

## The Role of Kinetotherapy in the Functional Recovery of the Patients Diagnosed with Lumbar Discopathy

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### Summary

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**The aim** of our study is to demonstrate the role of the kinetic program in the improvement of the functional capacity and life's quality in the case of the patients diagnosed with lumbar discopathy. Lumbar discopathy is characterized by disorders of the lumbar column, that influence the global functional capacity of the patient during the process of carrying out the daily activities, finally leading to chronic disability. **The objectives** of our research were: to establish the best exercises within the kinetic program implemented in accordance with the patient's state, (evolutive, the etiopathogenic context); to develop the kinetic program that the patient will have to follow at home, with a relatively normal life and work program. **The research methods** used were: the method of the bibliographical study, the observation and data recording method, the statistical and mathematical processing method. **Results.** The data confirm the reduction of pain intensity-the score of VAS scale registered by the female subjects was poorer than the one registered by the male subjects, with the mention that pain reduction was significant, irrespective of the patients' gender and group age. **Conclusions:** By means of the results obtained, we managed to underline the role of the kinetotherapist in the evaluation and functional recovery of the consequences generated by the lumbar disorder, with a view to fundamenting our objectives, methods and kinetic meanings within the implemented complex program of functional recovery.

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**Keywords:** lumbar discopathy, recuperative kinetic program, articular functional deficiency, lumbar column, patient's functional capacity, pathology.

### 1. Introduction

#### Lumbar Herniated Disc. Evaluation and Rehabilitation

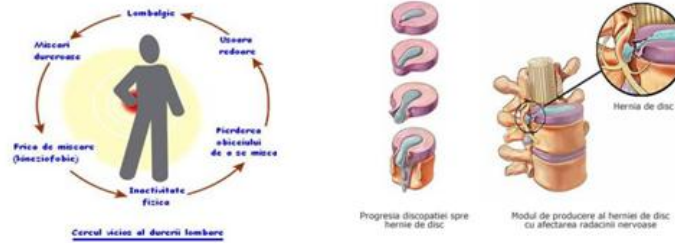
The lumbar column represents a long median and posterior backbone, made up by the superposition of several bony pieces called vertebrae. It is the most important segment of the locomotor apparatus, all the other segments are tied to. The vertebral column consists of the following parts: the cervical column with seven vertebrae, the thoracic column which has twelve vertebrae, the lumbar column that has five vertebrae, the sacral column with five vertebrae, the coccygeal column, with four-five vertebrae.

The lumbar column must be seen as a unitary whole, which contains, apart from the intervertebral disc, the adjacent soft tissues, (muscles, ligaments, fascias), that can often reveal a disorder. This may be the reason why the last monographies emphasize what the Anglo-Saxon authors define as "**low back pain.**"

The disorders related to the lumbar column are represented by a group of disorders with clinical characteristics that allowed De Seze many years ago to elaborate a classification according to stages and phases of the so-called lumbar herniated discopathy, a classification that still has a big practical interest (Baciu. C., 1980, pp. 190-193).

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**Phase I.** It is the phase concerned with the lumbar instability, with a soft laxity of the pulpous nucleus in the fibrous ring, generating intermittent chronic, postural lumbar pains. Most of the times, in the absence of effort or during rests, these pains disappear, in order to reappear when the lumbar segment is used.

**Phase II.** It is the phase related to the disc lesion, to the damage of the fibrous ring and the posterior-central protrusion of the pulpous nucleus, generating an **acute or severe lumbago**, (lower back pain).

**Phase III.** It is also called the radicular phase and it manifests by the posterior-lateral protrusion of the herniated disc, that will intercept a nervous root. This is the reason why the symptomatology will appear unilaterally

**Phase IV.** It deals with the degenerative modifications, with the manifestation of discartrosis and interapophyseal arthrosis, after the age of 40. With time, the pulpous nucleus dehydrates and it becomes friable. At the same time, the fibrous ring also suffers important changes, as a consequence of the mechanical solicitations. The phase could be associated with the generic term of lumbar discopathy. In this phase, we will come across the following clinical aspects:

- **the absence of subjective manifestations;** 60-70% of the subjects are carriers of an asymptomatic lumbar discopathy, phase IV;
- **Sciatica**, caused by a compressed nerve in the lower spine. It is the so-called "**elderly person sciatica**," with the negative Lassčgue sign;
- **acute lumbago** after the age of 40, a muscular-ligamentary lumbago, accompanied by a pseudo-sciatica, (a diffuse pain in the inferior member, without a dermatomal character). The symptomatology usually appears suddenly, after a physical effort consisting of lifting weights, being accompanied by the limitation of the lumbar column's mobility, especially on the lateral curves, that are more painful;
- **chronic low back pain**, with myogelosis nodules and paralumbar and parasacral trigger points, whose activation has a psycho-emotional and meteorotropic character;
- **vertebral canal stenosis**, diagnosed in a smaller proportion, can manifest at the polymorphous level, from the simple low back pain and lumbosciatica to the ponytail syndrome (Rinderiu T., Rusu L., Rosulescu E., 2001, p. 68).

## 2. The Clinical and Functional Evaluation

**Anamnesis** In the case of anamnesis, it is very important that we obtain **pain information:** pain location, the intensity, the moment of pain manifestation, span, triggering elements, irradiation in the limitrophe areas, aspects proper to the cause, (myogenic, bony, articular, neurogenic, vascular, visceral, psychogenic), regional dysmorphisms, (thoracic asymmetries of shoulders, basin, vertebral disorders), functional disorders, (local/from a distance).

**The examination and palpation of the spinal cord:** regional, overall: standing, sitting, in clinostatism.

### The evaluation of the correct position and posture

The appreciation of the gravitational line –lead thread– in the frontal plane, (the lateral inclinations), in the sagittal plane, (the anterior- posterior deviations). The appreciation of the correct position in the horizontal plane, (the scapular and pelvic belts). The evaluation of the segments' correct position: anterior, posterior. The examination is carried out with the subject standing, putting down the anatomical observations. For the lateral deviations: the lead thread, (corresponding to the symmetrical axis of the body), placed at the level of the occipital protuberance, covers the following aspects: the spinal apophysis of the prominence (C7); along the spinal apophyses of the dorsal column- intergluteal lumbar fold; between the internal femoral nerves, between the internal malleoli, the space between the anklebones. For the anterior-posterior deviations: the lead thread is placed at the level of the tragus and it covers the following aspects: anterior to the shoulder; lateral to the big trochanter; lateral to the tibial malleolus (Robacki R., 1985, pp, 201-205).

### **The Palpation of Therahidian Region**

The cutaneous modifications, (painful cutaneous fold-manoeuvre of rolling-plucking). We palpate: the painful points/trigger points: paravertebral, apophysis related, interspinal, interscapular, tender points, Arnold points, Valleyx points, (paravertebral, the sacral-vertebral angle, intergluteal, on the inferior member), the bony aspects, (spinal apophyses; shoulder blades' angles, the sacral fossettes): the tonus of the paravertebral musculature, muscular contractions.

### **The evaluation of the spinal cord's mobility**

It is achieved by global tests, (passive/active). It is concerned with mobility in all the three movements planes. The relation between two vertebrae is provided by: the vertebral-disc related articulation, the posterior hypophysis-related articulations.

### **Articular testing**

The vertebral-disc related articulation allows the following movements: rotation around a vertical axle; flexion - extension, around a transversal axle; lateral inclinations—around a sagittal axle; slipping movements on parallel axes of the vertebral bodies; approaching and moving away movements between two vertebrae of the vertebral column.

### **The articular dorsolumbar balance. Normal values**

Extension: 20-30 degrees, flexion: 80-90 degrees, (50° of the dorsal column and 40° of the lumbar column), rotation: 30-45 degrees, the lateral inclinations: 20-35 degrees.

### **Mobility indices**

Schober (flexion, > 5 cm), Ott (flexion, > 5 cm), fingers-ground, (flexion, 0 cm), reversed Schober, (the distance will decrease in extension below 3 cm), fingers-knees, (lateral inclinations).

### **The Muscular Dorsolumbar Balance. The neurological evaluation**

Highlighted elements: the exteroceptive sensitivity within the dermatomal area, ROT, Laseque test, (HDL), Romberg test, (differential dg. in ICVB).

## **3. The Objectives and Methods Concerned with the Rehabilitation of the Herniated Lumbar Disc**

### **3.1 Objectives:**

Pain prevention and control; The correction of the muscular disorders between the agonists and the antagonists; The re-establishment of the proper control of movement; The prophylaxis of relapses.

Means of treatment. Postural hygiene treatment. The total rest is recommended in the case of acute diseases, 2-4 days being usually enough. For the common forms, the relative rest is usually recommended, on a hard bed, in the following position: dorsal position or lateral position with the inferior members inflected. Food will contain all the nutritious principles, being recommended a hypocaloric diet in the case of the overweight patients. In the case of anti-inflammatory medication, a controlled sodium diet is recommended (Zaharia C., 1994, p. 162).

### **3.2 The massage**

In the case of subacute forms, a sacral gluteal massage can be made, as well as along the inferior member. In the case of hyperallergic forms, we can avoid the use of massage techniques. In the case of hypertrophies and vascular-vegetative disorders, we can use the trophic massage.

The massage- anatomophysiology, effects, manoeuvres. The massage contains a series of manual/instrumental manoeuvres, (mechanical, electrical, aquatique, gas bubbles, warm air jet), implemented with a hygienic, prophylactic, or therapeutic and recuperative aim, by a more or less qualified person, (usually, the masseur); while the self-massage represents the implementation of these techniques by a person on his or her own body, (for example: feathering technique, frictions, tapotment, shakings, underwater massage, vibromassage, manual, reflex massage), with the respective limits, (the accessibility of the self-massage is usually members-related).

## Massage Effects

- **The circulatory effects** can be noticed at the capillary, venous and lymphatic levels. For example, the feathering manoeuvres help and stimulate the superficial venous return, easing the heart's work. Associating this delicate manoeuvre with several powerful manoeuvres, such as the pressures, we also act upon the profound venous return, whose effect is used in the venous pathology.
- **The muscular effects** resulting as a consequence of having implemented certain massage manoeuvres, (tapotment) mechanically, (directly) and at the reflexive level, (indirectly), that activates the muscles blood flow, stimulate the increase in the nutritious agents and at the same time they favour the elimination of certain catabolites, especially in the case of sports people, (lactic acid, lipid peroxides); the elasticity and the power of contraction specific to the muscle fibres are also stimulated (Márza D., 1998, pp. 182-184).
- **The metabolic effects** are the consequence of certain stimulative techniques, (tapotment, dynamic vibrations) that activate the metabolism as follows: they mobilize the fats in the subcutaneous cell layer, contributing to their elimination, as well as to the reduction of the additional subcutaneous tissue.
- By the activation of the local blood flow, a high oxygen, phosphates, glucose, triglycerides, free fat acids and other nutrients' contribution is induced especially at the level of muscles, contributing thus to the increase in the mechanical efficiency.
- **Reflex effects.** The reflex action of the massage, more precisely certain techniques, were highlighted only later, (the feathering technique, the fine vibrations) that animate the skin receptors, informing thus certain nervous centers, which in their turn, give rise to answer reactions at the level of certain organs and tissues.

**The fundamental manoeuvres of the manual massage.** The fundamental manoeuvres exercises different influences at the level of teguments, the muscle, osteoarticular, circulatory and nervous systems, which offers the possibility to implement various massage techniques, according to the therapeutic objectives. The fundamental manoeuvres include: the feathering technique; the friction; kneading; the tapotment; vibrations. Apart from the fundamental and secondary manoeuvres concerned with the manual massage used by the masseur that applies the technique, or by the person that offers herself a massage, there is a series of other procedures that include: the reflex massage; the hydromassage; the instrumental massage; the warm air jet massage; the gaseous bubbles massage; ice massage.

**The reflex massage.** The reflex massage is based on the reflex influence, from a distance, after its application on the painful, integumentary, or periosteal areas, in the case of visceral disorders, or disorders of the locomotor apparatus. This category includes: the periosteal massage; on reflexogenic areas; pressopuncture.

**The periosteal massage.** Consists in the execution of certain powerful pressures, by means of the medius, in points situated on the periosteum, there where it is not covered by soft parts. The pressure points are chosen according to the degree of sensibility to pressure. The pressure is exercised for 2-3 minutes on each point, being accompanied by circular frictions. The manoeuvre can be repeated two or three times for each point, then other painful points are palpated. In order to obtain longer effects, three or four sessions are needed.

**The profound transversal massage.** The profound transversal massage, or the Cyriax massage, consists in the use of friction with a view to obtaining the mobilization of the soft tissues, teguments, tissues, fasciae, muscle fibres, tendons. It is based on the exact diagnosis of the lesion, by 2-finger palpation of the traumatized area and the emphasis of the painful point. A 2-finger profound transversal friction is implemented, perpendicularly on the direction of the muscle or ligamentary fibres, connected to the traumatism. The pressure remains constant all along the session, the fingers maintaining the permanent contact with the skin. The procedure lasts 10 minutes, being repeated every 2 days. The profound transversal massage eliminates the fibrous adherences after traumatisms of the locomotor apparatus. It is not recommended in the acute stage or in the inflammatory disorders of the locomotor apparatus.

**The hydromassage** consists in the association between the massage techniques and a hydrotherapy procedure. There are two ways we can get a hydromassage, namely: the shower massage and the underwater massage.

**The shower massage** consists in the manual massaging of a certain part of the body, under the jet of warm showers that act vertically. Naked, the patient lies on a ventral or dorsal decubitus position, on a massage table, above which there are 4-6 showers, from which the water falls in rain, at a temperature of 38°, from the height of 60 cm.

The procedure lasts 5-10 minutes and it is usually carried out partially, (on the back, on the thorax, the abdomen or the members). This procedure is used in the treatment of arthroses from the level of the vertebral column or members, in various forms of the abarticular rheumatism, in different sequelae of the traumatism specific to the locomotor apparatus, as well as in the sport massage (Cordun M., 1999, p. 152).

**The underwater shower** represents the second form of hydromassage and it consists in getting a cylindrical shower on one segment or all over the patient's body, that is under the water, at the temperature of 37<sup>o</sup>-38<sup>o</sup>. The shower's pressure that is projected on that part of the body that is going to be massaged can be adjusted to 1-6 atmospheres, according to the sensibility of the treated area.

The underwater shower has the following beneficial effects: it generates a profound hyperemia, that favours the resorption processes; it produces the muscular relaxation; it favours the elimination of the adherence processes caused by inflammatory disorders of the locomotor apparatus, stimulating the motor activity of certain abdominal viscera.

**The instrumental massage** is produced by means of those devices able to generate vibrations, called vibromassage devices. The implementation of the mechanical vibrations on the areas that are going to be treated is achieved by two modalities: vibrating band devices; portable devices with plastic or rubber devices of different forms, which determine a better comfort for the patient (De Lisa, Joel, A. 1991, p. 102).

**Ice local massage** is a procedure that combines one of the fundamental massage manoeuvres, namely softening with the cryotherapy. It consists in the use of ice cubes to get the feathering massage on the affected area for 3-7 minutes. The manoeuvre can be repeated every two hours. The ice massage is used in various traumatic disorders of the locomotor apparatus, such as contusions, sprains, fibrillar muscle lesions. The treatment's efficiency is conditioned by its prompt implementation.

### 3.3 Kinetotherapy

The objectives of kinetotherapy are different, according to the suffering stage: acute, subacute, chronic, or complete remission. In the acute stage, methods concerned with the general relaxation of the lumbar musculature are applied. In the subacute stage, the real program of kinetotherapy begins, the best known being Williams program. Apart from the relaxation techniques, techniques concerned with the inferior trunk asuplization will be applied. In the next place, we will present the exercises that make up Williams program, exercises that are executed differentially, in three distinct phases, according to the affection's evolution (Georgescu, M., 1998, pp. 172-177).

#### Williams program - the first phase

**Exercise 1**—Dorsal decubitus: the knees are flexed and stretched.

**Exercise 2**—Dorsal decubitus: one of the knees is taken to the chest by means of both hands, trying to touch it with the forehead; we follow the same procedure for the other knee.

**Exercise 3**—Similar to the second exercise, but with both knees at the same time.

**Exercise 4**—Dorsal decubitus, hands under the head: one of the knees is taken to the chest, then the other one, then both knees.

**Exercise 5**—Dorsal decubitus, hands raised above the head, knees flexed at 90<sup>o</sup>, soles on the bed: we push the spine to the bed, the abdominal muscles are contracted, we lift the sacrum from the bed; then, we repeat the exercise.

**Exercise 6**—Sitting on a chair, knees apart: we push forward, so that we can touch the ground under the chair; we maintain the position for 4-5 seconds, then we repeat the exercise.

#### Williams program - the second phase

**Exercise 7**—Dorsal decubitus, knees flexed, the soles on the bed: we bend both knees to the right, then to the left, until they reach the bed.

**Exercise 8**—Dorsal decubitus: the right sole is placed on the left sole; we try to perform an internal abduction of the right hip, until we can touch with the right knee the bed, then we proceed the same for the left sole.

**Exercise 9**—Dorsal decubitus: we raise alternatively as high as we can our stretched inferior members.

**Exercise 10**—Standing: genuflexions, our hands on the back of the chair, the back perfectly straight, the soles on the ground.

**Exercise 11**—The position of "knight servant," the body leaning on the hip raised at 90<sup>o</sup>, hands on the ground: we stretch the supporting knee, executing a to-and-fro that must stretch the iliopsoas..

### Williams program - the third phase

**Exercise 12** - Dorsal decubitus, knees flexed at 90°, the soles on the bed: we push the spine to the bed, we contract the abdominal muscles, we raise the sacrum from the bed; gradually, we can execute the same lumbar and basin movements, but with the knees less flexed, until they will be completely stretched.

**Exercise 13**—Leaning against the wall, the soles 25-30 cm away from the wall: the sacrum and the spine touch the wall; we gradually draw our soles nearer to the wall, maintaining the spine's contact to it.

**Exercise 14**— Dorsal decubitus: we use the bike, our basin tilted (Kiss L, 1989, pp. 127-133).

#### Flexor muscles – flexion. Types of static exercises:

**Exercise 1:** a series of "head on trunk" exercises from the position of dorsal decubitus, with or without flexed knees: we raise the head, such as we can "see" our legs; the abdominal muscles are contracted in order to fix the thorax. Thus, the latter will represent in its turn a fixed point for the scalene muscles and the sternocleidomastoid ones.

**Exercise 2:** the series of exercises "trunk on the inferior members," the vertebral column remaining straight, rigid: from lying down or sitting, the inferior members stretched, (or flexed), we raise or lower the straight trunk.

**Exercise 3:** a series of exercises, known as "inferior members on the trunk," carried out from the position of dorsal decubitus, from standing position, both members at the same time, or alternatively: we execute the hip's flexion, with the knee flexed or stretched; if the flexion is not complete, we can resort to the static contraction of the abdominal muscles; if it is complete, a posterior tilt, (a sloping position) of the pelvis is achieved.

**Exercise 4:** from the ventral position, leaning on our hands and toes, we flex the arms: the abdominal muscles is forced to contract statically anti-gravity, in order to prevent the anterior tilt of the basin.

**Exercise 5:** powerful abdominal contractions from various positions: dorsal decubitus with the knees flexed, from the ventral decubitus, sitting or standing.

#### Types of dynamic exercises:

**Exercise 1:** the combination between trunk and inferior members movements: from the dorsal decubitus, we combine the column's flexion with the inferior members' flexion, taking the knee to the chest, by means of the arms.

**Exercise 2:** the group of exercises "pelvis and lumbar column on the superior trunk and inferior members": from the position of dorsal decubitus, the knees flexed, we tilt the basin back; the abdominal musculature works in parallel with the hip's stretchers.

**Exercise 3:** the series of exercises "inferior members on the pelvis, pelvis and lumbar spine on the superior trunk": from the dorsal decubitus we execute the CF flexion, with or without the knee's flexion, combined with the flexion of the thoracic-lumbar column.

**Exercise 4:** the series of exercises named "vertebral column on the pelvis, pelvis on the inferior members": the exercises are executed from the position of dorsal decubitus, the legs fixed.

**Exercise 5:** the series of exercises called "column on the pelvis" —namely the column's flexion without the movement of pelvis or of the inferior members, that are executed from the position of dorsal decubitus, the degree of flexion being variable: rising is not performed with the straight, rigid column, we do not deal here only with the flexion of the cervical column().

#### The extensor muscles – extension. Types of static exercises:

**Exercise 1:** a group of exercises of the type "rigid trunk on the inferior members": from the sitting, orthostatic, or ventral position, leaning on the basin, we perform lowering-raising movements of the trunk, the vertebral column being straight, rigid; the movement is performed by means of the hips, (flexion-extension), the thoracic-lumbar extensors in static contraction, fighting against gravitation, that tends to flex the column.

**Exercise 2:** a series of exercises of the type "hanging from the bar with arms' flexion." During these exercises, the extensors act statically in order to maintain the column's straight position, fighting against gravitation.

**Exercise 3:** a group of exercises, called "falling forward," more precisely, from an orthostatic position, the leg goes straight ahead, the body "falling" forward; then, we repeat the same exercise with the left leg. The erector muscles contract in order to fight against gravitation, maintaining the back perfectly straight.

**Exercise 4:** a series of exercises called "inferior members on the trunk:" from the position of ventral decubitus, we stretch the inferior members in turn, at 15 degrees; the thoracic-lumbar extensors and the flexors of the opposite

hip act statically in order to block the posterior to-and-fro tendency manifested by the pelvis, by the extensors of the raised inferior member.

#### **Types of dynamic exercises:**

**Exercise 1:** of the kind "pelvis and lumbar column on the superior trunk and the inferior members:" from the position of the dorsal decubitus, the knees flexed, the pelvis is tilted forward, with an accented lumbar curve—thoracic-lumbar extensor muscles act synergically with the CF flexors.

**Exercise 2:** a group of exercises entitled "inferior member on pelvis, pelvis and lumbar spine on the superior trunk:" from the position of ventral decubitus, we stretch the legs alternatively more than 15 degrees; the iliofemoral ligament blocks the CF extension that exceeds 15 degrees, so that the pelvis will tilt anteriorly as much as the extensors of the thoracic-lumbar column and the flexors of the coxofemoral articulation of the inferior members allow.

**Exercise 3:** a series of exercises of the type "trunk, (curved column) on the inferior members:" they are performed from a dorsal decubitus, with or without flexed knees, lifting the chest from the ground, by leaning on the shoulders; or, leaning our hands on the bar, we arch our back. If the knees and CF are flexed, we reduce the possibility to raise the pelvis and spine, the extension taking thus place especially in the thoracic area.

**Exercise 4:** a series of exercises called "backbone on pelvis, pelvis on the inferior members," where the thoracic-lumbar erectors are activated concomitantly with the hip's extensors.

**Exercise 5:** a type of exercises called "backbone on pelvis:" from the position of ventral decubitus, we perform the vertebral column's extension, (a dynamic activity specific to the erectors, while the hip's extensors work isometrically, fixing the pelvis), the arms behind.

**Exercise 6:** a series of exercises that involve the combination between the movement "inferior members on pelvis" and the "backbone's extension" —here as well the thoracic-lumbar erectors act synergically with the hip's extensors (Robanescu N., 1992,p. 188).

#### **Flexion and extension. Types of dynamic exercises.**

**Exercise 1:** sitting on all fours, we raise one knee to the abdomen, then that particular inferior member is stretched, concomitantly curving the vertebral column.

**Exercise 2:** sitting on all fours, the pelvis' tilt forward with the head's extension, leads to the trunk's extension, then the pelvis' tilt backward with the head's flexion, determines the thoracic-lumbar's kyphosis.

**Exercise 3:** the contraction of the calf muscles limits the trunk's flexion: in these cases, special exercises are recommended, exercises concerned with the stretch of the calf muscles, that are obtained by successive movements of the trunk's flexion-extension, from special positions.

#### **The lateral flexors of the backbone—Lateroflexion-based movement. Types of static exercises**

**Exercise 1:** a series of exercises of the type "rigid trunk on the inferior members," by the lateral bending of the trunk that is maintained straight, with the abduction or the adduction of the supporting hip, the other inferior member being mobilized together with the trunk.

**Exercise 2:** a group of exercises of the type "lateral movements of the arm and of the pelvic member, with lateral fall of the trunk," where the lateroflexion-based muscles from the inferior side contract in order to maintain the trunk straight, lest it should yield under its own weight.

**Exercise 3:** by lateral lunges, with the body's fall on that particular side, (hands on hips), a powerful contraction of the lateral flexors on the opposite side is obtained.

#### **Types of dynamic exercises:**

**Exercise 1:** a series of exercises called "backbone on the pelvis," that need positions where the pelvis should be fixed; thus, from the position astride on a banquette, we bend to the left and to the right, from the position of orthostatism, with one of the legs on a short bench, we bend the body from the left to the right and vice versa, the arm opposed to the movement being in abduction.

**Exercise 2:** a group of exercises of the kind "backbone on the pelvis, pelvis on the inferior members," where the lateral flexors act concomitantly with the abductors-adductors of the hip. These exercises are performed from the position of orthostatism, from the dorsal or lateral decubitus.

**Exercise 3:** a group of exercises of the type "inferior members on the pelvis, pelvis and lumbar column on the superior trunk," more precisely the lateral movement of the inferior members and of the basin; it can be made in

a passive or active manner, from the position of dorsal decubitus or in hanging position, (with the hands clutching one of the bars of the gym apparatus).

**Exercise 4:** a series of exercises of the type "pelvis and lumbar column on the superior trunk," that combine the lateral flexor action of the injured hip's lifters with the lateral flexor action of the opposite hip's abductors. From the position of orthostatism or sitting, the hands clutching a bar at shoulders' height, we raise a hip and we flex our spine.

**Exercise 5:** "a simultaneous movement of the trunk and of one of the inferior members." It is performed from the position of dorsal decubitus.

**Exercise 6:** a series of exercises from the position of lateral fall, when we lower or raise our pelvis, associating the activity specific to the adductors of the hip from above and the activity specific to the abductors of the hip below (Sbenghe T., 1999, pp. 143-146).

#### **Spine rotators–Rotation movement. Types of dynamic exercises:**

**Exercise 1:** a series of exercises called "backbone on pelvis" that are carried out by rotating the trunk from positions that block the pelvis: astride on a bench, on all fours; in order to intensify the rotation, we mobilize the superior members, similar to some wings; the exercises can also be performed from the position of dorsal decubitus, taking one of the arms over the body, raising the shoulder and the pelvis.

**Exercise 2:** "inferior members, pelvis and lumbar spine on the superior trunk:" from the dorsal decubitus, the arms crosswise and the knees flexed, we perform movements from one side to the other, mobilizing the pelvis, as well.

**Exercise 3:** "backbone on pelvis, pelvis on the inferior members:" from the position of orthostatism and dorsal decubitus, (legs apart) we perform rotations to one side and to the other.

**Exercise 4:** "pelvis and the lumbar spine on the superior trunk and the inferior members:" in hanging position, (in order to block the superior trunk), the legs leaning on the floor, or on the bar, we perform the rotations by means of the pelvis and the lumbar spine.

#### **Combined exercises for the rotators, the flexors and the extensors**

**Exercise 1:** the activation of the flexors and rotators belonging to the spine, by the hip's rotators from the position of dorsal decubitus, the legs apart: we raise our trunk, rotating askew, our arm crossing our body to the rotation side.

**Exercise 2:** the activation of the flexors and rotators belonging to the backbone and hips, from the position of dorsal decubitus, the knees flexed and the legs under the bar, the hands on the nape: we raise our trunk, (without flexing the cervical column) and we rotate.

**Exercise 3:** involves the activation of the backbone's extensors and rotators, as well as of hip's extensors, from the Mahommedan position, that prevents the rotation of pelvis: we carry out the extension "vertebra after vertebra," with the trunk's rotation.

**Exercise 4:** the activation of the extensors and rotators belonging to the backbone and hips, from the ventral decubitus, the hands on nape: extension by means of the trunk's rotation.

#### **Circumduction exercises of the vertebral column**

These are performed on the sequence "backbone on the pelvis, pelvis on the inferior members."

- Exercise: the activation of the spine's circumductors, by the hip's flexors and extensors, from the position "sitting astride on a bench," hands on the hips, the calves fixing the bench: trunk rotations are executed (Kisner C., Colby A., 1990, p. 162).
- Versions: the same movement from the position of orthostatism, the hands on the hips, or: from hanging position, the hands clutching two rings and the legs on the ground, we perform rotations of the whole body.

**Facilitation exercises.** For the activation of the trunk's muscles, these exercises can be performed starting from the superior or inferior members. *ioare sau inferioare.* Schemas for the superior trunk: we combine the movements of the head, neck, the superior trunk with asymmetrical Kabat schemas of the superior extremities:

"Choping:" one of the hands grabs the opposite forearm, performing a diagonal movement. For example, "the right choping" combines the D1E of the right superior member drept with the D2E of the left inferior member. The exercise is a closed kinetic chain. The kinetotherapist works with the forehead and the right palm. Together with "choping," the patient rotates and bends his head and shoulders, the movements being controlled by the kinetotherapist. The exercise activates the abdominal oblique muscles, ameliorates the trunk's mobility and, of



course, it increases the force in the superior members and the neck. "Lifting" –the opposite of "chopping" –carries out the trunk's extension, by rotation. The superior members are positioned as during the "chopping" exercise, but they follow Kabat diagonal movements on the flexion, (D1F and D2F) of the superior members. Concomitantly, the assistant will control the movement of the superior members as well as the head's extension. The exercise exploits the posterior-superior muscles of the trunk, (the extensors and the flexors). Both "Chopping" and "lifting" are performed from the dorsal decubitus and while sitting.

#### 4. Organization and Research Methodology

##### 4.1 Research aim and objectives

The final aim of the whole medical assistance of this type of pathology of the locomotor apparatus is the physical independence, in the context of observing the stability and mobility, after the correct and complete evaluation, (etiopathogenic, clinical and functional) preceding the therapeutic and during its development (Konin J.G., 2000, p. 146).

Kinetotherapy has a fundamental role in the achievement of the objectives followed within the complex medical assistance, after the complete examination of the patient, more precisely:

- the maintenance or the promotion of the articular mobility,
- the re-establishment of the muscles' force and resistance,
- the re-establishment of the movements' coordination,
- the promotion of the arterial-venolymphatic blood flow,
- the recoup of the motor control as well as of the functionality of the affected area.

##### 4.2 The research objectives are:

- to establish the best exercises within the kinetic program implemented in accordance with the patient's state, (evolutive, the etiopathogenic),
- to determine the indications and contraindications specific to the kinetic program within the complex medical assistance, (medicated, physical, kinetic) of the patient,
- to determine the optimal number of the sessions within the recuperative program,
- to determine the best period for the implementation of the therapy meant to generate the amelioration of the clinical symptomatology of these patients,
- to develop the kinetic program that the patient will have to follow at home, during a relatively normal regime of life and work.

##### 4.3 Research hypotheses

- the complete clinical and functional evaluation of the trunk, the vertebral column and the inferior member, within the context of the patient's general clinical and functional status, contributes to the efficient rehabilitation of the patient,
- the precocity and correctness of the complex medical assistance significantly improves the rehabilitation process,
- the choice and manner of implementation of the kinetic methods are adapted to the each individual, as well as to the seriousness of the spinal disc herniation,
- the analytical and global re-education of the trunk represent essential aspects for the re-education of the global functionality,
- the demonstration of the effectiveness specific to the kinetic means and techniques of articular protection, associated with the other methods of recovery within the algic and functional syndromes therapy, specific to the lumbar herniated disc.

##### 4.4. subjects' description

The research we made consisted of **16 patients diagnosed with lumbar discopathy**, aged between **25-60**. The study was carried out at "Saint Mary" Neuro-motor Recovery Center, Pitești-Argeș, between **December 2017 – May 2018** and we studied the effects of the implemented therapy for a period of six months.

The complex evaluation took place at the beginning of the recuperative treatment, at the end of the physical-kinetic therapy, (about 4 weeks), every six months for each patient. We were interested in the therapeutic effects determined by the massage, kinetotherapy, hydrokinetotherapy program for the **16 patients**.

**The selection of cases**

The gender, group age and original environment distribution of the examined patients is contained by the following tables.

**Tabel –Gender distribution.**

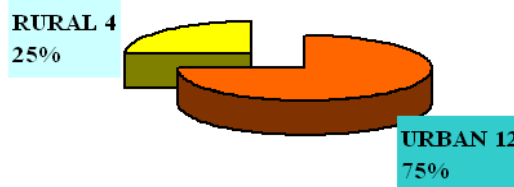
|       | Number of cases |
|-------|-----------------|
| Men   | 7               |
| Women | 9               |
| Total | 16              |



**Fig.2. - Componenta pe sexe a lotului studiat.**

**Tabel –The original environment.**

|       | Urban environment | Rural environment |
|-------|-------------------|-------------------|
| Men   | 5                 | 2                 |
| Women | 7                 | 2                 |
| Total | 12                | 4                 |



**Fig.1. - Componenta pe mediul de provenienta a lotului studiat.**

The distribution of patients according to their origin denotes, in the case of our research a higher incidence in the urban environment of the lumbar discopathy in the case of women.

**Tabel 3.2. –age grups.**

|       | Number of cases | 25-30 years | 31-40 years | 41-50 years | 51-60 years |
|-------|-----------------|-------------|-------------|-------------|-------------|
| Men   | 7               | 0           | 3           | 2           | 2           |
| Women | 9               | 2           | 4           | 2           | 1           |
| Total | 16              | 2           | 7           | 4           | 3           |

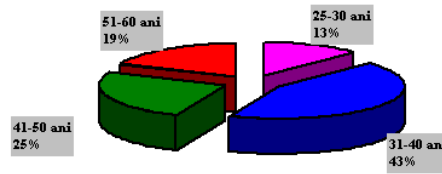


Fig.3. - Componenta pe grupe de varsta a lotului studiat.

First, we have developed a complete evaluation, (etiopathogenic, clinical, paraclinical and functional) of the studied patients, by means of the multidisciplinary recovery team. Within the process of clinical evaluation, we took into consideration the general physical state, (especially the cardiovascular function—the arterial tension, cardiac frequency, the peripheral pulse, the state of the peripheric blood vessels, the respiratory, digestive, neurological state)(Popescu R., Marinescu L., 1999,p. 187).

#### 4.5 The determination of the research methods and parameters used

##### 4.5.1 The parameters.

- For the **pain** parameter, we used the **visual analogue scale (VAS)** by means of which, each patient assessed himself from the point of view of pain intensity, with a figure from 0 to 10, (0 = absent pain, 10 = maximum pain).
- For the estimation of the therapy's antalgic effect we used the visual analogue scale of the therapeutic result VAS
- The Chronic Disability Index of Waddell and Main for the patients diagnosed with low back pain - *Chronic Disability Index of Waddell and Main for Patients with Low Back Pain*
- Low Back Pain Disability Questionnaire of Roland and Morris - *Low Back Pain Disability Questionnaire of Roland and Morris*.

##### 4.5.2 Research methods used

The research methods implemented in the present study were:

1. **the method of the bibliographical study** – represented by the reading of the bibliographical references, (magazines, books, treaties) that can be found in the University Library of Pitești.
2. **the method based on data observation and registration** –that consisted in measuring the established parameters, obtained within the patients' complete evaluation, according to a known methodology, parameters that observed the international norms, implemented in our country, too; the data were registered over *a period of six months* for each case, the evaluation taking place *at the beginning of the study – moment I, at the end of the physical-kinetic recuperative program - moment II, at the age of six - moment III*.
3. **the statistical and mathematical processing** of the data obtained –that consisted in: the processing of the results obtained, of the mathematical values, of the measured physiological parameters, according to the calculation methods, the determination of the scores belonging to the scales used, the interpretation of all the results on the basis of the already existing standard norms;

We used descriptive statistical methods necessary to collect, classify and describe the analytical, (inductive) data and methods with a view to obtaining a critical analysis of the data by various processing methods. Descriptively, we estimated the researched parameters by the calculation of:

- *the median (the median value)* –the value that divides the series of characteristics, (versions) in two equal parts—with the percentages 25-75% (the values between which the 50% - 1/2 characteristics from the middle of the series) range.
- *the average (the average value)* –the sum in relation to the values of distribution, useful for the statistical comparison(Popescu, Roxana, Traistaru, Rodica, Badea, Petrica, 2004,pp. 165-168).
- *CI ("confidence interval," significance interval)* –indicates the probability that the studied statistical unit, taken at random from a population with an  $Ma$  average and a standard deviation  $\sigma$ , has the value of characteristic ranging between certain limits, (95% =  $Ma \pm 1,96 \sigma$ ). At the analytical level, we investigated various *percentages*, probabilities

that generate a phenomenon –the relation between the number of those cases favourable to the phenomenon and the total number of the possible cases, (rendered in x% or 0,x percentages);

**4. the graphic method** –the graphic representation of the variations specific to the studied parameters, as well as to the indices measured according to these parameters; by means of this graphic representation, we can obtain a better visualization of the experiment's effects, together with an overview estimation of the research's results;

**5. the evaluation method** –for the studied patients, (the descriptive studies), making use of nominal standardized scales, (the simple classification according to different categories, without the existence of certain special connections between them) and ordinary scales, (that measure the amplitude of a property, using a predetermined classification of possible answers), described below, such as they were used for the studied patients:

**The visual analogue scale of pain, (VAS)**

**the biggest possible pain**

**no pain**

This is usually a 10 centimeters line according to which the patient notes the degree and intensity of pain from 0 to 10.  
VAS for pain severity

**The visual analogue scale of VAS therapeutic result**

VAS for the treatment's effect

**No pain amelioration**

**The complete disappearance of pain**

***Chronic Disability Index of Waddell and Main for Patients with Low Back Pain***

Waddell and Main use a simple scale to evaluate the patients with low back pain, lumbar pain. The authors are part of Western Infirmary, Glasgow, Scotland.

**Questions:**

|   |   |
|---|---|
| 1 | Heavy objects liftings must be avoided, (a heavy suitcase, a three-four years old child)  |
| 2 | Sitting on a chair is generally limited to less than half an hour                         |
| 3 | Travelling by car or by bus is generally limited to less than half an hour                |
| 4 | Maintaining the motionless position is generally limited to less than half an hour        |
| 5 | Walking is generally limited to less than half an hour                                    |
| 6 | Sleeping regularly interrupted by back pains, (for example twice a week)                  |
| 7 | Regular absences or the limitation of the social activities, (no sports)                  |
| 8 | The reduction of the sexual activity's frequency  |
| 9 | We need constant help while putting our shoes on, (tying our laces, putting on the socks) |

| ANSWER | POINTS |
|--------|--------|
| YES    | 1      |
| NO     | 0      |

**TOTAL SCORE = THE SUM (of the points obtained while answering the 9 questions)**

*Interpretation:* **minimum score: 0, maximum score: 9** the higher the number of items, the higher the level of disability.

**Low Back Pain Disability Questionnaire of Roland and Morris.** Roland and Morris developed a questionnaire meant to evaluate the patients with low back pain. The questionnaire can be used to determine the patient's level of disability and measure the results obtained after the therapeutic intervention. The authors are employees of St. Thomas' Hospital, London.

NOTE: The questionnaire is usually associated with the analogue scale of pain, (VAS). **Questions on the present perception of the patient:**

|    |  |
|----|--|
| 1  | I stay home most of the time because of the back pains.  |
| 2  | I often change my position in order to find a comfortable position for my back.                      |
| 3  | I walk slowly, because of the back pains.  |
| 4  | I can no longer do the housework because of the back pains.  |
| 5  | I use the banister to climb the stairs because of the back pains.                                    |
| 6  | I lie in order to rest.  |
| 7  | I must hold on something in order to rise from the chair because of the back pains.                  |
| 8  | I ask other people to help me with various things because of the back pains.                         |
| 9  | I get dressed more slowly than usually because of the back pains.                                    |
| 10 | I stand for short periods of time because of my back pains.  |
| 11 | I avoid to bend down or kneel because of the back pains.   |
| 12 | I find it very difficult to rise from the chair because of the back pains.                           |
| 13 | My back hurts all the time.  |
| 14 | I find it difficult to turn in the bed because of the back pains.                                    |
| 15 | I lost my appetite because of the back pains.  |
| 16 | I find it difficult to put on my sockets or my shoes because of the back pains.                      |
| 17 | I walk only short distances because of the back pains.   |
| 18 | I rest worse because of the back pains.  |
| 19 | I need help to get dressed because of the back pains.  |
| 20 | I sit down most of the time because of the back pains.   |
| 21 | I avoid the difficult tasks around the house because of the back pains.                              |
| 22 | I am more irritable and ill disposed with the persons around than usually because of the back pains. |
| 23 | I climb the stairs more slowly than usually because of the back pains.                               |
| 24 | I lie in my bed most of the time because of the back pains.  |

| ANSWER | POINTS |
|--------|--------|
| YES    | 1      |
| NO     | 0      |

**Total score = SUM, (points for all the 24 situations)**

*Interpretation:* **minim score: 0, maximum score: 24.** The higher the score the more serious the disability associated with the back pain. 0 points indicate the absence of any disability, whereas 24 points indicate the presence of disability. A score higher than or equal to 14 indicates a severely affected patient.

#### **4.6 The composition and implementation of the complex therapeutic program**

Kinotherapy and the massage are focused, both as objective and as technical means of recuperative therapy according to the clinical state of the patient.

##### **The kinotherapy implemented in the acute phase**

The objectives of this period are: SNV rebalancing, the general relaxation, the decrease in the radicular sensitivity, or sensitivity of the sinuvertebral nerve, the relaxation of the painful lumbar muscles.

SNV rebalancing is necessary in the case of the majority of patients, that manifest a hyper sympatheticotonia that influences the cardiac rhythm and the rhythm of the arterial tension, (tahictachycardia, high arterial tension). The increase in the vagal tone is taken into consideration. Apart from the proper medication, the following things are recommended:

- The position of ventral decubitus, with a relatively harder pillow under the abdomen, (that compresses the celiac plexus) and big enough to maintain the spine extended; if this position is not endured, the lateral decubitus can be tried, pressing with the hands the pillow placed on the epigastrium (Sbenghe T., 1999, pp. 100-104).
- The bed inclined in the Tredenburg position, (for the stimulation of the carotid sinus).
- The delicate "touch" of the paravertebral muscles.
- Neuter heat in the lumbar area.

The general relaxation is recommended for the reduction of the psychical pressure determined by pain. It also reduces the level of pain and decontracts all the muscles, including the paravertebral muscles. We use Jacobson relaxation method or simpler, profound exhalation exercises, with extended exhalation.

The patient concentrates only on the breathing movements. The reduction of the radicular sensitivity in the presence of a pathological process at the intracanalicular level, by:

The adoption of various antalgic positions:

- Dorsal decubitus, the head and shoulders elevated on a pillow, the knees bent, with a bolt under them, the legs resting on the soles.
- Lateral decubitus.
- Dorsal decubitus, the hips and knees bent at 90 degrees, the calves resting on a small chair or on a box.
- Any other position, however strange it might seem, in which the patient feels a real amelioration of the algic phenomena.

Continuous vertebral pullups while lying in bed, by means of a special frame or improvising the pullup on the basin by a wide belt, whose cable is pulled on by a pulley. The counterresistance is given by the patient's body, the bed being in the Trendelenburg position; it is recommended that the CF and the knees be positioned in a right angle, the calves resting on a small chair. Immobilisation in "Williams plastered device," that obtains a position similar to the one described above. The relaxation of the lumbar muscles contraction, that determines pain itself, giving shape to the vicious circle: defense voluntary muscular contraction → local muscular circulatory disorders → acid metabolites accumulation → pain → involuntary contraction → muscular circulatory disorders → acid metabolites accumulation → pain.

The best methodology to obtain the inferior lumbar muscular relaxation, with the concomitant reduction of lumbar sacral pain, is the implementation of the modified "hold-relax" exercise. The resistance applied will be moderate to minimum.

The contraction is followed by the relaxation of the activated muscles. The approach to the groups of muscles will be performed from a distance towards the affected area, more precisely from the "indirect to the direct approach." We use the final positions of Kabat diagonals for the members in order to influence the trunk's muscles. The diagonals of the superior members will influence the superior abdominal and extensor muscles of the trunk. The diagonals of the inferior members will influence the inferior abdominal muscles and the trunk's muscles. These exercises can be considered disto proximal exercises. Let us suppose that the patient suffers from a left lumbar painful contraction:

We begin with the right members, determining thus a muscular activity on the right hemitruncus. From the dorsal decubitus:

- D2E schema: right superior member, (the second extension diagonal of the right superior member), the elbow stretched: the kinetotherapist's counterresistance for isometry is applied in the case of the final position, (shortened muscles). This schema activates the the right superior abdominal muscles (Vladutu R., 2001, p. 172).
- D2F schema: right superior member, (the second diagonal concerned with the flexion of the right superior member), the elbow stretched: for isometry, the kinetotherapist's counterresistance is applied at the end of the diagonal's movement – opposing the continuation of the diagonal's movement. This schema activates the extensor muscles of the superior trunk on the right side.
- D1F schema: right inferior member, (the first diagonal related to the flexion of the right inferior member), the knee bent at 90 degrees: the kinetotherapist works with the muscles present on the inferior part of the hip and on the dorsal face of the leg, the counterresistance being made at the end of the exercise. This schema activates the right inferior abdominal muscles.
- D1E schema: the right superior member, the elbow stretched: the kinetotherapist works with the posterolateral side of the arm and the volar face of the hand and fist's articulation, the counterresistance being applied within the shortened diagonal phase. This schema activates the muscles of the trunk's lateral flexors.
- D1E schema: the right inferior member, the knee stretched: the kinetotherapist works with the muscles belonging to the inferior third of the hip and to the knee; counterresistance in the final position. The schema activates the right lumbar extensors.

Then, the schemas of the diagonals performed with the members from the affected side follow. If one of these schemas cause any pains, we will give up on it for the following two days.

### The kinetotherapy implemented in the subacute phase

A. The relaxation of the contracted muscles in order to allow the free mobilization of the trunk, that implies: the continuation, with an increased resistance of isometry within the "hold-relax" method, by means of the schemas above; the performance of the exercises all along the Kabat diagonal, (isotonic contraction), the kinetotherapist obtaining a slight counterresistance all along the diagonal.

B. The asuplization of the the inferior trunk by exercises consisting in the remobilization of the lumbar spine, basin tilting, basin bends, the stretch of the paravertebral muscles and of the iliopsoas muscle, (which is also an extensor of the lumbar spine).

*The first phase of Williams program* contains the following exercises:

**Exercise 1-** dorsal decubitus: the knees are bent and stretched.

**Exercise 2-** dorsal decubitus: we take one of the knees to the chest, trying to touch it with our forehead; we repeat the same exercise for the other knee.

**Exercise 3-** we follow the same technique from exercise 2, but concomitantly with both knees.

**Exercise 4-** dorsal decubitus, the hands under the head: we take one of the knees to the chest, then the other, then concomitantly.

**Exercise 5-** from the position of dorsal decubitus, the arms raised high, the knees bent at 90 degrees, the soles on the bed: we push the spine towards the bed, the abdominal muscles contract, we raise the sacrum from the bed; then, we repeat the exercise.

**Exercise 6-** sitting on a chair, the knees apart: we bend over, the hands facing forward, so that they touch the ground under the chair; we maintain this position for 4-5 seconds, then we repeat the exercise.

Each exercise of the first phase is carried out three or five times, the program being repeated twice or thrice a day. After two weeks, during the second part of the subacute stage, the exercises become more complex, being associated with those specific to the *second phase of Williams program*:

**Exercise 7-** dorsal decubitus, the knees bent, the soles on the bed: we bend both knees to the right, then to the left, until they touch the bed (Ionescu N.A., 1994, p. 125).

**Exercise 8-** dorsal decubitus: the right heel is placed over the left heel; we perform an internal abduction of the right hip, until we touch the bed with the right knee, then we switch.

**Exercise 9-** dorsal decubitus: we raise alternatively the inferior members, the knee being perfectly stretched.

**Exercise 10-** standing: genuflexions, the hands on the chair back, the back perfectly straight, the heels resting on the floor.

**Exercise 11- the position of "knight servant," the body bent over the hip raised at 90 degrees, the hands resting on the ground:** we stretch the supporting knee, performing a to-and-fro movement that must stretch the iliopsoas.

1. Meanwhile, we perform several exercises in hanging position:

a) The back to the espalier, the hands over the head, holding the bar:

- The lift of the knees to the chest;
- Left-right rotation of the flexed knees;
- Left-right tilt of the stretched inferior members, (like a pendulum);
- Semi-suspension, resting on the feet, (CF and G at 90 degrees): we perform the forward-backward and lateral tilt of the basin.

b) Facing the espalier, the palms to the wall: the pendulation of the basin and of the inferior members to the left and to the right; the legs on one of the bars, we perform lumbar rotations.

**The kinetotherapy implemented during the chronic stage.** There are two main objectives: continuing the lumbar asuplization and tonifying the weak muscles.

A. The lumbar asuplization is obtained by means of the same effects we dealt with during the subacute period:

1. Tilting the pelvis by the performance of the exercises in *the third phase of Williams program*:

**Exercise 1**—dorsal decubitus, the knees flexed: we push the spine towards the bed, we tilt the sacrum up, (the spine remains in contact to the bed all the time), we contract the abdominal wall.

We gradually perform the same lumbar movements for the basin, the knees less flexed, until they are completely stretched.

**Exercise 2**—in standing position, to the wall, the soles 25-30 cm away from the wall: we press both the sacrum and the spine against the wall; we gradually get the heels closer to the wall, maintaining the spine's contact to the wall.

**Exercise 3**—dorsal decubitus: we perform exercises on the bike, the pelvis tilted forward.

2. We stretch the hip's flexors—which are muscles that control the lordosis of the lumbar spine. Their retraction limits the lumbar mobility— according to Kabat schemas:

- D1F schema: the inferior members in "the elongated position," the knee flexed at the edge of the table, the calf being under its level: the kinotherapist works with the dorsal face of the leg, the knees; an isometry counterresistance is obtained, followed by a relaxation within the "hold-relax" technique (Roland M Morris R., 1983, pp. 143-144).
- Lateral decubitus on the opposite side of the affected hip: the homolateral hip and knee are powerfully flexed, (which tilts the pelvis forward); the other hip stretched: the kinotherapist works with the knees and the affected; counterresistance in relation to the patient's CF flexion; isometric contraction, then relaxation.
- D2F schema: inferior members in the "elongated position" (startup), the knee stretched; counterresistance on the anterolateral face of the hip and the dorsal face of the leg. The schema actually determines the stretching of the tensor fasciae latae muscle by "hold-relax" technique.

3. Stretching the lumbar extensors, performed by implementing the "hold-relax" technique on the antagonists, (flexor muscles), not on the agonists, (the paravertebral muscles):

Dorsal decubitus, CF and the knee at 90 degrees: we work with the knees and soles; the patient takes the knees to the chest, (knees to chest stretch), movement controlled by the medical assistant; at the same time, he controls the rotation movement, (the assistant tries to move the calves, as if they were some levers, on one side and the other). This kind of isometry, (on flexion and hip rotation) tonifies the flexors and relaxes the trunk's extensors.

While sitting down, the inferior members stretched, we perform the "chopping" movement: the right hand of the patient catches the inferior third of the opposite forearm; the couple of the superior members is thus laterally placed, towards the left hip; concomitantly, the head is flexed; the nurse controls the head's flexion by massing the forehead and the left hand. We execute the exercise by the "hold-relax" technique.

B. The fortification of the trunk and abdominal muscles, as well as of the lumbar extensor muscles. The inferior trunk must obtain, in orthostatic position, the maintenance of a neutral position of the pelvis and an abdominal pressure meant to take control of one part of the pressure transmitted to the discs.

As we have noticed, the obtainment of a neutral position, (intermediary) of the spine is connected to the stretch of the lumbar extensor muscles, (the paravertebral extensors and the iliopsoas), as well as to the fortification of the abdominal muscles and of the gluteal muscles, (located down the posterior face of the basin) —the muscles that will contribute to the basin's tilt.

**Exercise 1** - in dorsal decubitus, the knees flexed at 90 degrees and close to one another, the soles on the bed: we try to raise them up to the ceiling, but the nurse counterposes the movement—all along the exercise the spine must be in contact to the bed. The exercise determines the best contraction, (the lumbar and abdominal muscles). As the inferior trunk's force and flexibility ameliorates, the exercise above will be performed with the knees stretched.

**Exercise 2**—dorsal decubitus, the knees at 90 degrees, the soles on the bed: we raise the head-shoulders-trunk, (the arms stretched), until the palms come 10 cm above the knees; then, we repeat. The exercise tonifies the right abdominals.

The trunk's lift is achieved by taking the hands laterally to the knees, (left, then right). The exercise tonifies the abdominal oblique muscles.



**Exercise 3**—on all fours, for the correction of lordosis posture: we suck in our abdominal wall; we maintain this position for 5-6 seconds; we repeat. The exercise tonifies the transverse abdominal muscle.

**Exercise 4**—is a more complex exercise, that determines concomitantly the best muscular contraction of all muscles. It takes place in four different phases, from dorsal decubitus posture, the knees at 90 degrees and the soles on the bed:

- We lift the spine, the nurse controls the correct performance, keeping the hand under the patient's spine;
- We tilt the sacrum and the coccyx, the spine remaining in contact with the bed: we contract isometrically the gluteal muscles;
- We raise the head-trunk, the arms stretched towards the hips;
- We hold a relatively hard elastic belt, that we pull to the lateral side, (the palms raised). We maintain the position for 5-6 seconds, then we repeat the exercise.

**Exercise 5**—dorsal decubitus, the knees flexed at 90 degrees: the patient takes both knees to the bed's plan; we perform the isometry, (the nurse opposes the movement).

**Exercise 6**—dorsal decubitus, the inferior members stretched: keeping the forearm under the distal third of the hips, the kinetotherapist tries to raise them up, but the patient opposes; concomitantly, with the other hand, the medical assistant holds the patient's legs and takes them to him, but the patient opposes.

**Exercise 7**—dorsal decubitus, the hips and knees at 90 degrees: the patient takes his knees to the chest, but the medical assistant opposes; concomitantly, he tries to rotate the calves as if they were levers, but the patient opposes.

**Exercise 8**—in dorsal decubitus posture, the hips flexed: the kinetotherapist works with the muscles on the anterior face of the shoulder, pulling it back, while with the other hand, he massages the muscles on the superior pelvis; the patient opposes to these forces; then, the kinetotherapist switches the exercises, (posterior-shoulder and anterior-pelvis). Then, the patient relaxes. From lateral decubitus posture, we can activate the abdominal muscles, without involving the hip's flexors (Waddell G Main CJ, pp. 204-208).

**The kinetotherapy implemented during the complete remission.** After the complete healing of all the lumbosacral affections, kinetotherapy must be replaced with the program of secondary kinetoprophylaxy, meant to prevent possible relapses. This program is called "school back" and it was introduced for the first time by the Swedish Marianne Zachrisson. Kinetoprophylaxy of lumbosacralgia is based on three objectives:

A. Being aware of the correct position of the lumbar spine and of the basin by the permanent correction of the lumbar spine's posture, irrespective of the body's position or the activities we are involved in. The adoption of the correct postures: In dorsal decubitus, the knees flexed and the shoulders slightly raised; In lateral decubitus, the hips and knees flexed; In orthostatic position, when we wear flat shoes; one leg on the small chair; shortening of the distance appendix-xiphoid; pressing the spine against a wall; noticing, in front of the mirror the abdominal wall retraction and the correct position of the lumbar spine; Sitting, the knees 8-10 cm over the hips; legs crossed pose; leaning against the chair back, (we do not lie on the edge of the chair); pulling the driver's seat towards the steering wheel;

**Exercises concerned with the correct position of the lumbar spine by tilting the basin:**

- In dorsal decubitus, the knees flexed, then, gradually, with the knees stretched;
- In orthostatic position, to the wall, the heels 25-30 cm away from the wall, then we bring them near one another;
- In orthostatic position: one hand the palm upwards; the other, the palm downwards, at the level of the xiphoid muscle—the shortening and increase of the distance between the two hands;
- In sitting position, hands back: we move upwards and backwards;
- On all fours, we move upwards and backwards.

**Usual exercises involving upwards and backwards movements:**

- Bending the trunk over one of the flexed, the other inferior member remaining stretched, at a distance—the body takes the shape of a "turn"; thus, we can lift easy objects from the floor;
- Genuflexions, in order to lift a heavy object by means of both hands, then we place a heavy object at the level of our basin, the arms stretched, (not at the level of our chest);
- We lean forward, by flexing the hips, the lumbar spine being in a neutral position.

B. "Fastening" the lumbar spine, with a view to learning how to maintain the correct position, as well as the independent mobilization of the members in relation to the trunk, during effort. "Fastening" technique is characterized by four different stages:

- The first stage: "the fastening" of the lumbar rachis in neutral position concomitantly with the members' immobilization. Concretely, the patient adopts immobile positions in orthostatic, sitting, or decubitus posture, breathing slowly and deeply, following the elongation of the head and neck in an axle, without the mobilization of the members and the rachis. The patient must be aware of the whole body's immobility.
- The second stage: maintaining the trunk "fastened," the patient completely immobilizes the members and spine. In dorsal decubitus, the patient flexes and deflexes the knees, he abducts and adducts the arms. In sitting position: lifting the arms horizontally, hips lifts, their abduction. In orthostatic position: the flexion of hips at 90 degrees, arms' mobilization (Sbenghe T., 1999, p. 82).
- The third stage: the mobilization of the "fastened" trunk, similar to a "unique piece." In decubitus: getting out of the bed by lateral rolling movement, followed by arms pushing and the concomitant lowering of the inferior members. In sitting position: anteroposterior and lateral oscillations by rolling on the ischia, (hands on hips); rising from and sitting down a chair. In orthostatic position: leaning over, lunging at one of the legs, followed by the performance of "the turn"; genuflexions with the back leaning against the wall, or free genuflexions, with anterior leaning, easy running.
- The fourth stage: where the exercises learnt during the first three stages are implemented differently for the daily home, or professional activity. For example, the way we lift and carry a heavy object; the way we push a piece of furniture; the way we work with a saw.

### C. Maintaining the muscular force, (the muscles belonging to the inferior trunk and the gluteal muscles).

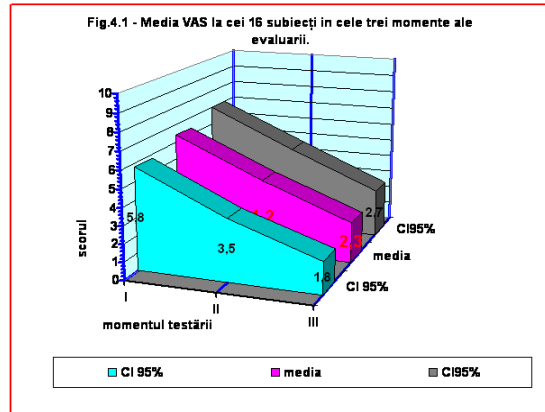
#### 5. The Analysis and Interpretation of the Research Results

The semiological elements, (clinical and functional) studied and estimated during the three evaluation periods, for each patient, were:

**PAIN.** It was estimated individually during the three evaluation periods, then we calculated the average and the confidence interval for the studied group, according to their gender.

**Table–The result of pain evaluation by VAS scale**

| No.                           | VAS pain              |                         |                         |
|-------------------------------|-----------------------|-------------------------|-------------------------|
|                               | I                     | II                      | III                     |
| 1                             | 10                    | 7                       | 3                       |
| 2                             | 7                     | 4                       | 3                       |
| 3                             | 6                     | 6                       | 3                       |
| 4                             | 5                     | 3                       | 1                       |
| 5                             | 5                     | 4                       | 2                       |
| 6                             | 5                     | 2                       | 1                       |
| 7                             | 5                     | 4                       | 1                       |
| 8                             | 7                     | 2                       | 1                       |
| 9                             | 7                     | 5                       | 4                       |
| 10                            | 7                     | 4                       | 3                       |
| 11                            | 8                     | 5                       | 2                       |
| 12                            | 7                     | 4                       | 3                       |
| 13                            | 6                     | 6                       | 3                       |
| 14                            | 8                     | 5                       | 3                       |
| 15                            | 5                     | 4                       | 2                       |
| 16                            | 5                     | 2                       | 1                       |
| <b>AVERAGE (CI 95%, n=16)</b> | <b>6.4</b><br>(5.8-7) | <b>4.2</b><br>(3.5-4.8) | <b>2.3</b><br>(1.8-2.7) |



The data obtained in the table confirm the decrease in pain intensity. Generally, the females registered a VAS scale score lower than the one registered by the male patients, during all the evaluation periods.

We have to mention that the reduction of pain parameter was significant, irrespective of the patients' gender and group age(Konin J.G., 2000,p.120).

**The functional evaluation**

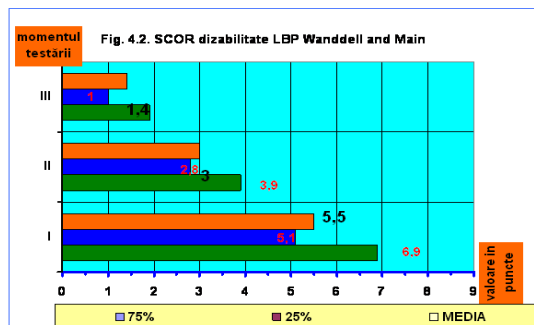
**Chronic Disability Index of Waddell and Main for Patients with Low Back Pain**

**TOTAL SCORE = SUM, (points obtained after answering the 9 questions)**

*Interpretation:* minimum score: 0, maximum score: 9, the bigger the number of items, the bigger the level of disability.

Table no. 2.

| No. (patient)                 | SCORE Waddell and Main LPB disability |                       |                       |
|-------------------------------|---------------------------------------|-----------------------|-----------------------|
|                               | I                                     | II                    | III                   |
| 1                             | 9                                     | 5                     | 3                     |
| 2                             | 8                                     | 3                     | 2                     |
| 3                             | 5                                     | 5                     | 2                     |
| 4                             | 4                                     | 2                     | 1                     |
| 5                             | 4                                     | 3                     | 1                     |
| 6                             | 4                                     | 1                     | 1                     |
| 7                             | 3                                     | 2                     | 0                     |
| 8                             | 5                                     | 2                     | 1                     |
| 9                             | 8                                     | 3                     | 2                     |
| 10                            | 7                                     | 3                     | 2                     |
| 11                            | 8                                     | 4                     | 1                     |
| 12                            | 5                                     | 3                     | 2                     |
| 13                            | 4                                     | 3                     | 2                     |
| 14                            | 7                                     | 5                     | 2                     |
| 15                            | 4                                     | 3                     | 1                     |
| 16                            | 4                                     | 2                     | 0                     |
| <b>AVERAGE (CI 95%, n=16)</b> | <b>5.5</b><br>(5.1-6.9)               | <b>3</b><br>(2.8-3.9) | <b>1.4</b><br>(1-1.8) |



The previous table and chart indicate a significant attenuation of the disability caused by lumbar pain, two of the patients manifesting a complete functional rehabilitation after the physical-kinetic program, at the end of the evaluation period.

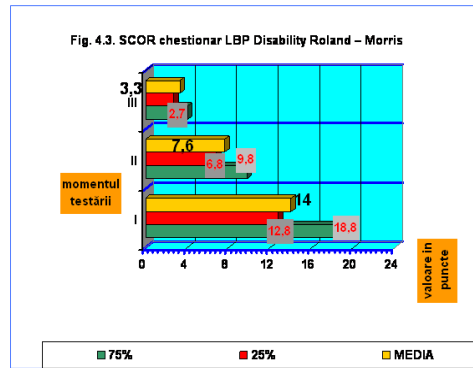
**Low Back Pain Disability Questionnaire of Roland and Morris**

**Total score = SUM, (points for all the 24 situations)**

Interpretation: **minimum score: 0, maximum score: 24.**The higher the score, the more serious the disability associated with back pains. 0 points indicate the absence of any disabilities, whereas 24 points indicate a disability. A score higher than or equal to 14 indicates a patient severely affected. We considered necessary the implementation of an additional scale, with a view to evaluating more correctly the patient's therapeutic evolution (Roland M Morris R., 1983, pp. 178-183).

**Table–The scores of Roland –Morris LBP Disability Questionnaire obtained during the three evaluation periods**

| No. (patient)                 | SCORE Roland-Morris LBP Disability Questionnaire |                     |                    |
|-------------------------------|--|---------------------|--------------------|
|                               | I  | II                  | III                |
| 1                             | 22   | 14                  | 6                  |
| 2                             | 20   | 8                   | 4                  |
| 3                             | 10   | 9                   | 4                  |
| 4                             | 9  | 6                   | 4                  |
| 5                             | 8  | 6                   | 3                  |
| 6                             | 6  | 3                   | 2                  |
| 7                             | 5  | 3                   | 1                  |
| 8                             | 12   | 6                   | 3                  |
| 9                             | 20   | 8                   | 4                  |
| 10                            | 18   | 7                   | 3                  |
| 11                            | 21   | 10                  | 2                  |
| 12                            | 14   | 7                   | 4                  |
| 13                            | 10   | 7                   | 3                  |
| 14                            | 19   | 13                  | 4                  |
| 15                            | 17   | 9                   | 4                  |
| 16                            | 13   | 5                   | 1                  |
| <b>AVERAGE (CI 95%, n=16)</b> | <b>14(12.8-18.1)</b>                             | <b>7.6(6.8-9.8)</b> | <b>3.3 (2.7-4)</b> |



The previous table and chart indicate a significant amelioration of the disability caused by lumbar pain, seven patients manifesting almost complete functional rehabilitation after the physical-kinetic program, registering a score lower than or equal to three, at the end of the evaluation period (Kiss L, 1989, pp. 230-232).

## 6. Conclusions

The correct and complete evaluation of the lumbar spine and of the functional status generated by the consecutive disability in the case of those patients with herniated lumbar disc represent an important component within the recuperative program. The recuperative methods we resorted to in this paper are the recovery through kinetotherapy and massage, starting from the consideration that the vertebral column's stability is not due to the structure of the bony articular extremities, or to the capsulo-ligamentary formations, characterized by passive insufficient sustaining elements, but to the periarticular groups of muscles. The therapeutic help in the rehabilitation of HDL patients must be complex, it must approach all the physiopathological links and it needs associated recovery means: medicated, physical-kinetic and educational. The therapeutic means we used brought about a pain amelioration for all the patients, during all the evaluation methods, with the mention that the attenuation of pain parameter was significant, irrespective of the patients' gender and group age. The present study underlines the objectivity of the patients' favourable evolution with herniated lumbar disc, by the implementation of the complex recovery program and especially by the massage and kinetotherapy techniques applied differently, according to the etiopathogenic implications.

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