highest in the third decade of life. [(5)] In accordance with the report of World Health Organization in 2002, LBP constituted 37% of all occupational risk factors which occupies first rank among the disease complications caused bywork. [(6)]

In Mechanical Low Back Pain, morning stiffness is present. Forward flexion and returning back to erect from forward bend position is painful. Pain is mainly after prolonged sitting, or standing which is relieved by change of position or lying down. [(7)] The characteristics of mechanical low back pain are heavy pain, which getting worsen with exertion especially in the afternoon, relieved with rest, absence of neurological and muscle contraction,
antalgic posture, associated with inactivity and poor posture. [(8)]

The Mulligan Concept is one of the preferred concepts in the field of manual therapy. These techniques are always applied in a pain-free directionand aredescribed as correcting joint tracking from a positional fault. [(9)]

Mulligan Segmental Traction is a mulligan manual therapy technique used to reduce low back pain by applying vertical pull/traction along the long axis of the vertebral column with using belt. The belt is positioned under the spinous process of the vertebra above the offending segment [(9)] so that Superior facet of inferior vertebra slides caudally under the inferior facet of the superior vertebra, by this way the mobilization of the desired lumbar level occurs. [(10)] And it can concentrate the force on the target segment. [(11)]

However, many previous studies may be explained by imperfection results of general traction as it increases the stress on annulus fibrosus, if its load passes a certain threshold and thus, patient's pain and disability increase secondarily. So in contrast, Segmental Traction can concentrate only The Force on the Target Segment.[(11)]

So, **Need of the study** is to see the effect of adding Mulligan Segmental Traction to conventional in chronic mechanical LBP.

2. Literature Survey

Karimi N et al (2017) conducted study on Effects of segmental traction therapy on lumbar disc herniation in patients with acute low back pain measured by magnetic resonance imaging. They included Fifteen patients with acute LBP diagnosed by LDH. Participants undertook 15 sessions of segmental traction therapy along with conventional physiotherapy, 5 times a week for 3 weeks.

They found that herniated mass size and patients' pain were reduced significantly. In addition, lumbar flexion ROM showed a significant improvement. However, no significant change was observed for back extensor muscle endurance after the treatment procedure. They concluded that segmental traction therapy might play an important role in the treatment of acute LBP stimulated by LDH. [12]

Parvin Akberov et al (2015) conducted study to see the Effects of Adding Segmental Traction Therapy to Routine Physiotherapy on Pain and Functional Ability on 9 patients with Acute Low Back Pain. They undertook a 7-day conventional physiotherapy along with segmental traction therapy. Pain, functional ability and lumbar flexion range of motion (ROM) were measured before and after the therapeutic intervention. A significant reduction in pain was observed after the intervention. In addition, patients' functional ability increased significantly. However, there were no significant changes in lumbar in flexion ROM. They concluded that segmental traction therapy along with a physiotherapy protocol reduces pain and improves functional ability in patient with acute LBP. Although no effect on lumbar ROM is expected.[11]

Kavita Kiritkumar Bosmia et al (2015) Comparison between the effectiveness of Manual Mulligan traction and intermittent electric traction (IET) in cervical spondylosis.22 subjects showing spondylotic changes on cervical spine in X-ray were included. They found that significant improvement in ROM of the subjects treated with Manual Mulligan traction. It was also observed that 63.6% treated with MT had complete relief in radiation whereas those treated with IET only 9.09% had complete relief. So they concluded that Manual mulligan traction can be considered as the treatment of choice for Cervical Spondylosis over Intermittent electric traction, also in cases with radiculopathy. [13]

Sankarganesh A et al (2017) conducted study on to determine the Attitudes and Treatment Preferences of Physical Therapists in Chennai in Managing Low Back Pain (LBP). 91 practicing therapists from Chennai were included in the study. The method of evaluation by the therapists and treatment by the therapist and effectiveness of various treatments noted. They concluded that Treatment by the IFT, strengthening, stretching exercise and education of body mechanics is the most preferable treatment and history, posture, palpation is the best assessment given by the therapist. [14]

3. Methodology

This study was approved by the institutional ethical committee of Gujarat university. Patients having complaint related to back pain and referred to outpatient physiotherapy department by orthopaedic experts, were assessed to find their suitability as per the inclusion and exclusion criteria below. They were requested to participate in the study. They were briefly stated the nature of the study and intervention and written informed consent was taken from them. Demographic data and the pre assessment were taken for back pain like, they were asked about the symptoms of mechanical low back pain and brief physical assessment of the participants were taken. The study was an experimental study, conducted in the different outpatient physiotherapy department of Ahmedabad.

Inclusion Criteria

- Age 20-45 years.
- Subjects having Mechanical low back pain since more than 3 months.
- Both Male and female.
- Subjects having tenderness with grade 1 to 3 at the lumbar spinal level.
- Subjects who are willing to participate

Exclusion Criteria

- Degenerative changes in lumbar spine.
- Individual with neurological entrapment and compression syndrome of lumbar spine.
- Subject having radicular pain.
- Spondylolysis, spondylolisthesis or acute or chronic PIVD of lumbar spine.
- History of any fracture, trauma, surgery to spine and hip.
- Any systemic disorder of lumbar spine, pelvic and hip.
- Subjects with any sever deformity of the spine.
- Pregnancy.

Outcome Measure

Visual Analogue Scale (VAS) was measured to assess the pain. Patients were asked to place a mark on the horizontal line, 10cm in length, to indicate the severity of their pain. The left end of line represents no pain and right end represents severe pain. Measure the distance from the left end of the line to the patient's mark and give it a numerical value. [12] Validity of the VAS for chronic pain is 0.84.[15]

Modified Oswestry Disability Questionnaire(MODQ) as measured to assess the function. This questionnaire consists of 10 items addressing different aspects of function. Each item is scored from 0 to 5; The total score is the ratio of total marked points divided by total possible score multiplied by 100. With higher values representing greater disability. [14] For MODQ the ICC value of 0.84 (95% CI).[16]

4. Procedure

Group A: Experimental Group
This group received Mulligan Segmental Traction and Conventional Therapy.

Group B: Control Group
This group received only Conventional Therapy

Treatment is given for 4 days per week for 4 week. 16 sessions of treatment were given to the patients in 4 week.

Mulligan Segmental Traction
Before application of Mulligan Segmental Traction:[10]
Expose the part of lumbar area to be treated and examine the lower back area which was painful (Tender) and mark that point and after that Proper explanation about the technique has to be given to the patient.

Patient's Position: [10]
- Crook lying

Therapist's Position: [10]
- Standing towards the foot end of the patient.

Belt Placement: [10]
- Therapist secures the belt at the desired lumbar level.
- Belt is secured at the radial groove outside the therapist's arms.
- The other stabilizing belt is place just below the rib cage to stabilize the thorax.

Placement of Pressure Algometer:
- The pull component of pressure algometer is used to measure the force of traction to the spinal segmental level.
- The hook is fit to the pull component side of algometer and it is fixed with the belt beside the patient's lumbar level, opposite and perpendicular to the belt from which the traction force is to be conducted.
- The instrument is held by the other therapist while giving traction, to counteract the force.
- Traction force over the lumbar segment :

Traction Force (T_F) = (Body Weight/4)-4.53 [11]
Reliability of pressure algometer to measure pressure (ICCs) have been shown to range from 0.43 to 0.94 for patient populations. [18]

Figure 1: Placement of Pressure Algometer

Hand Placement: [10]
- Therapist makes fists with both hands and rests them on the foot end of the plinth.

Mobilization: [10]
- Therapist applies the traction by shifting his body weight backward, i.e., simply leans back (lunges) to apply vertical pull/traction along the long axis of the vertebral column.
- Traction is sustained for 20 seconds, 6 repetition in one set. Total 3 sets were given.
- Patient's own body weight will provide the counterforce.

Figure 2: Application of Mulligan Segmental Traction Technique

Conventional Therapy
The patients received conventional therapy in the form of the basic fundamental exercise of 16 sessions in 4 weeks. The exercise session held 4 days per week for 4 weeks. This intervention includes:

- Strengthening exercise for abdominal muscles
- Exercise for core stability
- Stretching exercise.

Stabilization Training: [19]

Segmental muscle activation and sustained contraction
- Drawing-in maneuver

Superficial global multi-segmental muscle activation
- Alternate Straight leg raise
- Alternate Single knee to chest
- Curl up
- Bridging
- Prone on elbow
- Prone hip extension
- Cat-Camel exercise

One set consist of 10 repetitions with 5 second hold was performed 4 days per week over 4 weeks.

Stretching Exercise: [19]
- Stretching of Hamstring muscle
- Stretching of Iliopsoas muscle
- Stretching of Thoracolumbar fascia.

3 sets of stretching with 30 seconds hold and 30 seconds relax, repeated for 3 times was performed 4 days per week over 4 weeks.

Figure 3: Conventional Therapy

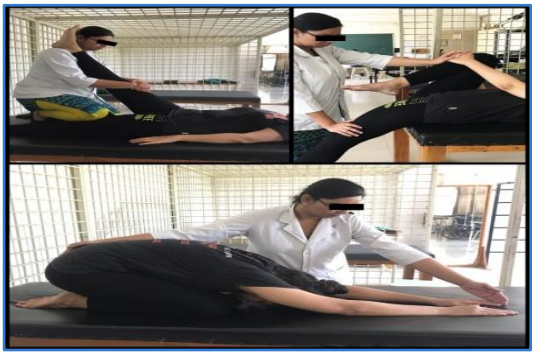


Figure 4: Stretching Exercises

5. Statistical Analysis

The statistical analysis was done using in SPSS 20.Before applying statistical tests, data was screened for normal distribution by Shapiro-Wilk test. In this study power was kept at 95% and level of significance was kept at 5%. The outcome measurements were Pain- measured by Visual Analogue Scale (VAS), Function- by Modified Oswestry Disability Questionnaire (MODQ) with using statistical tests.

Table 1: Distribution of age among the experimentaland control groups

	Experimental	*Control*
Number of subjects, n	12	12
Mean age (yr)	36.58	29.25
Male:female	0:10	2:10

Table 2: Tests Used To Compare Outcome Measures Within and Between Groups

Outcome Measures	*Test Used To Compare Within Group A*	*Test Used To Compare Within Group B*	*Test Used To Compare Between Group A,B*
VAS	Paired t Test	Paired t Test	Unpaired t Test
MODQ	Wilcoxon signed rank test	Wilcoxon signed rank test	Mann Whitney U test

6. Result

As per statistical analysis of this study showed statistically significant improvement in VAS and MODQwithin and between Group A and B.

Table: 3 Paired t test within group A and B FOR VAS

Groups	Pre Treatment		Post Treatment		t Value	p Value
	Mean	SD	Mean	SD		
Group A	6.33	1.32	1.36	1.05	12.61	0.001
Group B	5.94	0.93	3.56	0.81	12.24	0.001

Table 4: Wilcoxon signed rank test within Group A and B for MODQ

Groups	Pre Treatment		Post Treatment		Z Value	p Value
	Mean	SD	Mean	SD		
Group A	18.27	7.49	4.45	2.91	3.066	0.002
Group B	17.67	6.02	10.50	5.72	3.064	0.002

Table 5: Unpaired t test between GROUPS FOR VAS

DIFF VAS	Group A	Group B	t value	p value
MEAN	4.84	2.37	5.736	0.001
SD	1.32	0.67		

Here, the between group comparison of VAS was done by using Unpaired t test, and p value was 0.001 between the two groups. Statistically significant difference in VAS was found between Groups A, and B.

VAS between Group A and B

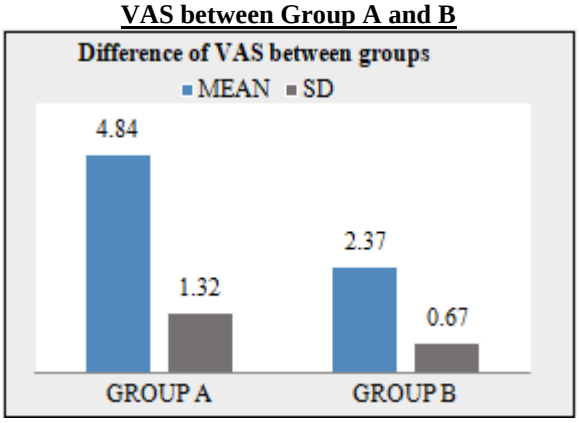
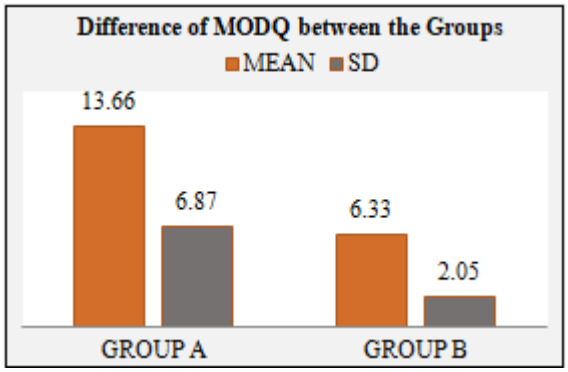


Table 6: Mann Whitnney U test between GROUPS for MODQ

DIFF VAS	Group A	Group B	t value	p value
MEAN	13.66	6.33	18	0.002
SD	6.87	2.05		

Here, the between group comparison of MODQ was done by using Mann Whitnney U test, and p value was 0.002 between the two groups. Statistically significant difference in MODQ was found between Groups A and B.

MODQ between Group A and B



7. Discussion

This study showed that Group A was more effective in reducing pain and improving function than Group B. This could be because of both **Neurophysiological and Biomechanical effect.**

Neurophysiologically, it might stimulate mechanoreceptors and proprioceptors in and around the joints which probably releases much stronger chemicals, which relieves pain. So, sensations of altered relationship of two joint (facet joints) surfaces arrive at the synapse in the substantia gelatinosa of posterior horn of the spinal cord faster than the nociceptive stimulus, there by inhibiting the pain sensations, and release neurotransmitters like endorphins and encephalins, because of which there is less experience of pain. [10]

Biomechanically, such as separation of the intervertebral motion segment, so the micro mal-alignment (positional fault) of the joint is biomechanically corrected by changing the joint alignment and their relationship to each other and

soby this way treating the pathomechanics of the joint which also helps the local inflammation to subside and there is instant pain relief occurs. [10]

The positional fault between affected facet joint surfaces is corrected because in this technique, Superior facet of inferior vertebra slides caudally under the inferior facet of the superior vertebra. So it improves the intervertebral movements at that segmental level so by this It might unlock the jammed facet and also release an entrapped meniscoid between facet joints , the hence correcting the biomechanics of the joints, so spinal muscles around the joints get balanced .[10,12]

Help in stretching and relaxing the muscles around the joints. [10] The relaxation of back musculture which reduces the spasmodic compressive force on the lumbar vertebral column. It may also reducing local peak stress in the annulus fibrosus. It is believed that this stress reduction may result in decrement of the pain, in the low back area. It results in lessening the muscle spasm. It may indirectly break down the pain-spasm cycle and reduce the pain. [12]

In addition to the muscle relaxation effect of segmental traction, **Mobilization induces movement helps to provide nutrition to the facet joints and disc** by movement of synovial folds so the cartilage gets nutrition through synovial fluid. [10] Other mechanism may be, it causes opening of the intervertebral foramen consequently, the imposed pressure on the nerve roots and the induced inflammation and neural sensitivity were lessened. [12]

The present study gives similar result by,
Noureddin Karimi et al (2016) suggest that segmental traction therapy is beneficial on pain who have acute LBP.

Parvin Akberov et al, (2015) suggest that segmental traction therapy along with a physiotherapy protocol reduces pain and improves functional ability in patient with acute LBP.

Whereas in this study during conventional therapy there is reduction of pain and function due to with strengthening exercise programs may have been due to the wide range of muscles trained and the improvements in muscle strength, power and functional abilities seen. And stabilization exercise isolated motor training of the tranversus abdominus leads to earlier onset of tranversus abdominus activation. This enhanced motor control during functional tasks may contribute to reduction in pain. [14] Also,Core strength training program is employed for deep muscles of the trunk. [20] With using thecore muscle stabilization exercise it reduces the shear movements in the spine (i.e) facet joints, facilitating segmental stability so it might reduce the low back pain.[40]

So, in mulligan segmental traction the traction was given in desired segment level therefore the micro-malalignment (positional fault) is corrected, so more intervertebral movements at that segmental level occurs and helps to provide nutrition to the facet joints and disc by movement of synovial folds. While with conventional therapy technique, stabilization of the spine and strengthening of back muscles occurwith core muscles activation and back muscles strengthening exercises. So, with adding mulligan traction more benefit in spinal segmental level movement occurs and positional fault was also corrected so it will more beneficial for mechanical LBP instead of only conventional therapy. So, the result showed more improvement in relieving pain and function in adding mulligan segmental traction with conventional therapy.

Limitation of the study includes Blinding was not done, and Male and female ratio was not equal.

Clinical Implication is that Clinically therapist also use mulligan segmental traction in addition to general traction with conventional therapy for better outcome.

8. Conclusion

So, this study concluded that **adding Mulligan Segmental traction technique to conventional therapy is more effective in reducing pain and improving function** in subjects with chronic mechanical low back pain.

9. Future Scope

- The study can be done to compare the immediate and short term basis.
- The study can also be done in other conditions of low back pain in which it is not contraindicated.
- Study to be done with regular and long-term follow up.

References

[1] Vikki J Parikh et al, Study on factors associated with chronic low back pain in western India, National Journal Of Medical Research 2016. Volume 6, page no.140-142.
[2] Saravanan Kuppusamy et al, Effectiveness of Mckenzie Exercises and Mat Based Pilates Exercises in Subjects with Chronic Non-Specific Low Back Pain: A Comparative Study. International Journal of Prevention and Treatment 2013, 2(4): 47-54.
[3] Maheswari J. Essensial Orthopedics, 3rd Edition(Revised). Page no-350
[4] Anand Heggannavar et al, Immediate effect of modified lumbar SNAGS in non-specific chronic low back pain patients: A pilot study.International Journal of Physiotherapy and Research 2015, Vol 3(3):1018-23.
[5] Anil Chankaramangalam Mathew et al, The prevalence and correlates of low back pain in adults: A cross sectional study from Southern India. International Journal of Medicine and Public Health, Oct-Dec 2013 , Vol 3, Issue 4, page no., 342-346.
[6] Supreet Bindra et al, Epidemiology of low back pain in Indian population: a review.International Journal of Basic and Applied Medical Sciences2015, Vol. 5, page no., 166-179
[7] David J Meggie, Orthopedic Physical Assessment. 6th edition. 2014. Page no.558

[8] Daniele Tatiane Lizier et al, Exercises for Treatment of Nonspecific Low Back Pain. Revista Brasileira de Anestesiologia, 2012, Vol. 62, page no., 838-846.
[9] Brain R Mulligan, Manual Therapy "NAGS", "SNAGS", "MWM" 5th edition.
[10] Dr. Deepak Kumar, Brain R. Mulligan, Manual of Mulligan Concept, Capri institute of manual therapy, (Revised Edition 2015).
[11] Parvin Akberov et al, Effects of Adding Segmental Traction Therapy to Routine Physiotherapy on Pain and Functional Ability of Patients with Acute Low Back Pain, Journal of Rehabilitation Sciences and Research (2015), 37-40.
[12] Karimi N et al, Effects of segmental traction therapy on lumbar disc herniation in patients with acute low back pain measured by magnetic resonance imaging: A single arm clinical trial. J Back Musculoskelet Rehabil. 2017;30(2):247-253
[13] Kavita Kiritkumar Bosmia et al, Comparison between the effectiveness of Manual Mulligan traction and intermittent electric traction in cervical spondylosis. Journal of Nursing and Health Science, Volume 4, Issue 5 Ver. III (Sep. - Oct. 2015), 59-64
[14] Sankarganesh A et al, Managing Low Back Pain: Attitudes and Treatment Preferences of Physical Therapists in Chennai. Journal of Physiotherapy Research. 2017 Vol. 1 No. 2:7
[15] Sriwatanakul et al, Studies with different types of visual analog scales for measurement of pain, Clin. Pharmacol. Ther, August 1983, Volume 34, Number 2, page no 234,235.
[16] JM Fritz et al, A Comparison of a Modified Oswestry Low Back Pain Disability Questionnaire and the Quebec Back Pain Disability Scale. Physical Therapy, February 200. Volume 81. Number 2 .
[17] Davidson et at, A comparison of five low back disability questionnaires: reliability and responsiveness. **Phys Ther.** 2002 Jan;82(1):8-24
[18] Ann M. Kisner et al, Reliability and validly of a pressure algometer, Journal of Strength and Conditioning Research , 2009, 23(1), 312-314.
[19] Shaji john et al, comparison between kinesio taping and a traditional physical therapy program in treatment of non specific low back pain. J. Phys. Ther. Sci, 2014, 26: 1185-1188.
[20] Akhlaq Ahmed et al, Effectiveness of Core Muscle Stabilization Exercises with and without LumbarStretching in Non-Specific Low Back Pain, Annals. July – Sept. 2017, Volume 23, Issue 3.
[21] Paramasivan Mani et al, Abdominal Drawing InManeuver : Effect On Gait Parameters And Pain Reduction In Patients With Chronic Low Back Pain. Int J Physiother., August 2016, Vol 3(4), 473-477.

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