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Original article

## UPDATES IN MEDICAL REHABILITATION FOR LUMBAR DISC HERNIATION AFTER CONVENTIONAL SURGICAL INTERVENTION AND PROFESSIONAL REINSERTION

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### Abstract

Current studies show that the incidence of cases with a diagnosis of operated lumbar disc herniation is growing rapidly. Studies claim that more than 80% of the population presents at least once during their life, complains of lumbar pain. 25% of them have recurrences, and 10% will have chronic pain, which leads to the loss of work capacity due to disability, affecting health resources and affecting the quality of life. The clinical manifestations given by the degenerative diseases of the spine as being an important determining factor in the loss of work capacity. The success rate of lumbar disc surgery appears to be 92-98% in some studies and 5-20% for recurrent hernia.

*Aim.* The aim of this study was to increase the quality of medical care regarding medical rehabilitation for patients with operated lumbar disc herniation.

The objective is to establish the percentage of subjects with operated lumbar disc herniation in relation to professional reinsertion.

This research will be done 1396 subjects aged between 40 and 50 years in INEMRCM Bucharest, during 10 days to which a physiotherapy protocol was applied for 3 hours / day. Subjects underwent surgery for a lumbar disc herniation operated by the traditional method on the L5-S1 vertebrae. During this research, the patients will be given a physiotherapeutic program adapted to the pathology of the operated lumbar disc herniation.

*Methods.* Lumbar Schober test, Tomayer test, Biometric evaluation using dynamometer and Analog visual scale, applied in the initial and the final phase to see the efficiency of the proposed physiotherapeutic program

*Results.* The results of the study show the importance of physical exercise for the functional recovery in lumbar disc herniation and the subjects were able to resume their professional activity.

*Conclusions.* Research has shown that physical exercise performed under specialized medical instructions has a beneficial effect on the biopsychosocial balance and promotes well-being.

*Keywords:* lumbar disc herniation, medical rehabilitation, professional reinsertion.

### Introduction

Physical exercise is the basis of medical rehabilitation and represents the link between the subject of this paper and Sports Science. Used for therapeutic purposes, physical exercise has the effect of increasing the quality of life due to the organization of movements under specialized guidance, respecting the biomechanics of the human body. The quality of life includes all conditions that ensure the integrity of biological life (Petrescu, 2013).

The global balance, obtained through physical exercise, enters into connection with the other subsystems of social life, transforming into a particularly comprehensive phenomenon, bringing into its sphere millions of individuals, with different historical and cultural backgrounds (Hanu, Teodorescu & Ene-Voiculescu, 2016). Physical exercise is based on spatio-temporal orientation and has the role of maintaining a balance between training based only on the game and those based only on technical-tactical information (Stoica et al., 2023).

Orderly movements contribute to maintaining a postural balance. Balance is part of coordination and the ability to coordinate is necessary to achieve the development of motor skills and is based on the ability to learn, control and adapt permanently (Gherghel & Buzescu, 2013).

Motor life depends on the health of the spine, as any damage to it can lead to damage to psychomotor skills.

The vertebral column is seen as the "axial organ" of the locomotor apparatus (Marcu & Dan, 2006). Affecting the locomotor apparatus causes locomotion disorders and implicitly the development of locomotor disability (Bernardi et al., 2021).

High axial load, in areas with high gravitational impact such as the lumbar spine, leads to various pathologies of the spine such as lumbar disc herniation which, if not properly treated, emerges for a surgical intervention.

For the purpose of somato-functional rehabilitation and to prevent a locomotor disability that occurred as a result of a lumbar disc herniation in the case of a surgical intervention, we use a set of techniques and methods, based on physical exercise, to obtain a favorable recuperative response in the shortest possible time (Blauwet & Willick, 2012).

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The action of the morpho-functional factors cooperates in performing physical exercises and is due to biomotor qualities (Nemeș & Gogulescu, 2006). The correct attitude is particularly important during the execution of the movements (Baciu, 1981).

The correct attitude favors the normal development of the movements, and the correct movements, in turn, determine a recovery of the attitude. We find this anticipation phenomenon in proprioceptive exercises, also called neuro-motor (sensory-motor) reprogramming exercises.

Adequate neuromuscular control allows the permanent maintenance of a minimum level of joint stiffness, while temporary or permanent modification of this neuromuscular control can lead to the installation of lesions in the lumbar spine, causing pain. Continued lumbar pain syndrome with operated lumbar disc herniation, is a musculoskeletal affliction that affects the vast majority of the population, regardless of age, being predominantly in people of the second age. The worldwide recognition of the importance of medical recovery is the result of its beneficial effects, therefore, it is necessary to develop new models for testing and evaluating subjects with the aim of limiting pain and the frequency of pathology.

A 2014 study reporting on the incidence of herniated discs in adults states that lumbar disc herniation is the most common cause of radiculopathy, with an estimated annual incidence ranging from 1.6% in the general population to 43% in certain areas of activity (Patel et al., 2014).

Motor rehabilitation started as early as 1919, after the First World War, due to the need to prevent injuries during the war and at the same time the disabilities that occurred, and as a specialization it was adopted in 1947, after the Second World War.

Lumbar disc herniation with the presence of sciatica is a well-known condition from a historical point of view. The process of understanding was quite long, moving from the beliefs of an early society that believed that supernatural demonic forces would act with crippling pain on individuals, to those with physiological views that critically approached the decisions of the ancient Greeks (Hippocrates) to Egyptians who suspected a relationship between lumbar spine pathology and lower limb symptoms (Truumees et al., 2015).

At the beginning of the 20th century, the concept of herniated disc was introduced by Christian Georg Schmorl. Currently, according to the recommendations of the combined North American Spine Society, American Society of Spine Radiology, and American Society of Neuroradiology, they have concluded that "the best general term to indicate displacement of disc material and localized displacement of nucleus, cartilage, fragment of apophyseal bone or fragmented annular tissue beyond the intervertebral disc space is disc herniation" (Benzakour et al., 2019).

Nowadays, medical recovery is rapidly rising due to the human need to use physical exercise for prophylactic purposes and not only, and the discovery and development of new rehabilitation techniques have a favorable and rapid response in medical recovery. That is why, in international guidelines, it is desired to have as many innovative equipment as possible with a rapid effect in medical rehabilitation (Major et al., 2021).

#### *The purpose of the research*

This research aims at the effective medical recovery of patients with lumbar disc herniation pathology operated in order to recover work capacity and and facilitate medical staff communication, the use of assessment tools as well as standardized outcome measures for rehabilitation interventions. (Ustun et al., 2003).

#### **Objectives**

- The purpose of this study is the development of a complex physiotherapeutic protocol, which allows the synthesis of evaluation and treatment means in schemes with indicative value. Approaching new treatment methods to enhance the healing process.

#### *Research hypotheses*

- A complex recovery protocol ensures effective functional recovery
- Professional reinsertion depends on a properly applied therapeutic protocol

#### *Research period, place and subjects*

This research will be done 1396 subjects aged between 40 and 50 years in INEMRCM Bucharest, during 10 days to which a physiotherapy protocol was applied for 3 hours / day. Subjects underwent surgery for a lumbar disc herniation operated by the traditional method on the L5-S1 vertebrae. During this research, the patients will be given a physiotherapeutic program adapted to the pathology of the operated lumbar disc herniation.

#### *Inclusion criteria:*

- Age between 40 and 50 years; factor of the disease: overload, surgical procedure performed at least 3 months before the conventional method; acute treatment of the disease, radiculopathy present; o osteosynthesis materials present

#### *Exclusion criteria:*

- No hypertension in treatment, obesity, diabetes, postoperative complications, history of COVID, no spine surgery before.

## Methods

Measurements and tests used in research

Regarding the testing, we will use several evaluation tests targeting 2 statistical indicators, namely the evolution of the subjects by comparison during two weeks after the application of the proposed medical recovery program. We also want to assess whether the psychological indicator was positively affected after the treatment.

### 1. Lumbar Schober Test:

Test position: orthostatic

- a sign is placed on the skin over the 5th spinous process of the S1 vertebra, which is at the level of the superior iliac spines or the pits of Venus, and another sign 10 cm above in the midline, the subject performs the flexion of the trunk without bending the knees, it is measured in cm, the distance starting from the L5/S1 level with 10 cm caudal (for lumbar Schober) and 10 cm proximal (for dorsal Schober) the change made by flexion of the spine is measured. In healthy patients, the distance between the two signs increases by more than 5 cm, while an increase of less than 4 cm suggests a decrease in the mobility of the lumbar spine.

2. Tomayer test - from orthostatism the bent torso, with close legs and arms outstretched, is assessed by measuring the distance between the ground and the top of the middle after performing the spine flexion, the optimal distance is 0.

### 3. Biometric evaluation - joint evaluation that can be done using:

Joint balance - is done with the goniometer

- is an objective evaluation method used to measure from a biomechanical point of view, the range of motion of the joint of interest, on the possible anatomical directions, in the corresponding planes and axes.

Torso flexion

- movement involving the concave curvature of the torso forward: lumbar lordosis changes in the opposite direction, dorsal kyphosis is accentuated and the cervical spine is rectilinear and slightly concave forward. (Jiri Dvorak, 1991)

The range of motion is between 00-900 of which 500 are made from the spine and the next 40 are made from the lumbar spine

Lateral tilt of the torso

Orthostatism with the hands next to the body, the subject performs the lateral tilt of the torso so that the hand approaches the lateral epicondyle of the femur. The range of motion is between 00-350. (Sidenco, 2005)

### 4. Analog visual scale (VAS)

Pain assessment is recommended using an analog visual scale (0 to 10 points). 2. The etiological assessment of pain (eg musculoskeletal or neuropathic), location, qualitative and quantitative characteristics, intensity, duration, determination of factors that aggravate or ameliorate pain is recommended. Pain Assessment Scale - The Wong Baker Faces Scale (VAS) or visual analog scale is an important tool used by many specialists to determine the intensity of pain. (Puolakka, 2008)

### *Rehabilitation protocol*

#### Massage

A sequence of manual or mechanical manipulations is performed, applied symptomatically on the body surface for therapeutic purposes with the help of sedative massage, also having the role of maintaining muscular and vascular trophicity, which will be applied to all the muscles of the back (Ernst, 1999). Since lumbar pain is expressed as a "living" pain due to contractions, all maneuvers will be performed to the limit of endurance (Ionite et al., 2007).

#### Electrotherapy

Magnetodiaflux - acts on SNV components and on different organs and tissues depending on intensity and frequency. The forms of application are: continuous, arrhythmically interrupted, rhythmically interrupted. They can be modulated in the variants: 50 Hz, 50-100 Hz, 100 Hz.

The exponential current in the case of operated lumbar disc herniation is used to stimulate the muscles, totally or partially, denervated in disc herniations with motor deficit (Ozkaraoglu, Tarakci & Alun, 2020).

#### Hydrokinetotherapy

It allows antalgic postures, is particularly useful in lumbar disc herniation, and can be applied even in acute inflammatory pain (Kulisch et al., 2009). Since water can take over the body weight, large and complex movements can be easily performed (Bălan & Marinescu, 2014). Hydrostatic pressure stimulates the exteroceptors, proprioceptors and baroreceptors, which have the role of stimulating the return circulation;

#### Physical therapy

It is performed using anakinetic techniques - mobilization and posture and kinetic techniques - neuroproprioceptive facilitation techniques, the Williams I, II and III method and the Feldenkrais method, according to the proposed rehabilitation protocol (Smidt et. al., 2005).

#### *Proposed recovery program objectives:*

- Eliminating or limiting the algic syndrome - pain;
- Reducing the risk of lumbar disc herniation;
- Postural re-education through the implementation of a correct anatomical posture;

- Toning of the back, abdominal, pelvic girdle and overall muscles;
- Restoring muscle balance for the agonist and antagonist muscles;
- Gradual gain of joint amplitude;
- Increase in muscle strength;
- Restoring bipodal/unipodal stability;
- Follow-up of normal-functional development;
- Improving local circulation by influencing the mass of capillaries;
- Increasing muscle elasticity;
- Softening of the intra-articular capsuloligamentous structures;
- Improving the motor image from somatoscopy on the cerebral cortex;
- Stimulation of the endocrine system;
- Improving body schema.

#### *International Classification of Functioning, Disability and Health*

The International Classification of Functioning, Disability and Health (ICF) emerged in the 1970s (Cieza et.al., 2002) and was used as a framework for organizing and documenting information on functioning and disability (according to WHO 2001). It conceptualizes functioning as a "dynamic interaction between a person's health status, environmental factors, and personal factors," integrates major models of disability—the medical model and the social model—as a "bio-psycho-social synthesis," and recognizes the role of environment in creating disability, as well as the role of health conditions (Ustun et. al., 2003).

The ICF is focused on the following key terms: impairment - "any loss or abnormality of psychological, physiological or anatomical structure or function", disability - "any restriction or lack (resulting from an impairment) of the ability to carry out an activity in the manner or within the range considered normal for a human being" and disadvantage - "a disadvantage for a particular individual, resulting from a deficiency or handicap, which limits or prevents the performance of a role that is normal (depending on age, sex, social factors and cultural) for that individual" (World Health Organization, 1980).

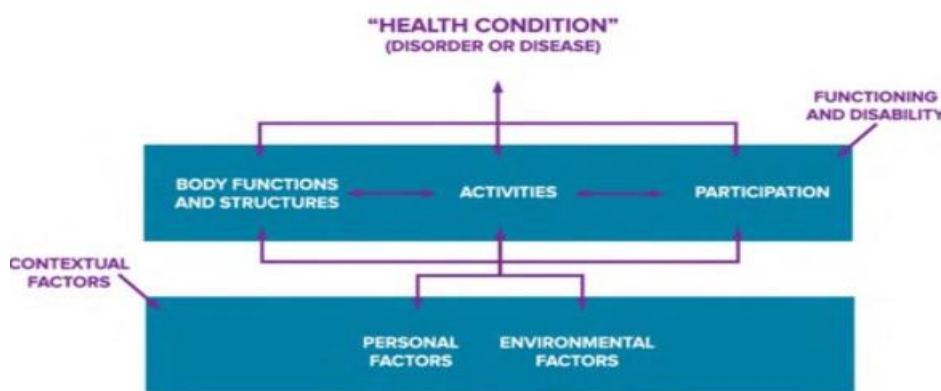


Fig. 1. Pyramid of Disabilities

The role of the CIF is to provide a coherent point of view, making a synthesis of all perspectives of health: biological, individual and social (Hunsaker et al., 2002) for experiencing or not a certain degree of disability.

#### *Classification of disabilities determined by operated lumbar disc herniation*

Classification:

- *Phase I* discopathy (algic phase) – when there is more laxity of the intervertebral disc and abnormal laxity of the nucleus pulposus and annulus fibrosus with the appearance of localized pain in the spine spontaneously or when pressed.
- *Phase II* discopathy (blockage phase) – cracks appear in the fibrous ring through which the nucleus pulposus bulges (disc protrusion). Clinically, there is blockage of the vertebral segment, paravertebral muscle contracture.
- *Phase III* discopathy (neurological phase) – prolapse (herniation) of the nucleus pulposus in the spinal canal and is divided into three stages:
  - o Stage I (algic) – irritation of the nerve root, neuralgic-type pain occurs (neuralgic-type radiculopathy)
  - o Stage II – compression of the nerve root, pain and paresthesias appear + disappearance of ROT (algo-paresthetic radiculopathy).

- o Stage III – interruption of the nerve root, pain, paresthesias and functional deficit of the muscles appear.
- Discopathy phase IV - dyscartosis
- Regarding the deficiencies that appeared after the pathology was established, a table of deficiencies was created to reflect the degree of impairment, respectively the degree of disability assigned.
- Currently, in Romania, according to the Official Monitor of Romania, Part I, No. 1243 bis/22.XII.2022, the following functional deficiencies are established (Table I.1. Functional deficiencies), related to the individual's adaptive capacity for socio-professional reintegration:

Table.1. Functional impairments

<b>Functional impairments – Degrees of disability</b>			
<b>Functional diagnosis</b>	Adaptive disability	Work capacity	Degree of disability
<b>Easy functional deficiency</b>	20-49%	kept	A change of job is recommended
<b>Medium functional deficiency</b>	50-69%	At least half lost	Grade III - It is recommended to change the job
<b>Increased functional impairment</b>	70-89%	Totally lost	Grade II
<b>Severe functional impairment</b>	90-100%	Totally lost	Grade I

- The relationship "functional impairment - adaptive incapacity - degree of disability" is represented on a negative scale, which expresses the functional loss with repercussions on the fulfillment of the appropriate role according to the age, level of training and existing sociocultural factors.

### Functional deficiency

(1) The functional diagnosis is based on clinical elements and the results of laboratory investigations. It expresses the severity of functional disorders and the mechanisms by which they occur.

(2) Functional deficiency is the response to various morphological or functional disorders (diseases, accidents, genetic anomalies). It can be correlated with adaptive incapacity and with the degree of disability.

(3) Adaptive incapacity is generated by various morphological and functional disorders and expresses the person's limits regarding the effort to adapt to the natural and social environment.

(4) The ability to work is defined as the possibility of carrying out an organized activity, in which the person provides for himself and his family.

(5) Disability is quantified in relation to the possibility of carrying out activities related to daily and/or professional life.

As for the operated lumbar disc herniation, characteristic of the previously presented lumbar discopathy, this is characteristic of phase III. This includes 3 stages of evolution:

- Vertebral discopathy – phase III (neurological phase)/Stage I (painful): radicular irritation, the patient presents pain when coughing, sneezing or exerting himself. Positive signs of elongation (Lasseque, Bonnet).

- Vertebral discopathy – phase III (neurological phase)/Stage II: radicular lesion usually residual, chronic, without surgical indication.

- Vertebral discopathy – phase III (neurological phase)/Stage III with severe motor deficits (localized in small muscle groups, without affecting a topographical segment, discrete amyotrophies, without surgical indication)

The statistical results were presented during the National Congress of Medical Expertise and Work Capacity Recovery, held between September 21-23, 2023, at INEMCRM Bucharest. The Congress was supported by the Romanian Society of Medical Expertise and Work Capacity Rehabilitation.

- We have the following records for establishing deficiencies and classifying patients as disabled:
- In the second degree of disability, 6.1% of all hospitalized patients were classified. 39.7% were included in the III degree of disability. The percentage of subjects who presented themselves at the physical medicine and balneology recovery department, after more than 183 days of leave, is 17.0%, while those who presented themselves at the department before the completion of 183 days of leave, had a percentage of 37.1% (Fig. 2.).

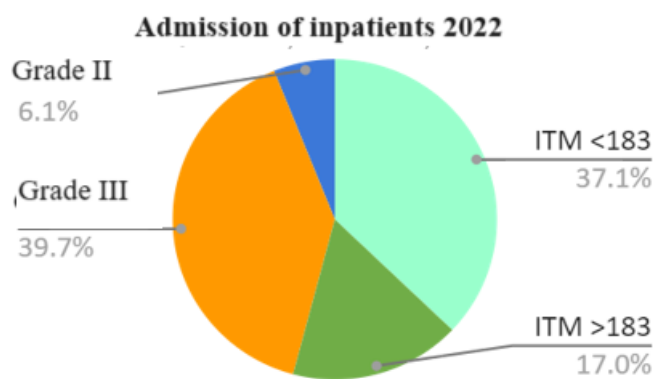


Fig.2. Disability grade for DVL in 2022

Regarding the resumption of activity for the subjects who followed the indicated medical recovery protocol, for the year 2022, the retired subjects were in a percentage of 21.0%, instead, the subjects who resumed their professional activity were in a percentage of 79.0 % (Fig.3.).

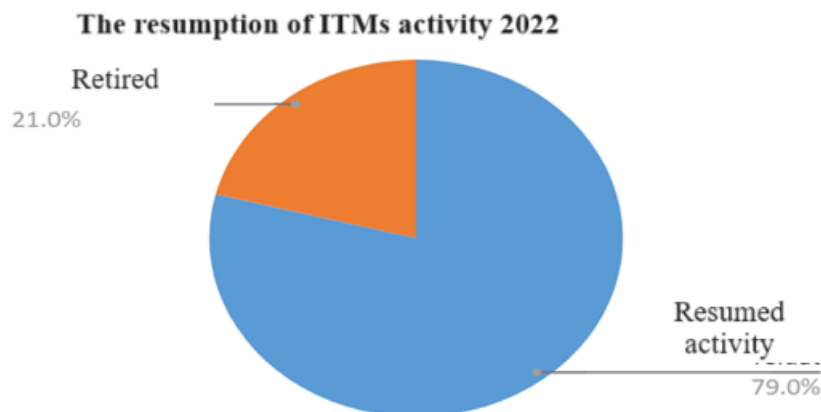


Fig.3. Resumption of activity of subjects with DVL in 2022

### Discussions

According to the latest estimates, of all operated patients, between 10-40% become symptomatic again after a variable time interval, regardless of the operative technique used. The rate of low back pain after spine surgery ranges from a low of 5% to a high of 74.6%, and the rate of needing a repeat operation from 13.4% to 35%. The prevalence of neuropathic spinal pain in the UK is 5800 per 100,000 population, with a large proportion of this number attributable to post-laminectomy or discectomy syndrome. The review of epidemiological studies found that conditions such as foraminal stenosis, alteration of the inner portion of the disc, pseudarthrosis and neuropathic pain together constitute the cause of more than 70% of cases of lumbar pathologies.

### Conclusions

Following the study, it is found that physical exercise performed under specialized medical indications has a beneficial effect on the biopsychosocial balance and promotes well-being.

It also influences the recovery of work capacity by increasing the pain threshold, which causes the subject to resume his usual activity, to restore his financial situation, to make him change his way of life, thus giving him the desire to do more a lot for him and for society.

Analyzing the results obtained after the conclusion of this study, following the initial and final evaluation of the subjects and after the application of the physiotherapeutic treatment.

We note that following the proposed treatment protocol, the subjects registered in this study had considerable benefits. From the point of view of the obtained percentage, the subjects who resumed their activity and who were able to reintegrate into everyday life, the value is significantly higher than the subjects who were retired.

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