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Rekha Chaturvedi
Assistant Professor, Guru
Jambheshwar University of
Science and Technology, Hisar,
Haryana, India

Surya Kant Sharma
Head of Physiotherapy
Department, Chawla Nursing
Home, Hisar Haryana, India

Comparison of core muscle strengthening exercise program versus spinal flexion exercises on pain in chronic low back pain patients

Rekha Chaturvedi and Surya Kant Sharma

Abstract

In view of the towering incidences of low back pain an effective exercise protocol that reduces pain as well as strengthen the back musculature must be devised. A variety of exercise regimes are available for treating the low back pain however a particular exercise protocol that can be recommended is unavailable. The primary objective of the current study is to compare the effectiveness of core strengthening exercises and spinal flexion exercises on pain in chronic low back pain patients. A total of 30 subjects were selected by convenience sampling method and are randomized into 2 groups. Group A received exercise protocol of core strengthening exercises and Group B received spinal flexion exercises for 5 days in a week for 6 weeks. Pre and post values of pain were measured by visual analogue scale at baseline visit and at the end of 6 week exercise sessions. The result of the study showed significant improvement in pain in group that received core strengthening exercises. Therefore core strengthening exercises might be recommended for reducing pain in patients with chronic low back pain.

Keywords: Core strengthening, spinal flexion exercises, pain, exercise protocol

1. Introduction

Low back pain is the most commonly encountered musculoskeletal problem. LBP has been habitually related to lumbar flux when defects in design of bone in lumbar region are not diagnosed. This brings to light an emergent problem in contemporary society with commonness ranging from 15% to 20% in the U.S.A, and from 25% to 40% in the European nations, with life time incidences of as high as 60% - 90% and has a prevalence rate of 16% in the Indian population.

In spite of its towering occurrence, the root cause of these aches is not well-known in the majority of patients and is referred as “non specific low back pain”. Spinal stability and muscular strength are prominent factors in the development and persistency of nonspecific LBP [1].

Core musculature plays predominant role in spinal stabilization and pelvis control thus playing cardinal role in the kinetic chain while performing functional movements. Absence in the role played by core muscles will turn the spine to be mechanically unbalanced with compressive forces. When the core muscle works to the expected level there is appropriate recruitment of muscle resulting in maximal force production with minimal shearing and compressive forces while performing the functional movements [2].

Punjabi *et al.* 1992 anticipates about system for progress and reporting pain in spinal region. According to his theory spinal stability involves the articular, muscular and neural systems working in accordance of each other for stabilization by scheming intervertebral movement [3]. Thus, lack of spinal stability can be owned to alteration in the recruitment of deep spinal muscles and which was demonstrated in study by (Paulo H Ferreira *et al.*, 2006) in patients with pain in back [4]. Especially the transversus abdominis co-acting with the lumbar multifidus muscle is important for stiffening the lumbar spine thereby increasing the stability. Also the transversus abdominis provides lateral as well as rotational control to the spine by maintaining the intra-abdominal pressure and disseminating tension to thoracolumbar fascia [5]. Many researchers have demonstrated improper recruitment of these deep trunk muscles (eg transversus abdominis and multifidus) being accountable for instability of the spinal column in

Correspondence
Rekha Chaturvedi
Assistant Professor, Guru
Jambheshwar University of
Science and Technology, Hisar,
Haryana, India

patients with LBP. It was also demonstrated that there is decreased cross-sectional area of Multifidus and Transversus abdominis which accounts for low core endurance in patients with low back pain and increasing the core endurance resulted in hypertrophy of transversus abdominis and multifidus [6] and increased intramuscular fat in the paraspinal muscles in individuals with LBP [1]. Spinal flexion exercises have also proved to be effective in reducing pain by 37% as compared to spinal extension exercises in low back pain patients [7].

Hence, interventions targeting rectification of the changes in the deep trunk musculature and aims to re-establish control and synchronization of deep muscles of the back can be effectual in the administration of importunate LBP [1].

Considering our augmented thoughtfulness of core muscle training in chronic low back pain, modification must be made in our aptitude to reinforce the weak muscle thus bettering low back pain and stability. Low back pain is a frequent crisis observed in females. Researches in this area are mainly focused on clinical procedures and outcomes and this stress is reflected in the quantity of clinical studies that exists. A mixture of treatment designs have been implemented for decreasing pain and stabilizing patients in chronic low back pain. There is relatively small volume of research in the literature concerning program for reducing pain and in chronic low back pain patients. But there is crucial need for development of physical therapy manual in observance with the pain and stability as the criterion in chronic low back pain patients. This research plans to compare the efficacy of core strengthening and spinal flexion on pain in patients suffering from low back ache.

1.1 Objectives

The basic objective of the study is to find out the usefulness of core muscle strengthening schedules on chronic low back pain and body stability. To estimate the success of spinal flexion exercises on chronic low back pain and body stability.

2. Materials & Methods

2.1 Study design: The study was a single blind randomized controlled trial using convenience sampling technique. 30 patients with low back pain aged between 20-60 years following the inclusion and exclusion criteria were recruited in the study.

2.2 Inclusion and exclusion criteria

Inclusion criteria: The participants were included if they had: a) age between 20-60 years b) low back pain from last 3 months c) ready to undertake treatment and measurement regimes.

Exclusion criteria: The subject were excluded if they had: History of lumbar surgery b) Radicular symptoms during functional evaluation c) Neuromuscular and reflex deficits d) History of ankle sprain in last 2 years e) Current hip, knee and ankle pain f) Symptoms of vertigo and dizziness g) Carcinoma h) Pregnancy.

2.3 Procedure

Following the randomization in two groups pre intervention data for pain by using visual analogue scale (VAS) for both the groups were taken. Group A consists of core strengthening group and Group B spinal flexion group consisting of 15 participants in each group. Group A received 6 weeks of progressive core stabilization exercise whereas group B received spinal flexion exercises for 6 weeks. Pain on visual analogue scale (VAS) was the outcome measure for the

present study. Pre and post measurement for pain using VAS were taken at the baseline visit and after 6 weeks.

Progressive core endurance exercise: These exercises were divided into 3 stages, each lasting for 2 weeks, making the exercise duration of total 6 weeks. The systematic approach involves three stages of segmental control, with each stage exposing the individual patient to increasing challenges to her joint protection mechanisms [8, 9, 10, 11]. The exercises were selected based on our previous publication [12]. The exercise session started with warm up that includes jogging for 5 min. Each exercise session lasts for 45-60 min each day with a frequency of 5 days a week for 6 weeks. A rest period of 2 days was given after 5 sessions of exercises for providing adequate rest from exercise. During all the exercise session the subjects were asked to perform abdominal drawing-in maneuver along with the dynamic exercises to facilitate co-activation of the transversus abdominis and multifidus muscles for stabilization of trunk which is a foundational basis for lumbar stabilization exercises. For dynamic exercises, each exercise were performed for 10 repetitions maintaining concentric contraction for 2 sec with expiration and hold for 8 sec with normal breathing and 3 sec of eccentric contraction with inspiration with a rest period of 5 sec during each set. All the exercises were repeated 3 times making a total of 30 repetitions. For static exercises, the subjects were asked to hold the core muscle by drawing in maneuver for 10 sec (30-40 % of maximal voluntary contraction as intensity) followed by 5 sec rest. Each exercise was repeated for 10 times in one set and 3 sets were performed per session (total 30 repetitions) [13]. An interval of 60 sec between the sets and of 3 min between each exercise was given [14, 15, 16, 17, 18].



Fig 1: Tucking –in maneuver in sitting position



Fig 2: Bird dog exercise

3. Data Analysis: Data was analyzed for statistical significance using unrelated T test. The significance level was set at $p \leq 0.05$.

4. Results & Discussion

The result showed greater improvement in pain scores in group A as compared to group B (3.2 ± 1.20 and 1.73 ± 1.22 respectively). There were greater improvements in pain scores in the group A that received core stabilization exercises. The result of the study is in accordance with the review suggesting greater efficacy of motor control exercises in reducing pain and disability as compared to minimal intervention, however the effectiveness of core exercises was not suggested better over any other form of exercise therapy [1]. Chang Wen-Dien *et al.* 2015 that core strengthening exercises have an edge on any other type of resistance exercises for alleviating pain in low back pain patients. Exercises focusing on deep trunk muscle training are recommended to alleviate chronic low back pain [19]. Hides *et al.* 1996 demonstrated that the recovery of multifidus is not spontaneous after episode of low back pain, which is a common cause of remission of low back pain in such patients [20]. Richardson *et al.* 2002 suggested strengthening of transversus abdominis specifically has shown to reduce pain by decreasing the sacroiliac laxity in patients of low back pain [21]. Therefore exercises focusing on local muscle control as well as global muscle control must be practiced in order to prevent the remission of back pain episodes. Akuthota *et al.* 2008 reported strengthening the core musculature provides a strong theoretical basis for treatment and prevention of low back pain, as evidenced by its widespread utilization in clinical practice [16]. Studies had shown that these programs helped in decreasing pain and improve functions in patients with low back pain. Future studies are required to investigate the efficacy of a particular core strengthening programs on treatment and prevention of low back pain, as compared to other exercise training programs for low back pain.

5. Conclusion

The core strengthening exercises can be a better choice for improving pain as compared to spinal flexion exercises in patients suffering from low back pain.

6. Limitations

The finding of the study was based on small number of patients. No follow up was made to confirm the long term effects of the treatment. The present study only focused on parameters of pain and not on any other variables of quality of life, global improvement, and return to work. Theories regarding the mechanisms by which core strengthening exercises relieves in pain in low back pain should be explored further in order to establish in depth understanding about the pain inhibiting mechanism by core strengthening exercises.

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