

Effectiveness of Lumbar Stabilization Exercise on Mechanical Low Back Pain

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ABSTRACT

Background: Mechanical low back pain is the most common medical complaint and the leading cause of disability. Lumbar stabilization exercise focussed on deep abdominal and back muscles has gained credibility in patients with mechanical low back pain. Lumbar stabilization exercise has shown benefits for people with mechanical low back pain as the lumbar stabilizer muscles play a role in lumbar segmental stability and as a basic support, and for lumbar segmental stabilization, strengthening of deep and superficial stabilizer muscles and co-ordination are necessary. This study was conducted to find the effectiveness of lumbar stabilization exercise on mechanical low back pain and functional disability in people with mechanical low back pain.

Methods: 15 individuals (both male and female) of the age group 20-50 with mechanical LBP were included in the study and performed each exercise for lumbar musculature once daily for 2 weeks. Visual analogue scale (VAS) and Oswestry disability index (ODI) were used as the outcome measure.

Results: Paired t-tests showed a statistically significant difference between pre and post VAS and ODI ($p \leq 0.05$).

Conclusion: This study concludes that lumbar stabilization exercises are effective in reducing mechanical low back pain and improving functional disability in patients with mechanical low back pain.

Keywords: Mechanical low back pain, Lumbar stabilization exercises, Functional disability.

INTRODUCTION

The most representative musculoskeletal system disorder is the mechanical low back pain (MLBP).^[1] MLBP pain arises fundamentally from the spine, intervertebral disks, or surrounding soft tissues.^[2] Unilateral pain with no referral below the knee that may be caused by injury to the muscle (strain) or ligament (sprain), the facet joint, or in some cases, the sacroiliac joint is called mechanical low back pain.^[3] Chronic low back pain is referred as the pain lasting for at least 3 months.^[4]

The most common symptoms are cyclic pain, Low back pain (LBP) is often referred to buttock and thigh, Morning stiffness or pain is common at morning, Pain is often generated and aggravated by

extension, side flexion, rotation, standing, walking, sitting, and exercise in general which worsens over the course of the day and pain is relived down by change in position by lying down especially in fetal position. Lifting and twisting, poor back posture sustained for prolonged period, inadequate trunk strength, less physical fitness, monotonous work is few risk factors MLBP.^[3]

The lumbar muscles, which includes the deep stabilizer muscles; the multifidus, transverse abdominis, and internal oblique abdominal, and superficial stabilizer muscles, the erector spinae, rectus abdominis, and external oblique abdominal muscle-play an important role in lumbar segmental stability. Thus, strengthening of

deep and superficial stabilizer muscles and co-ordination are necessary. [5] One of the important predisposing causes of recurrent LBP is lack of spinal core stability. As a result, for subjects with low back pain more attention has been paid in the training of localized spinal stabilizer muscles. [6]

The specific lumbar stabilization exercises lead to changes in motor programming of the automatic feed-forward recruitment of deep core muscles. Lumbar stabilization is achieved internally by isometric contraction of the core muscles there by aimed at improving the neuromuscular control, strength, and endurance of the muscles that are central to maintaining the dynamic spinal and trunk stability. [6, 7]

Individuals with back pain can be taught to stabilize the painful pathologic condition through muscular development and movement patterns. [8] Therefore, stabilization exercises were suggested for mechanical low back pain. [6, 7] It is considered as a safe exercise with the advantages of having multiple stages, as well as cost-effectiveness. [9] Hence this study is conducted to find out the effectiveness of lumbar stabilization exercises on mechanical low back pain and functional disability.

MATERIALS AND METHODS

A case series was conducted in a tertiary care hospital, Sothern India. The study was approved by Institutional Ethical Committee.

Participants

Fifteen patients with mechanical low back pain since three months of the age group of 20 to 50 years (5males and 10 females) who were able to understand visual analogue scale and Oswestry disability index are included in this study were included in this study. The participants were excluded, if they have undergone previous back or lower

- Bridging on the floor and Swiss ball
- Modified bridging exercise on the floor and Swiss ball

extremity surgery, fractures or infections of lower back. Purposive Sampling was adopted to select an individual for the study. Using 80% power and 95% confidence interval and to expect difference of 10.8 with standard deviation of 14 with 10 % allowable error the sample size estimated for the study was 15.

$$n = \frac{[Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}]^2}{L^2}$$

Where, n = sample size

$Z_{1-\alpha/2}$ is 95% confidence interval

$Z_{1-\beta}$ is 80% power

L is the allowable error

Evaluation

The participants were recruited according to the inclusion criteria. The participants were asked about their intensity of pain using visual analogue scale and functional disability using Oswestry disability index which is reliable and valid. [10,11] X-ray, MRI and other radiographic images are used to confirm diagnosis.

Procedure

According to the inclusion and exclusion criteria participants were selected. Total of 15 participants (10 females and 5 males) were included in this study. Patients were asked to fill the visual analogue scale (VAS) and the Oswestry Low Back Pain Disability Questionnaire (ODQ) and the data selected were analysed by using paired t-test. All participants were verbally explained about the study and then were recruited in the study after written consent.

Exercise Interventions

All the 15 subjects performed lumbar stabilization exercise which includes:

- Abdominal drawing – in maneuver and hand knee.
- Curl-ups on the floor and Swiss ball
- straight leg raise on the floor and Swiss ball
- Front plank on a Swiss ball and floor
- pelvic rotations on a Swiss ball.

All exercises were conducted according to the following principles:

- Firstly breathe in and out, gently and slowly draw in your lower abdomen below your umbilicus without moving your upper stomach, back or pelvis. "Hollowing" was practiced by the participants with a therapist providing verbal instruction and tactile feedback. When the therapist fingers were placed on either side of the L4, L5 vertebrae a "bulging" of the multifidus muscle have been felt by the therapist. Thereby it ensures effective muscle activation as a feedback technique.

The second phase of this treatment consist of:

- Active joint mobilization exercise including extension exercises in prone and standing position an alternating mid-range flexion extension in a four point stance and to improve compliance, the intensity level of each exercise was modified according to each patient's capacity.
- Stabilization with progressive limb loading and Unstable training devices, such as balls were used.
- Simple curl ups for abdominal muscle strengthening was progressed to dynamic abdominal muscle raising which includes "dead bug" exercise using alternate arm and leg movements on supine and diagonal curl ups were performed.^[7,12]

All participants performed each exercise for three sets with eight to 10 repetitions in each set with two minutes rest between the sets over a period of four weeks once daily under the supervision of the investigator.

Statistical Analysis

Data were analysed using SPSS v.20. Paired t test was used to evaluate the effectiveness of lumbar stabilization exercise on mechanical low back pain and functional disability. Tests were applied at a 95% confidence interval and a p-value of ≤ 0.05 was considered statistically significant.

RESULTS

Fifteen (5 male and 10 female) patients who met the inclusion criteria participated in this study.

Table 1; paired t-test for mechanical low back pain and function

Outcome measures	t value	Sig. (p value)
VAS	14.38	0.00
ODI	3.37	0.005

Table 2: Mean difference of mechanical low back pain and function

Outcome measures	Mean	Mean difference
VAS(base line)	5.27±1.09	
VAS(post treatment)	2.07±1.09	3.20
ODI(base line)	21.34±8.19	
ODI(post treatment)	15.77±4.98	5.59

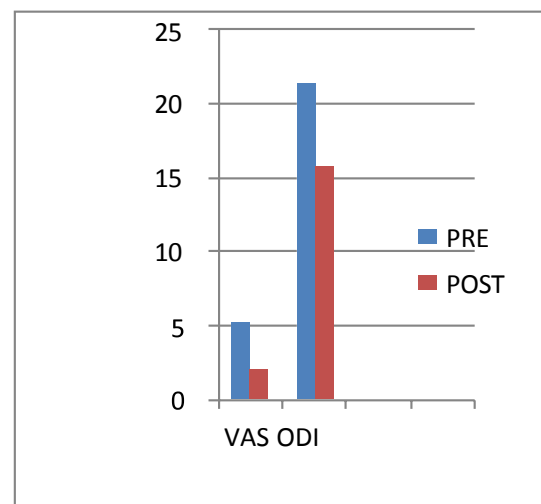


Figure 1: Pre and post treatment on mechanical low back pain and function

DISCUSSION

This study intended to find the effectiveness of lumbar stabilization exercise on mechanical low back pain and functional disability. All the 15 subjects included in this study had completed four weeks of treatment under supervision without fail. The patients showed statistically significant reduction in pain and improved function after four weeks of lumbar stabilization exercise training protocol.

Pain, muscle tension, or stiffness localized below the costal margin and above the inferior gluteal folds with or without leg pain is usually defined as low back pain.^[13] In general practice, the most back pains are from dysfunctions in the elements of mobile segments that is the two apophyseal joints,

intervertebral joints and the ligaments and its muscular attachments which is often referred to as mechanical low back pain.^[14] Also disability is one of the main problem leading to restricted function, limitation of activities and restriction of participation in life situations.^[15] Exercises for the lower back are considered as an effective way to prevent and control back pain.^[16] The lumbar stabilization program builds musculature that stabilize the torso, with concentration of abdominal muscles to provide a corseting effect of lumbar spine.^[8] For maintaining the spine and performing extremity movements lumbar stabilization exercise is important ;also it adjusts the imbalance between the abdominal and trunk extensor muscles.^[17]

Moon et al reported in their comparative study on effect of lumbar Stabilization and dynamic lumbar Strengthening exercises that, functional improvement and lumbar extensor strength was better after lumbar stabilization exercises. The limitation of the study was the results could not be generalized to all patients with LBP and suggesting further studies are needed with longer follow-up periods. ^[12] Suh et al concluded in their study on the effect of lumbar stabilization and walking exercises on chronic low back pain that lumbar stabilization and walking exercise can be recommended for patients with chronic LBP because they not only relieve back pain but also prevent chronic back pain through improving muscle endurance. The heterogeneous cause of LBP was considered as a limitation of this study.^[9]

Lumbar stabilization exercises has the capacity to control the strength of movement when the posture is unstable it controls movement to maintain a neutral spine, a position of the spine that can best adapt to the load of the spine and it tend to cause the activation of muscles while performing a task .There by the transverse abdominal, multifidus, and internal oblique muscles help to increase the intra-abdominal pressure, thereby contributing to the spinal and pelvic stability and thus reducing the mechanical low back pain.^[7,12]

The limitation of this study was that as the treatments were given as a group of exercise this study, could not specify which lumbar stabilization exercise was beneficial for the patients.

CONCLUSION

This study concludes that lumbar stabilization exercises are effective in reducing low back pain and improving functional disability in patients with mechanical low back pain.

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Conflict of Interest: The authors have not reported any potential conflict of interest.

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