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Original Article

Effects of six-week exercise training protocol on pain relief in patients with lumbar disc herniation

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Abstract

Introduction: Paraspinal, abdominal, and core muscles are playing the main role in lumbar disc herniation. The aim of the present study was to investigate the efficacy of a 6 weeks exercise training protocol on pain relief in males and females with lumbar disc herniation.

Methods: In this before-after trial study, 64 patients with lumbar disc herniation were assigned to a 6 weeks exercise training program. Training protocol included leg press, trunk lateral flexion, trunk rotation, trunk flexion/extension, and stretching exercises in two sessions a week with 25-30 minutes each. Pain was measured with visual analog scale (VAS) at 1st, 6th, and 12th sessions.

Results: A total of 64 patients (13 males with mean age 47.53 ± 11.71 years and 51 females with mean age 46.50 ± 11.76 years) completed the protocol. The pain was significantly reduced in both males and females during sessions 6 and 12 in comparison with the first session (P = 0.001). The amount of pain relief in males was higher than females (P = 0.047).

Conclusion: About 6 weeks exercise training program could reduce more pain in males with lumbar disc herniation compared to females. This core stabilizing exercise protocol could be a good recommendation for patients with disk herniated low back pain (LBP).

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Introduction

A backache is considered as one of the most crucial problems of the health system and become a costly burden to society. Roughly speaking 80% of the people suffer from the low back pain (LBP) during their lifetime. It is one of the prevalent causes for referral to the physician and leading to the restriction of daily and occupational activities. Different mechanisms are described, and numerous therapeutic methods have been assigned to cope with this problem. The mechanical factors, among other factors, have been stated as the basic cause of the LBP.[1]

The causes, deficiencies and problems of the back pain and the disk herniation inflicted by the mechanical factors such as the amount of the torque made by the erect spinal muscles, lumbar lordosis, and the normal range of spinal mobility which differ in male and female patients.[2,3]

The results of some studies have indicated

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that the disk degeneration is a more prevalent among men than women. It starts primarily in men from the second decade of life, whereas it occurs in women in the third decade.[4] Meanwhile, the back pain complication of the normal life and the kinetic activities affects both genders seriously. At present, there are numerous strategies for the treatment of the lumbar pains caused by the disk herniation which mostly emphasize the pain relief. Exercises and remedial sports have been suggested as one of the non-aggressive strategies to relieve the chronic back pains caused by the disk herniation. In all of these studies the effective role of remedial sports has been emphasized to lessen the LBPs and to restore the patient's normal activities.[5]

Various researches have been carried out to cure the lumbar pains by means of the surgery method of lumbar disk. Statistically, different results have been reported. For instance, some reports have asserted 60-90% pain relief; however, other reports have stated that pain and kinetic deficits remained in 30-70% of patients after the surgery. The persistence of these problems after the surgery could be the result of musculoskeletal imbalance in core muscles and highlights the consideration of exercise training to remedy the LBP. Until now, research projects have been conducted to examine the effects of stabilizing kinetic exercises on the subjects suffering from the chronic lumbar pains. They have pursued the stability and performance improvement of the lumbar spine musculature.[6,7]

Few comparative studies have taken place to reveal exercise effect on pain reduction in different genders inflicted to the lumbar disk herniation.

Consequently, it behooves the researches in the field to broaden and deepen their studies. This study aims at comparing the effect of an exercise protocol on the amount of pain improvement in both genders suffering from the disk herniation.

Methods

About 64 patients with LBP due to lumbar disk herniation were recruited. The subjects of this interventional prospective before-after study included 13 male and 51 female patients. All participants provided written informed consent and the study was approved by regional ethics committee. They were selected by the random sampling method from the patients referred to the outpatient clinic. Inclusion criteria were men and women suffering from the LBPs due to the disk herniation for more than 5 months, aged 20-70 years old. Exclusion criteria were a history of lumbar spine fracture, history of cancer, systemic steroid use, systemically ill, uncontrolled diabetes mellitus (DM), skeletal deformity, history of rheumatologic disorders, progressive motor weakness, incontinency and awakening pain at night.

They were examined by the specialists, and lumbar disk herniation was proved by physical examination and imaging studies. The physical examination included straight leg raise (SLR), reverse SLR, cross SLR, manual muscle tests, stretch tendon reflexes and sensory tests. Magnetic resonance imaging (MRI) conducted for all the patients. All participants had posterior or lateral disk herniation at L4-L5 or L5-S1 level in MRI study.

For pain evaluation progress during the study, we utilized a visual analog scale (VAS) which consists of the graduated line of 10 cm length ranging from 0 (no pain) to 10 indicating an extreme amount of pain. The evaluation of the pain was carried out before starting the first session, in session 6 after the beginning of the exercise protocol and after 12 training sessions. The participants ought to specify their self-evaluation of the existent pain on VAS scoring system.

The exercise training protocol was as follows: Intervention consisted of 6 weeks; two sessions a week and each session lasted for 25-30 minutes of training. After a slight warm-up activity for 5 minutes, they exercised with the leg press device, lateral thoracic flexion and extension for the first three sessions (Figures 1 and 2). After the fourth sessions, the lateral thoracic rotation was added to the training program which

required the flexion as well as extension exercises at the sixth session. All trainings were carried out with the implementation of Documentation Based Care (DBC) device made in Finland. The patients who were unable to do the lateral flexion and rotation movements due the pain were exempted from the activities. During the training program, the participants were asked to avoid taking any kind of painkillers.

All the analyses were performed applying SPSS software (version 13, SPSS Inc., Chicago, IL, USA). To determine the training effects on the pain scale, the correlated T was used and to compare the research groups. The independent test was administered. The significant level was considered as P = 0.050.

Results

Mean age, height, and weight of participants in this study were 56.9 ± 11.7 year, 163.03 ± 7.90 cm and 69.6 ± 10.3 kg, respectively. The age, height, and weight of the two groups (female and male) are given at table 1.

Figure 1. Training protocol based on Documentation Based Care (DBC)

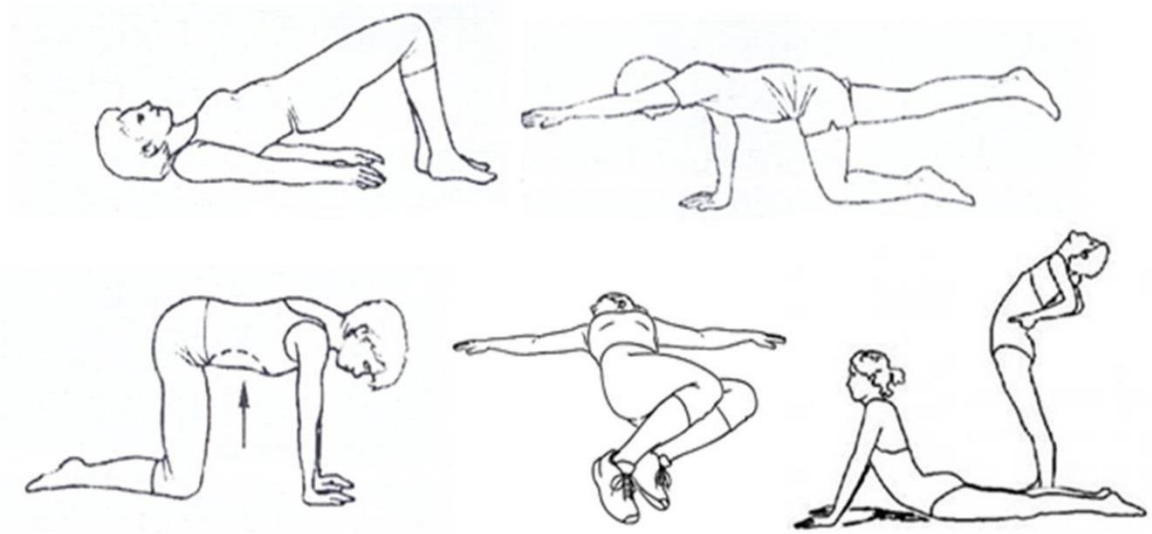

Figure 2. Exercises for low back pain (LBP) in research protocol

Figure 3 indicates the observed amount of pain for the participants in pre DBC, 6 weeks and 12 weeks after initiation of DBC. As it is seen, the pain amount has decreased significantly during the 6 and 12th sessions compared to the first session (P = 0.001).
Table 2 display the amount of observed VAS changes in the two groups between the 1st to the 6th and the 1st to the 12th sessions. It can be noticed that the amount of pain reduction did not reveal a significant difference between the male and female subjects during the 1st and 6th sessions (P = 0.074), whereas the pain decrease was significantly greater in men than women between the 1 and 12th sessions (P = 0.047). Based on VAS there was 12 units greater in men than women during the 1 and 12th sessions.

Table 1. Age, height and weight of female and male participants

Groups	Age (year)	Height (cm)	Weight (kg)
Female (n = 51)	46.50 ± 11.76	161.33 ± 8.15	68.33 ± 11.71
Male (n = 13)	47.53 ± 11.71	171.23 ± 7.79	76.46 ± 10.07

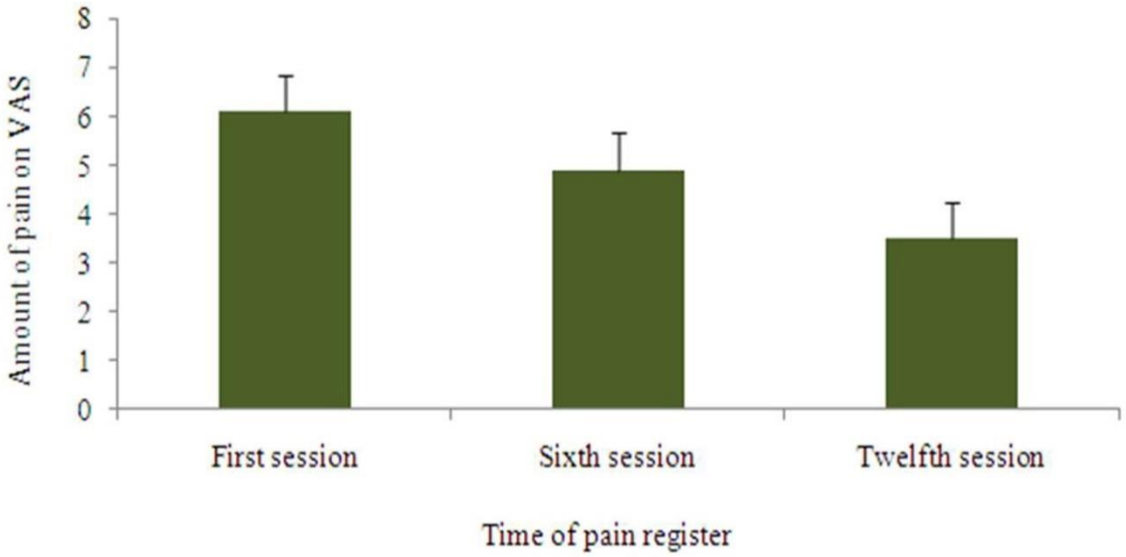

Figure 3. The observed amount of pain for the total participants during intervention and follow-up
VAS: Visual analog scale

Table 2. The amount of observed changes in the two groups between the 1st to the 6th and the 1st to the 12th sessions

Pain change between the sessions	Female	Male	Significant
Amount of pain decrease between the 1st and 6th session	1.60 ± 1.17	2.00 ± 2.15	0.074
Amount of pain decrease between the 1st and 12th session	1.90 ± 2.41	1.90 ± 3.65	0.047*

*Statistically significant

Discussion

In the present study, we compared the pain intensity before and after 12 weeks of exercise in chronic LBP. This study reveals that our 12 weeks of DBC core stabilization exercise protocol for chronic LBP patients reduces pain in 6 and 12 weeks. There is no difference in short-term (6 weeks) between two genders but in longer term DBC exercise (12 weeks), men improved a little bit more than female participants.

Various studies including those of Javadian et al.[8] have reported the consistency of the stabilizing exercises together with the routine exercises in decreasing the pain and increasing the performance ability rate as well as the muscular endurance with regard to its remaining effects during the 3 months after the treatment in the patients who suffered from the segmental lumbar vertebrates. The stabilizing exercises were a more effective than the routine ones.

Hemmati et al.[9] have found out the effects of the intensive central and stabilizing

exercises and under surveillance trainings on decreasing the pain and improving the patients' abilities against the chronic LBPs. Standaert et al.[10] have reported that the stabilizing exercises of the vertebras are effective in ameliorating the performance and the pains for the various groups with the LBP. According to the study done by Karimi,[11] the researcher have suggested the exercises should aim to improve the vertebra stability instead of increasing the power or hypertrophy of the trunk in the cases of LBPs.

Other studies showed a reduction of the pain and failure of the patients' with LBP through the resistance exercises. Furthermore, revealed that the training simultaneous with the coordinating and resisting exercises would be more effective than each in separation. Nutter[12] in the USA, Ylinen et al.[13] in Finland and Tritilanunt and Wajanavisit[14] in Thailand have shown that the useful and curable effects of the sports on killing the muscular-skeletal pains. In Canada, the researchers have demonstrated that daily and regular exercises of even 12 minutes will raise the LBP endurance.[1] Some investigations have reported the aerobic exercises will prevent the mechanical pains more effectively and inexpensively than the other clinical methods such as medicinal and physical therapies.[1]

In this study, the target muscles including the multifidus which are the profound muscles of the spinal vertebrates. It is difficult to access them through Williams and McKenzie's exercises. Yet, if different devices are designed to improve the multifidus at various directions such as flexion, extension, lateral flexion and rotation, the muscles will get stronger. They play crucial roles in controlling and stabilizing the spinal vertebrates; however, they become weakened and atrophic in the patients who suffer from the protruding lumbar disk. Later on, it will not be easy for them to how the access to the same muscles with the common routines. When the muscles get weaker, the back pain gets stronger, so the patient is compelled to being still. The defective cycle repeats itself permanently and leads to the further disability of the patient. Meanwhile as soon as core stabilizing muscles become stronger, the pain will reduce, and the patient will exercise better and get the ability to move correctly and save the normal posture, so the pain cycle brakes.

As a result, the pain and disability will gradually lessen, and the patient will get rid of the defective cycle and the state of disability. His movements are restored, and the performances are ameliorated. The findings of this project maintained that the amount of back pain has lessened and relieved significantly all participants of the two groups in the 6 and 12th sessions than that of the first.

They were correlated with the findings of the other studies. Oliveira and Goncalves[15] assessed the effects of 8 weeks resistance exercises on the electromyography (EMG) range (root mean square) and the frequent of the muscles based on the EMG fatigue threshold (as the highest level of exercises which is done without any change in the EMG). The findings of their study pointed that the exercise plan based on EMGFT1 would influence EMG range more than the MF frequency which is likely related to the recalling pattern of the muscles. Even through the extensor muscles of the trunk showed the variations in the frequency parameter, they become the flexible sign resulted from the training program. On the other hand, Cacchio et al.[16] proved that the training program would decrease the EMG activity of the antagonist muscles, the co-contractile amount of the muscles and increase the force output because of the improvement in the recalling pattern of the muscles and the enhancement of coordination in motor unit synchronism as well as motor learning. It would lead to the decrease of pressure amount on the joints at the final stage, and the perceived pain would be relieved by the patient.

The amount of pain decrease did not reveal any significant discrepancy between the male and female groups. However, it was

significantly greater in men than women between the 1st and the 12th sessions. The decrease rate of the pain based on the VAS scale was roughly 12 units greater in men than in women between the 1st and 12th sessions. The previous studies also reported the increase in muscular powers of the various age groups after a period of increasingly resistant trainings. The power increase is due to the neural flexibility, in particular, during the beginning weeks of exercises. There are evidence that less action individuals fail to recall all motor units during the maximum voluntary contractions. Consequently, the greatest amount of power increase pertains to the muscular-neural flexibilities during the beginning weeks of the exercises.

They, in turn, cause the better recalling for perfect motor units available. After the beginning weeks, the greater increase of power will be cause of the hypertrophy (the increase of the segmental and physiologic level of the muscles) and the increase in the segmental level of the muscular cords. As a result, the decrease amount of pain in both groups has been identical because the amelioration resulted from the exercises has neural reasons during the 1st weeks of the program, whereas when the exercise period is elongated, the pain decrease is greater in men than in women. Probably, the reasons for the pain decrease among the male group are related to the fact that muscular mass and contractile cords are more outnumbered in men than in women. When the training time is enhanced, the muscular power is more resulted from the muscular hypertrophy. Men are of more muscular mass, rapid contractile motor units and hypertrophy. They lead to the increase of power in men; consequently, the pressure on the joints is relieved, and the pain decreases even through to prove the issue requires the assessment of the muscular power.

This project is faced some limitations including, small sample number, lake of the control group, lack of the evaluation for the EMG activities and muscular power.

Conclusion

This study revealed that 6 weeks exercise training program could reduce the greater amount of pain in males with lumbar disc herniation compared to females. This 6 weeks core stabilizing exercise protocol could be a good recommendation for all patients with disk herniated LBP.

Conflict of Interests

Authors have no conflict of interest.

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