ORIGINAL ARTICLE

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The role of weight training in treating farmers with lumbar discopathy

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Abstract

Introduction: Weight training can have a very positive impact on the body by improving both the functioning of internal organs and motor coordination. Weakening of the muscles leads to spinal pain, which in turn reduces one's mobility, this further decreasing muscular strength. Weight training can be used to treat both motor dysfunction and lumbar pain, but it is crucial to combine it with flexibility exercises. The aim of the presented study is to demonstrate the need for including physical exercises into the rehabilitation of patients diagnosed with degenerative disc disease in the lumbar vertebrae.

Material and methods: The research was carried out on 120 patients who were agricultural workers. Each of them had been diagnosed as qualifying for surgery due to a herniated nucleus pulposus at the L4/L5 and L5/S1 levels. After all conventional methods had been tried, strength exercises were applied. The equipment used for the exercises included a multi- gym, dumbbells, weight training rods with plates chosen for a particular groups of muscles. General fitness exercises were also a part of the programme.

Results: The observed results indicate that, sooner or later, weight training leads to full recovery and as such is therapeutically indispensable. By developing antagonistic and synergistic muscular actions, exercises bring relief and allow reduction in the intake of analgesic drugs. As a result, all the patients recuperated. It should be remembered that one week's immobilization reduces muscle strength and endurance by 20%. All the patients who enrolled in the weight training programme were able to avoid back surgery. Systematic exercises improved their neuro-muscular coordination.

Key words

lumbar discopathy, pain, spine mobility weight training

INTRODUCTION

In recent years, awareness has been increasing of the importance of regular physical activity as a way preventing adverse effects of immobility. Exercising in a fitness room or gym is a good way of spending leisure time.

Weight training can have very positive impact on the body by improving both the functioning of internal organs and motor coordination. Weight training with external resistance is necessary, not only in all sport disciplines, but also in physical therapy of paresis, after a stroke or a heart attack, and after injuries of specific groups of muscles participating in a movement. Muscular strength is affected by gender, age, weight, and the type of work a person does. Weakening of the muscles leads to spinal pain, which in turn reduces one's mobility, thus further decreasing muscular strength. Although weight training can be used both to treat motor dysfunction and lumbar pain, it is crucial to combine it with flexibility exercises [1].

Spinal pain can be caused by physical strain which excessively engages muscles, leading to injuries of structures in the area around the spine and the spine itself. This type of strain engages not only the muscles directly responsible for particular movements, but also all other motor units active in contractions, which instantly produce strong mechanical force in the synergistic muscles, and often also in antagonistic muscles [2].

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Spinal stenosis can be congenital or acquired. Its causes include living under continuous stress and tension, lack of leisure and lack of understanding of the significance of regular exercise, all of which lead to all kinds of afflictions and dysfunctions of the locomotor organs. Lack of movement is also conducive to obesity, increases stress on the spine, impedes peripheral and coronary circulation, lowers muscle strength, weakens joints, causes vertebral arches to develop incorrectly, decreases the saggital diameter of the spinal canal, reduces the distances between vertebral corpuses and vertebrae, and narrows the vertebral foramina [3, 4]. Such narrowing occurs in posterior disc displacement, spondylolistesis, cancer, and injuries. The result is central spinal stenosis or lateral spinal stenosis, i.e. compression of the vertebral canal, causing such symptoms as:

– calf cramps
– tension of various vertebral muscles
– sacrum pain
– radicular pain
– numbness of limbs
– sensory disorders
– defecation disorders
– urination disorders
– potency disorders
– disorders of the knee and ankle jerk reflex.

Living under constant stress and lack of physical exercise lead to the weakening and dysfunctioning of organs. In locomotor organs, the stabilizing function is as important as the motor one. These functions are controlled by the muscular system of active stabilization and the passive stabilizing subsystem constituted by ligaments, intervertebral discs, joint capsules, and bones [5, 6].

When symptoms persist despite adequate conservative treatment, dependent on the cause of the pain, other methods are used: physical therapy, kinetic therapy, pain relievers, or surgery. The latter, however, carries serious risks, including limb paralysis. All kinds of intraoperative complications are also possible, such as tearing-off of the supraspinous ligament at the fibro-osseous junction, breaking-off of spinous processes or, in late complications, fatigue-related compression fracture of the L5 spinous process. Surgical treatment of sacrum pain caused by degeneration of intervertebral discs involves decompression of the neural structures and stopping the movement of the painful motion segment, which leads to the appearance of similar symptoms at the adjacent level [7].

Back pain is usually caused by changes related to overstrain, degeneration of vertebrae or the joints between the vertebral bodies, and decrease in the elasticity of the intervertebral discs, which start losing water and consequently also their flexibility, as do the fibres of the fibrous outer rings. With the breakpoint of the spine being c. 350 kg [8], discopathy is a pathological condition in which the fibrous ring around an intervertebral disc is damaged, causing the nucleus pulposus to move towards the spinal canal.

In the early phase of spondylosis, lumbago symptoms dominate [9, 10, 11]. This is believed to be caused by the bulging disc irritating the richly innervated longitudinal ligaments, the instabilty of the injured motor segment and excessive ligamentous tension [9, 10]. Subsequently, large osteophytes appear on the vertebral corpora, as well as deformations in intervertebral joints and narrowing of the vertebral canal [11, 12, 13, 14,], which often results in spondylolistesis, caused by vertebrae slippage [12, 15]. The collapse of the distance between vertebrae usually occurs at places which sustain the most spinal strain, i.e. L4/L5 and L5/S1.

To be healthy and fit, the human body needs regular physical strain, and even a few days of inactivity reduces its fitness by 20% [3, 4].

Lumbar pain is a serious problem, both medical and economic, for it is one of the most frequent causes of incapacitation of employees. It is the main reason for disability among persons under 45 years of age and affects between 60-90% of adults [9]. As regards agricultural workers, among women it is caused by the forward leaning posture during work, and among men by spending many hours (often 10 hours a day) sitting in the tractor seat.

MATERIALS AND METHODS

The research was carried out on 120 patients – agricultural workers – aged between 21-76 years of age: 70 men and 50 women, all with diagnosed spinal disc herniation qualifying for surgical treatment (Fig. 1).

The herniation affected the L4/L5 and L5/S1 levels. The symptoms varied greatly and had been occurring for between 2-9 years. In all patients, restricted spinal mobility with accompanying pain in the lower lumbar region was observed. All showed Laseque's symptoms.

The spreading of the pain into the legs and toes was the cause of motor dysfunctions or complete immobility, but it was not necessarily related to how long the patient had been suffering from the disease. Pain increased as the tension of spinal muscles increased. The patients exhibited static balance disorders caused by motion restrictions of the sacroilliac joints and the shortening of lower limb muscles. They were not able to stand on their toes or heels and all had foot drop, which indicated damage to the nerves in the lumbosacral part of the spine.

The fact that many different methods of treating spine injuries are used is itself proof that none of them offers a certain remedy. The patients were unable to continue their agricultural work.

Having tried conventional methods, weight training at the university gym was applied, with proper consideration given to the character and kind of injury, nature of the complications, existence of concurrent medical conditions, and the patient's age. The equipment used for the exercises included a multi-gym, dumbbells, and weight training rods with plates chosen for particular groups of muscles. General fitness exercises were also a part of the programme. Special attention was given to the groups of muscles of the lower limbs: anterior and posterior dorsal hip, and ventral hip, as follows:

anterior dorsal hip group:
m. psoas major,
m. psoas minor,
m. iliacus.

posterior dorsal hip group:
m. piriformis,
m. gluteus maximus,
m. gluteus medius,
m. gluteus minimus,
m. tensor fasciae latae.

ventral hip group:
m. obturatorius internus,
m. gemelli superior,
m. gemelli interior,
m. quadratus femoris,
m. obturatorius externus.

The abdominal muscles are active in all movements of the spine except its extension.

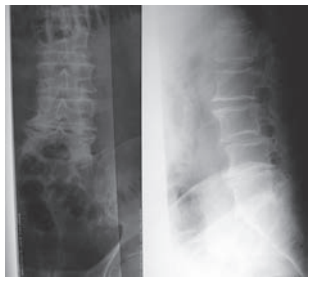
The erector spinae muscles are responsible for returning the vertebral column to its 'erect' position following motion. Attention was given to the following abdominal muscles which facilitate lateral and forward flexion, and rotation to the right and left:

lateral flexion:
m. obliquus externus abdominis,
m. obliquus internus abdominis,
m. quadratus lumborum.

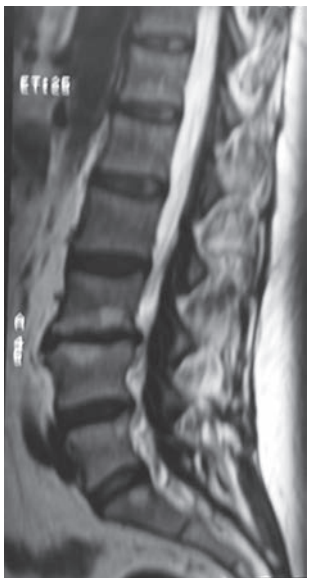
forward flexion:
m. rectus abdominis.

rotation to the right:
m. obliquus externus abdominis,
m. obliquus internus abdominis.

rotation to the left:
m. obliquus externus abdominis,
m. obliquus internus abdominis.



A



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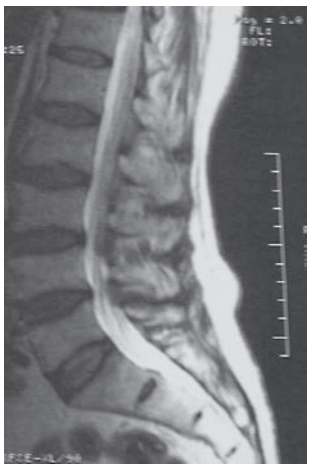

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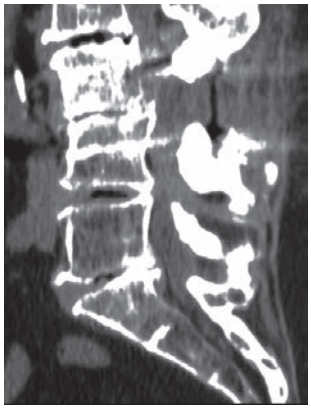
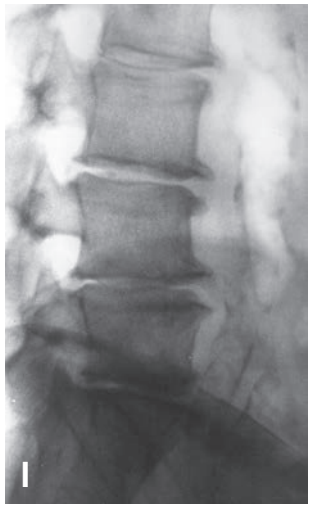
E



F

G

H



I

J

Figure legend. Patients A-J – Discopathy L4/L5 and L5/ S1.

A – men 29 years of age

B – women 40 years of age

C – men 31 years of age

D – men 70 years of age

E – woman 51 years of age

F – men 58 years of age

G – women 65 years of age

H – women 68 years of age

I – women 65 years of age

J – women 25 yearsof age

Figure 1. Examples of degenerative disc disorder associated with lack of lumbar lordosis and degeneration of lumbar vertebrae in farmer's population

The erector spinae muscles form a bundle of several muscle bellies that run in two columns, of which the lumbar and thoracic lordosis are the most developed parts of the group. The medial and lateral columns run parallel to the spine and are mainly responsible for its extension. The multipartite and the semispinalis muscles act laterally or ambilaterally, and depending on the position, they can rotate, flex or extend the spine.

The antagonists of the erector spinae are the abdominal muscles, especially the rectilinear ones. The tonus of the erector spinae alone can hold the body in the upright position. During exercises, particular attention is given to these muscles as well as to the m. quadriceps femoris, which is the only anterior muscle holding the body upright. As such, it is functionally opposed (in the body's upright position) to the spinal muscles in the lumbar region. General fitness exercises guarantee balanced development of all other muscles. Proportional development of the dorsal and abdominal muscles and the quadriceps femoris is very important.

RESULTS AND DISCUSSION

All the 120 patients who enrolled in the weight training programme achieved much improvement and were able to avoid back surgery. Systematic exercises improved their neuromuscular coordination which, as is well known, occurs also at the cellular level, within organs (lungs, heart) or body parts, since the body's movements are controlled by neuromuscular processes. The time it took for the pain to subside and the patient able to return to work varied between one week (*sic*! – in ten patients) and four weeks. The observed results suggest that weight training sooner or later leads to full recovery and as such is therapeutically indispensable. By developing antagonistic and synergistic muscular actions, exercises bring relief and allow reduction in the intake of analgesic drugs. Proper daily exercises at home or at a gym three times a week guarantee that pain and discomfort will not return in the future. It should be remembered that one week's immobilization reduces muscle strength and endurance by 20%.

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