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Effectiveness of Trunk Stabilization Exercises Using a Gym Ball Along with Dynamic Myofascial Release on Chronic Non-Specific Low Back Pain

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Abstract: ***Introduction: One of the most prevalent musculoskeletal disorders is low back pain and causes disability which adversely impacts the economy as well. Mainly, there are only few studies which addresses about the management of low back pain. The aim of this study is to find out the effectiveness of trunk stabilization exercises using a gym ball along with dynamic myofascial release on pain and functional performance among patients with chronic non-specific low back pain. Methodology: 30 Subject who have Non-specific low back pain were recruited for the study, subject were selected based on selection criteria. Experimental group: Trunk stabilization exercises using a gym ball along with dynamic myofascial release, Control group: Conventional treatment. Results: The statistical analysis done with unpaired "t" test within the Group which shows that Group A must be significant(p<0.05) than Group B. Conclusion: It is concluded that the effectiveness of trunk stabilization exercises using a swiss ball along with dynamic myofascial release is effective in reducing the low back pain and improving functional performance among patients with chronic non-specific low back pain.***

Keywords: Non-Specific chronic low back pain, trunk stabilization exercises, gym ball, dynamic myofascial release

1. Introduction

1.1 Chronic Non-Specific Low Back Pain

Low back pain can also be classified as acute (i.e., lasting <6 weeks), sub-acute (i.e., lasting between 6 weeks and 3 months) or chronic (i.e., lasting for more than 3 months). It is generally assumed that LBP is a very common condition worldwide, occurring with a relatively high frequency in the general population, so that up to 80% individuals will experience an episode at some point throughout the lifetime

Mechanical factors such as lifting and carrying probably do not have a major pathogenic role, but genetic constitution is important as well. One of the major reasons for low back pain is core muscle weakness. The involuntary basis of core muscle contraction as a part of motor programming. These muscles get recruited in response to the sensory motor mechanism activated by the mechanoreceptors[5,6]

One of the biggest health problems in worldwide is low back pain. Non-specific low back pain is defined as low back pain not attributable to a recognisable, known specific pathology (e.g., infection, tumour, osteoporosis, fracture, structural deformity, inflammatory disorder, radicular syndrome, or cauda equina syndrome). The lifetime prevalence of low back pain is estimated to be around 70% to 80%

The trunk stabilization is consists of several groups of muscle including the transverse abdominus, multifidus, diaphragm and pelvic floor muscles. These muscles work together to produce maximum stability in the trunk region as well as coordinate the movement of the arms, legs and spine.

1.2 Trunk Stabilization Exercise Using Gym Ball and Dynamic Myofacial Release

1.2.1 Trunk Stabilization Exercise

Trunk stability has been defined in terms of a co-activation of global and local muscles. So, specific training that promotes the function of these muscles is needed to achieve co-activation. Exercises for this purpose have been termed lumbar stabilization or core stabilization exercises. For lumbar stabilization exercises there is no formal definition exists, this exercise is aimed at promoting the neuromuscular control, endurance and strength of muscles that are central to maintaining dynamic stability of the spine and trunk[8&9].

Lumbar stabilization exercises tend to cause thickening of the vertebra which includes a combination of activation of muscles while performing a task[9&10]. Lumbar stabilization is the stabilization that is achieved internally by isometric contraction of the core muscles. It is also called core strengthening, motor control learning, and dynamic stabilization. The motive of lumbar stabilization is to regain control of muscles and their movements. The use of unstable surfaces is one approach for trunk stability training. Unstable training devices such as gym balls can be used to increase the difficulty of the exercises. Exercises that use the gym ball use most of the regions of the body so that activities can occur on a more extensive basis than with exercises on the floor. The gym ball purpose is to improve the stability of the spine, the dynamic balance ability, the flexibility, and the sense of balance as ways to prevent damage.

The gym ball exercises also help in improving strength, endurance, and coordination. Gym ball exercises are one of the dynamic exercises, and the main principle is to reduce low back pain by increasing muscle strength, endurance,

balance, and flexibility of the trunk while the individual leans on the Swiss ball. The Exercises can also improve the functions of the nervous and muscular system there by protect and control the spine. Instability training is shown to facilitate neural adaptations of trunk stabilizing musculature thus resulting in an improvement in trunk stability. Stabilization exercises aim to improve the activation pattern of trunk muscles so that low back pain can be relieved[9&10].

1.2.2 Dynamic Myofascial Release

DMFR involves a manual application of low amplitude, long duration stretch to the fascia and muscle, between the levels T6-12. Participants were instructed to relax as much as possible, and the therapist proceeded to smoothly move the joints in a diagonal or horizontal direction at a slow rate within the ROM. The therapist repeatedly pushed, pulled, or shook the joint area about three to five times for about 3 seconds with slight motion at the end of ROM[11].

Functional disability and level of pain can be measured using NPRS and MODI which are highly reliable & valid[20]

The available physiotherapy treatment for managing the non-specific low back pain are physiotherapy modalities, core muscle strengthening exercises, sensorimotor training, segmental stabilization etc. Up to our knowledge there are no studies have been conducted so far to find out the effects of trunk stabilization exercise using a gym ball along with dynamic myofacial release.

Therefore, this study is conducted to find out the effectiveness of trunk stabilization exercise using a gym ball along with dynamic myofacial release on pain and functional performance among patients with non-specific low back pain.

2. Materials and Methodology

Type of Study: Experimental study

Sample Size: 30
GROUP A (15)- Experimental group
GROUP B (15)- Control group

Study Duration: 6 Months

Treatment Duration: 4 WKS

Study Setting: Sri Venkateshwaraa College of Physiotherapy

Inclusion Criteria

- Non-specific low back pain minimum 3 month
- Age of 30-40 years
- NPRS value of 4 and above
- MODI Score ranging from 30 & above.

Exclusion Criteria

- Lumbar spondylolisthesis
- Lumbar fracture
- Spinal tumour
- Spinal infection or inflammatory disease

Outcome Measure

MODI [Modified Oswestry Disability Index] &
NPRS [Numerical Pain Rating Scale] for measuring low back pain and functional disability.

Procedure

Subjects who fulfilled the inclusion criteria were included for the study. The benefit of the study and treatment intervention will be explained to the patient and a written consent was taken. The subject will be assessed using NPRS and MODI question for functional activities. Here Interferential therapy (IFT) is used as a conventional therapy. The patient were allocated randomly into 2 groups consisted of 15 patients each.

Group A –Trunk stabilization exercises using a gym ball along with Dynamic myofascial release

Group B – Conventional therapy (IFT) Interferential therapy.

Interventions

The patient received a 40 minute session of exercise program, 3times a week for 4 weeks for each exercises the patient performed 10 repetitions with 10 second hold and 5 second rest in between the repetition. The patient was given a 1to 2 minute rest in between each type of exercise.

Trunk stabilization exercises using a gym ball

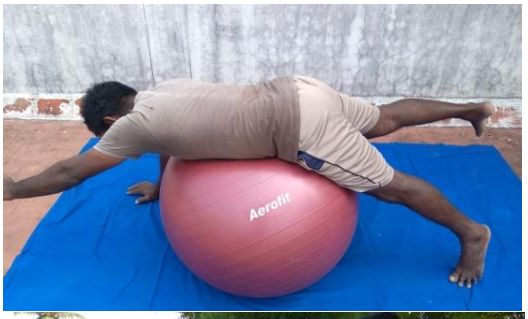
The patient lifted the gym ball up and held it between their legs with both knees flexed in the supine position. Later, the patient lifted the gym ball up and held it between their legs with knee extended in supine position.

The patient lifted their pelvis up to the bridged position and held it, while supporting themselves with both legs on the gym ball and with their knees extended in supine position. Later, the patient lifted their pelvis up to the bridged position and head on the gym ball and with their feet on the floor, with both knees flexed and in the supine position.

The patient placed both their hands on the gym ball and their knees flexed on the floor, maintaining fourpoint kneeling position. Later, patient maintained a four point kneeling position with one arm and leg in extension.

The patient lifted their body up to the push up position and held it, while supporting themselves with both legs on the gym ball and hands on the floor in prone position. later, the patient lifted their body up to the push up position and held it, while supporting themselves with their hand on the gym ball and their toes on the floor in prone position.





Dynamic myofascial release:
The therapist stood facing the participants and supported one arm of the participants to move. The therapist pulled and pushed gently on the side of the shoulder. When the participant shifted the weight forward, the therapist simultaneously moved to the front side slowly with breathing.

The participant put both hands on his neck, and the therapist flexed the knee to 90^0 and placed the participant's elbows on his lap. When the participant shifted his body weight forward, the therapist slowly adjusted the patient's breathing.

The therapist supported the patient's upper flexed knee on his thigh. He made movements of the pelvis and lower limb which was similar to the gait pattern.

MODI				
Group	Pre - test	Post - test	t-value	p- value
Experimental (A)	39.4±9.3	23.17±8.8	20.74	<0.0001
Control (B)	39.87±10.6	29.45±10.3	13.74	<0.0001

The therapist supported the patient upper flexed knee using one hand. Therapist pushed and pulled the iliac crest to the anterior, posterior, upward, and downward direction.

The patient was pronelying the therapist flexed one of the shoulder or pelvis and then moved the other part for counter rotation between the shoulder and the pelvis.

Statistical Analysis

The pre-test and post-test interventional differences within the two group were analyzed using paired 't' test for outcome measures. Statistical significance was set at $p<0.0001$

Within Group Analysis of NPRS (Group A and B)

NPRS				
Group	Pre - test	Post – test	t-value	p- value
Experimental (A)	6.6±0.81	2.2±0.64	20.74	<0.0001
Control (B)	6.3±1	3.3±0.9	13.74	<0.0001

Within Group Analysis of MODI (Group A and B)

3. Result

The statistical analysis done using unpaired 't' test with the values of experimental and control group shows significance of ($p< 0.0001$). Between the group analysis of the post values shows that the experimental group is significant than the control group. After the statistical analysis, it shows that there is a reduction in Pain and Disability of the experimental group A (trunk stabilization exercise using a gym ball along with dynamic myofascial release) than the control group B (conventional Therapy alone) Which shows that the experimental group is significant than the control group.

4. Discussion

The present study is the experimental study conducted to find out the "Effectiveness oftrunk stabilization exercise using a gym ball along with dynamic myofacial releaseon non-specific low back pain". This study was selected for the purpose to reduce the pain & functional performance present in chronic non-specific low back pain patient.

The subjects were selected on the basis of inclusion criteria and they were assessed using the outcome measures such as NPRS (Numerical pain rating scale) for pain and MODI (modified Oswestry disability index questionnaire) for functional outcomes were used.

The outcome measures showed the significant improvement in the relief of pain intensity and reduction in the disabilities of low back after treatment when compare to before treatment values. None of the participants reported aggregates of symptoms during the treatment sessions.

In this study 30 subjects are taken and are divided into two groups as GROUP-A Experimental (n = 15; trunk stabilization exercise using a gym ball along with dynamic myofacial release) and GROUP – B Control (n= 15; conventional therapy). Both the group shows improvement but the group A which is incorporated in trunk stabilization exercise using a gym ball along with dynamic myofacial release seems to be more effective than the control Group B in the reduction of pain intensity and improving functional performance with CLBP patients.

The possibility in the improvement of the dependent variables due to the trunk stabilization exercise using a gym ball along with dynamic myofacial release could involve the following mechanism.

Mechanism of trunk stabilization exercise& DMFR:

Lumbar or trunk stabilization is the stabilization that is achieved internally by isometric contraction of the core muscles. It is also called core strengthening, motor control learning, and dynamic stabilization. The motive of lumbar stabilization is to regain control of muscles and their movements. Unstable training devices such as balls can be used to increase the difficulty of the exercises. Exercises that use the Swiss ball use most of the regions of the body so that activities can occur on a more extensive basis than with exercises on the floor. The purpose of balls can improve the dynamic balance ability, the flexibility, and stability of the spine, and the sense of balance as ways to prevent damage

The ball exercises also help in improving strength, endurance, and coordination. Gym ball exercises are one of the dynamic exercises and the main principle is to reduce low back pain by increasing muscle strength, endurance, balance, and flexibility of the trunk while the individual leans on the gym ball. The exercises can also improve the functions of the nervous and muscular system there by protect and control the spine. Instability training is shown to facilitate neural adaptations of trunk stabilizing musculature thus resulting in an improvement in trunk stability. Stabilization exercises aim to improve the activation pattern of trunk muscles so that low back pain can be relieved.

DMFR involves a manual application of low amplitude, long duration stretch to the fascia and muscle, between the levels T6-12. Participants were instructed to relax as much as

possible, and the therapist proceeded to smoothly move the joints in a diagonal or horizontal direction at a slow rate within the ROM. The therapist repeatedly pushed, pulled, or shook the joint area about three to five times for about 3 seconds with slight motion at the end of ROM[11].

5. Conclusion

From this study it is concluded that the effectiveness of trunk stabilization exercise using a gym ball along with dynamic myofascial release is effective in reducing the low back pain and improving functional performance with non-specific chronic low back pain patients.

6. Limitations &Recommendation

Limitations

- Sample sizes were small.
- Long term follow ups couldn't be done.
- Encountered difficulty in finding 10 RM of each subjects periodically.

Recommendations

- Large sample size can be selected
- In further studies, more outcome measures have to be added.
- EMG can be used as a tool to measure the muscle strength.

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