

**THE EFFECTS OF A COMPLEX RECOVERY PROGRAM ON PAIN  
REDUCTION AND IMPROVEMENT OF LUMBAR SPINE MOBILITY IN  
PATIENTS WITH L4-L5 LUMBAR DISC HERNIATION**

**EPECTELE UNUI PROGRAM DE RECUPERARE COMPLEX ASUPRA  
REDUCERII DURERII ȘI ÎMBUNĂȚĂȚIRII MOBILITĂȚII COLOANEI  
VERTEBRALE LOMBARE LA PACIENȚII CU HERNIE DE DISC  
LOMBARĂ L4-L5**

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**Abstract**

*Hypothesis:* In our study we started from the hypothesis that, by using a complex program, which uses as means of rehabilitation massage, electrotherapy, hydrotherapy and physical therapy in patients with lumbar disc herniation, a decrease in pain and an improvement in spine mobility are to be expected.

*Material and methods:* The study was performed on a number of 23 patients who were diagnosed with hernia of the L4-L5 intervertebral disc. They followed a recovery program which included a 15 minute massage session, 10 minutes of electrotherapy with diadynamic currents, 20 minutes of hydrokinotherapy in the thermal water of Băile Felix Spa Town with its specific properties, at a water temperature of 37°C and 40 minutes of individual physiotherapy. Pain was assessed by using the Numerical Pain Rating Scale (NPRS), and spinal mobility by using fingertip-to-floor test (FTF), inverted Schober and Schober test, left and right lateral trunk tilt.

*Results:* The pain decreased in intensity in all 3 situations considered. Thus, in the morning it improved by  $2.61 \pm 1.75$  deck of intensity, after the physiotherapy session by  $1.57 \pm 1.34$  points, and in the evening by  $2.43 \pm 1.56$  points.

Spine mobility increased for all movements analyzed, so that flexion had a positive evolution in both the fingertip-to-floor test ( $5.63 \pm 4.76$  cm gain) and the Schober test ( $0.61 \pm 0.50$  cm) extension gained  $0.57 \pm 0.47$  cm on the average of sample, the right lateral trunk tilt  $1.16 \pm 1.37$  cm, and the left lateral trunk tilt  $0.80 \pm 1.12$  cm.

*Conclusions:* The conclusion reached was that the application of a complex recovery program, which uses massage, electrotherapy, hydrotherapy and physical therapy in patients with lumbar disc herniation at L4-L5, reduces the intensity of pain and improves spine mobility.

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Acceptat pentru publicare în 14.06.2021; Publicat pentru prima dată online în 16.06.2021

Pentru citare: Tarcău, E., Boca, I.C., Oltean, A., Cotrău, A., Ille, M.I. (2021). The effects of a complex recovery program on pain reduction and improvement of lumbar spine mobility in patients with L4-L5 lumbar disc herniation, *Revista Română de Kinetoterapie*, 27(46), 20-26

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**Keywords :** *lumbar spine, pain, joint mobility, rehabilitation*

## **Rezumat**

*Ipoteza:* În studiul nostru s-a plecat de la ipoteza conform căreia, prin utilizarea unui program complex, ce utilizează ca și mijloace de recuperare masajul, electroterapia, hidroterapia și kinetoterapia la pacienții hernie discală lombară, se așteaptă să se reducă durerea și să se îmbunătățească mobilitatea coloanei vertebrale.

*Material și metode:* Studiul s-a realizat pe un număr de 23 de pacienți care au prezentat diagnosticul de herniela nivelul discului intervertebral L4-L5. Ei au urmat un program de recuperare ce a cuprins masaj cu o durată de 15 minute, electroterapii cu curenți diadinamici timp de 10 minute, hidrokinetoterapie cu apă termală cu proprietățile specifice Stațiunii Băile Felix, timp de 20 de minute, la o temperatură a apei de 37°C și kinetoterapie individuală, timp de 40 de minute. Au fost evaluate durerea cu ajutorul scalei Numerical Pain Rating Scale (NPRS), și mobilitatea coloanei vertebrale (testul indice-sol, testul Schober și Schober inversat, inflexiunea laterală stânga și dreapta).

*Rezultate:* Durerea a scăzut în intensitate în toate cele 3 situații luate în considerare. Astfel dimineața s-a îmbunătățit cu  $2,61 \pm 1,75$  puncte de intensitate, după ședința de kinetoterapie cu  $1,57 \pm 1,34$  puncte, iar seara cu  $2,43 \pm 1,56$  puncte.

Mobilitatea coloanei vertebrale a crescut pentru toate mișcărilor analizate, astfel că flexia a avut o evoluție pozitivă atât la testul indice-sol ( $5,63 \pm 4,76$  cm), cât și la testul Schober ( $0,61 \pm 0,50$  cm). Extensia a câștigat  $0,57 \pm 0,47$  cm pe media lotului, inflexiunea laterală dreapta  $1,16 \pm 1,37$  cm, iar inflexiunea laterală stânga  $0,80 \pm 1,12$  cm.

*Concluzii:* Concluzia la care s-a ajuns a fost aceea că, aplicarea unui program complex de recuperare, ce utilizează ca și mijloace masajul, electroterapia, hidroterapia și kinetoterapia la pacienții hernie discală lombară la nivel L4-L5, duce la reducerea intensității durerii și se îmbunătățește mobilitatea coloanei vertebrale.

**Cuvinte cheie:** *coloana vertebrală lombară, durere, mobilitate articulară, recuperare*

## **Introduction**

Lumbar disk herniation accompanied by an increase in pain intensity at this level and a stiffening of the spine, is nowadays one of the most frequent pathologies addressing rehabilitation services. Thus, Papageorgiou, says that the monthly prevalence of back pain is estimated at 43% of the population [1], so that back pain is the second cause of general practitioner consultations after the ordinary cold [2]. The main causes of disc herniation in the lumbar area are, apart from the lack of movement, postural changes (mostly determined by long-held positions and associated with certain professions) and lifting weights repeatedly.

Repetitive physical activities that overload the lumbar spine in flexion can eventually cause the destruction of the posterior fibrous ring [3]. In this context, a study of 177 patients shows that certain types of lifts are associated with an increased risk of herniation of the intervertebral disc. In particular, lifting objects weighing 25 kg or more, with extended knees and bent torso, increases the risk by almost 4 times, and it multiplies up to 7 times if the movement is performed more than 25 times a day. [4]

Depending on the duration of lumbar pain, Şchiopu, says that lumbar pain is classified as acute pain, lasting less than 6 weeks; subacute pain with a development between 6 and 12 weeks and chronic pain whose evolution exceeds 12 weeks or has frequent recurrences [5]. Regarding the type of pain (acute, subacute, chronic), the patient is under stress which creates discomfort primarily physically, affecting functional status. With the persistence of this pain, when the pathology becomes chronic, the physical discomfort is gradually transferred to the mental level, patients being often emotionally affected, experiencing depressive states and anxiety [6]. All these considerations draw attention to an early and complex intervention in the treatment of lumbar disc herniation.

### **Study hypothesis**

By using a complex program that uses massage, electrotherapy, hydrotherapy and physical therapy in lumbar disc herniation patients as a means of rehabilitation, a decrease in pain and an improvement in spine mobility are expected.

### **Material and methods**

For the study were selected 23 people, who presented the diagnosis of hernia at the level of the intervertebral disc L4-L5 at the treatment base of Thermal Hotel in Băile Felix. Patients were evaluated at the beginning of the recovery program as well as at the end. They each participated to 10 rehabilitation sessions.

Pain was assessed on the basis of the Numerical Pain Rating Scale (NPRS). This scale, like the visual analog scale (VAS), is used by the patient to describe the degree of pain felt. The scale has ratings from 0 to 10 (11 items) [7] and the patient will describe the pain he or she has felt in the last 24 hours [8]. This scale has been chosen because it can be used both in written and verbal communication [9]. For the validity of the scale, it has been demonstrated that NPRS is correlated with VAS in patients with rheumatic diseases and other chronic conditions of their pain, correlations values between 0.86 and 0.95. [10]

For spinal mobility, the index-ground and Schober tests for flexion, the Inverted Schober test for extension, and lateral trunk tilt were used. The patient in orthostatism, with his back against the wall, will be asked to keep his arms close to his thighs. The index-ground test consists of the anterior flexion of the torso, with the knees extended in an attempt to reach the tip of the toes with the hands. To determine the score, mark with “-” (the number of centimeters needed until the support surface is reached) and the sign “+” (the number of centimeters that have exceeded the level of the support surface or the tiptoes). [11]

For the Schober test, the patient is in orthostatism and the examiner draws a horizontal line that marks the spinous process S1. The next horizontal line is marked 10 cm above the first line and the patient will be instructed to perform the flexion of the torso (with the knees extended) in an attempt to touch his feet. The examiner measures the new distance between the two lines. The difference between the initial and the final measurement indicates the amount of lumbar flexion. The test is positive when the increase is no more than 5 cm.

The Inverted Schober test is the opposite of the Schober test. The patient in orthostatism will be asked to extend the spine as much as possible. The result is obtained by the difference between the initial measurement (10 cm) and the final measurement.

For lateral trunk tilt assessment, the patient is in orthostatism, with his back against the wall, the examiner will mark with a horizontal line, on the side of the thigh, the point where the dactilion (tip of the medius finger) is. The patient is asked to tilt the trunk on a side without detaching the back from the wall. Another horizontal line will mark the new landmark of the dactilion and the difference between the 2 landmarks on both sides will be measured.

The objectives based on initial assessments and on the expectations at the end of the rehabilitation period were:

- ◆ Reducing pain intensity;
- ◆ Regaining the amplitude of movement on the movements of flexion, extension and lateral trunk tilt;
- ◆ Increasing the strength of the abdominal and gluteal muscles;
- ◆ Maintaining an optimal balance of strength between the abdominal muscles and lumbar extensors, between the piriformis muscle and small and medium glutes, toning in condition of shortening of the abdominal muscles, toning in conditions of elongation of the paravertebral muscles;
- ◆ Pelvic rebalancing and delordosis / lordosis;
- ◆ Maintaining a proper body alignment between the pelvis and lumbar spine.

The rehabilitation program included a 15 minute massage session, 10 minutes of electrotherapy with diadynamic currents, 20 minutes of hydrokinetotherapy with thermal water with the specific properties of Băile Felix Spa Town, at a water temperature of 37°C and 40 minutes of physiotherapy individually designed.

## Results

Pain indicates initially the higher intensity in the morning, group average was  $3.65 \pm 2.01$ , and the lowest, after the physiotherapy session, mean  $1.96 \pm 1.74$ . After 10 sessions of rehabilitation pain intensity decreased to  $0.39 \pm 0.58$ , after the physiotherapy session with an average to low effect size (0.332) and  $1.00 \pm 0.85$  in the morning, the effect size being average (0.458). (Table 1)

Table 1. Results of pain intensity assessment

How pain intensity was perceived	Initial	Final	Difference	Effect size
Morning	$3.65 \pm 2.01$	$1.00 \pm 0.85$	$2.61 \pm 1.75$	0.458
After the physical therapy session	$1.96 \pm 1.74$	$0.39 \pm 0.58$	$1.57 \pm 1.34$	0.332
In the evening	$3.00 \pm 1.68$	$0.57 \pm 0.79$	$2.43 \pm 1.56$	0.940

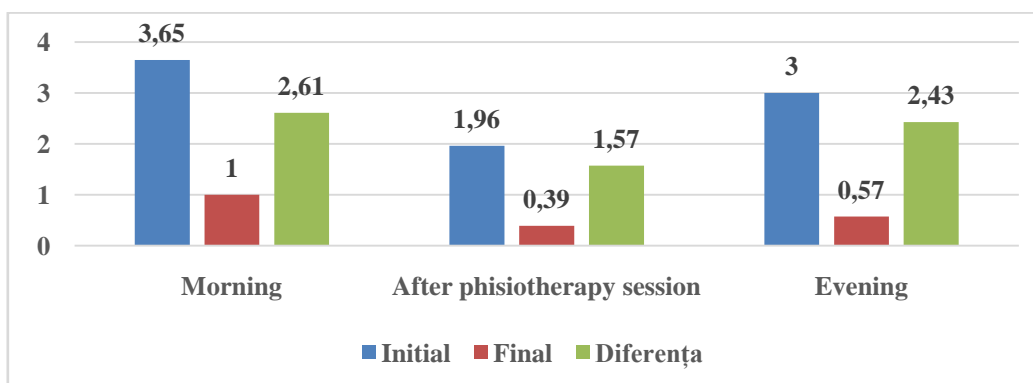


Figure 1. Pain analysis - group average

In the evening, the pain intensity values were between the other two measurements of the day, in both the initial evaluation with an average of  $3.00 \pm 1.68$  and the final evaluation with an average of  $0.57 \pm 0.79$ , the effect size being high (0.940). (Figure 1)

The mobility of the spine was analyzed in flexion, extension and lateral tilt movements, the flexion being analyzed both by the index-ground test and by the Schober test.

At the initial evaluation, with the help of the FTF test, a flexion deficit of  $-15.41 \pm 9.28$  cm resulted, and at the final evaluation the deficit was reduced to  $-9.70 \pm 10.66$  cm, so a gain of  $5.63 \pm 4.76$  cm and a small effect size (0.143). The Schober test also indicates a favorable evolution of the mobility of the spine, the final gain being  $0.61 \pm 0.50$  cm, the size of the effect being also in this case a low one (0.160).

The favorable effects of the recovery program followed on the mobility of the spine are also noticed in the other evaluated movements, the results being highlighted in table 3 and figure 2.

Table 3. Spine mobility analysis

Movement	Initial	Final	Difference	Effect size
Flexion (fingertip-to-floor test)	$-15.41 \pm 9.28$	$-9.70 \pm 10.66$	$5.63 \pm 4.76$	0.143
Flexion (Schober test)	$13.88 \pm 1.02$	$14.49 \pm 0.89$	$0.61 \pm 0.50$	0.160
Extension (inverted Schober test)	$8.91 \pm 0.43$	$8.31 \pm 0.56$	$0.57 \pm 0.47$	0.303
Right side tilt	$12.67 \pm 2.73$	$13.82 \pm 2.58$	$1.16 \pm 1.37$	0, 108
Left side tilt	$13.11 \pm 3.20$	$13.91 \pm 3.26$	$0.80 \pm 1.12$	0.062

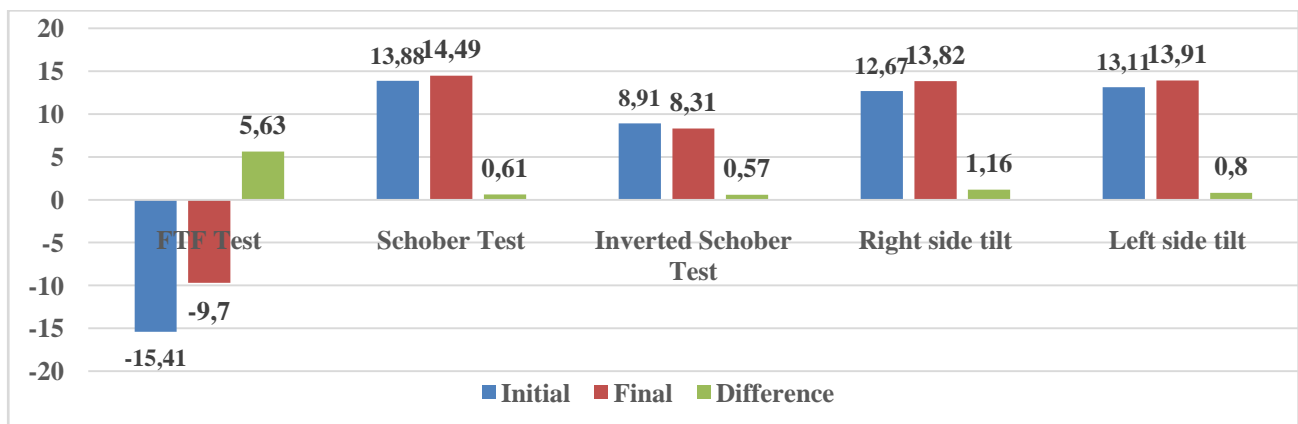


Figure 2. Analysis of the mobility of the spine - the average of the group

## Discussions and conclusions

The main symptom in lumbar disc herniation is pain of varying intensities, which in most cases also reduces the mobility of the spine and consequently functional deficit. Therefore, the treatment to be followed consists of using the most complex and complete means to reduce pain intensity. In this context, Szasz et al. (2012) conducted a study on 100 patients divided into 2 groups of 50 people, the first group (A) benefiting from drug treatment, electrotherapy and muscle relaxant massage., and the other (B) having in addition kinetotherapy [12]. The authors found that the pain improved after 3 weeks of treatment in both groups, with no major differences between them, from an average of  $7.48 \pm 0.93$  to  $2.34 \pm 1.00$  in group A and from a value of  $7.46 \pm 0.95$  to  $2.02 \pm 0.82$  in group B, and a  $p < 0.001$  index value with a high degree of statistical significance. At 6 months after treatment, the pain increased again in intensity, in group A approaching the initial

value, while in group B it remained almost as it was after the 3 weeks of treatment. Thus, from a statistical point of view, the authors show that, between the initial assessment and the one at 6 months, in group A, the value of  $p < 0.06$  is therefore statistically insignificant, while in group B, which also benefited from physiotherapy, with a  $p < 0.001$ , a high degree of statistical significance.

Regarding the mobility of the spine, the importance of physical therapy as a means of recovery is highlighted in various scientific papers. A recent study by Cichon et al. (2019) [13] on 33 elderly women with degenerative problems in the lumbar spine, claims that through physical therapy the degree of lumbar mobility increases. Jeong et al. (2017) [14] state the same. The study was performed on 30 subjects divided into 2 groups of 15 patients. During a time period of 4 weeks, patients in a group performed resistance exercises to stabilize the center of balance 3 times a week, for 30 minutes. In conclusion, it was established that these exercises improve the stability of the sacroiliac joint and therefore this increases the range of motion in the lumbar spine.

In conclusion the application of a complex program of rehabilitation, which uses as rehabilitation means: massage, electrotherapy, hydrotherapy and physiotherapy in patients with herniated lumbar disc, reduces pain and improves mobility of the spine.

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