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Physical Exercise, A Means Specific to Physical Education and Physical Therapy Used in the Recovery of Coxarthrosis

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ABSTRACT

Physical education and medical kinetology use, for prophylactic and therapeutic purposes, specific and non-specific means. A criterion for systematizing technical physical exercises is to classify them into static exercises, which include isometric positions and contractions, respectively dynamic exercises, which involve passive, active free movements or with external resistance. From a methodical perspective, the exercises are divided into two main categories: static and dynamic. Depending on the effects produced on the various apparatus and systems of the body, physical exercise, procedures and methods of prevention and recovery may be general or specific to certain anatomical and functional components. Primary coxarthrosis accounts for about 35-40% of all cases of coxarthrosis and are forms for which a clear etiology cannot be identified. They occur more frequently in women, and radiological investigations do not reveal dysmorphia or joint disalignment. The clinical onset is usually between 40 and 60 years of age and involves bilateral coxarthritic changes. The symptoms begin with mechanical, intermittent pain, with irradiation to the knees and the inner thigh, negatively influencing walking. The evolution is slowly progressive, and the therapeutic approach is, in most cases, conservative.

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Methods, Purpose, Tasks and Objectives of Research

In order to carry out this work, we used a series of research methods specific to the field of medical recovery and physical therapy, selected in such a way as to respond as faithfully as possible to the proposed objectives and to ensure a rigorous and objective analysis of the evolution of the patient with hip coxarthrosis. The importance of an appropriate methodology lies in guaranteeing the coherence, validity and reproducibility of the results.

The scientific method is a set of rational and systematic procedures, used to obtain, process and interpret data in order to understand and explain the phenomena studied The main purpose of the research is to select and apply the specific and non-specific means of physical education and physical therapy, in order to develop a perfected and individualized program, adapted to the condition, age, functional possibilities of the patient, the clinical form of the disease, the moment of initiation of treatment and the capacity for effort.

The present study aims to identify those methods with maximum efficiency, appropriate for each patient with coxo-femoral disorders, without neglecting the importance of subjective factors, especially motivational ones, involved in the process of functional recovery and social reintegration. The development of an original recovery program, which facilitates the social reintegration of patients, is based on the clinical experience gained in the field of physical therapy.

Research Tasks

- Collecting and centralizing clinical and functional data obtained from patients;
- Formulating relevant general and experimental conclusions.
- Scientific argumentation of the criteria used to validate or invalidate the results obtained.
- The elements of originality of the research are represented by.
- Personalized methodology for the application of physical exercises, specific to physical education and physical therapy, in the context of the recovery of patients with coxarthrosis and their social reintegration.
- Design of differentiated and individually adapted programs, depending on the particularities of each patient.

The objectives achievable by practicing physical exercises are classified according to the effects induced on morphological structures, functional (cardio-vascular, respiratory, etc.), neuropsychological (relaxation, coordination, balance, etc.) and social-educational sides. The fundamental requirement in the achievement of objectives is to formulate them as precisely as possible in order to easily deduce the appropriate means, methods and forms of organization.

Premises of the Research

1. Social reintegration, correlated with functional performance, is defined by three essential pillars: involvement in responsible professional activity, independent living in a stable family environment and the existence of a social support network.
2. The assessment of the degree of reintegration is crucial in situations where the therapeutic objectives are not aimed at complete recovery, but at the effective management of the disease or infirmity.
3. Musculoskeletal disorders are the main cause of functional disability in developed societies, significantly influencing the quality of life and generating considerable costs for health systems.
4. The literature contains numerous studies on coxo-femoral disorders, but few of them explicitly address the social reintegration component in the context of kinetic therapy.
5. It is necessary to expand the scientific base on the use of physical exercise as a fundamental functional unit in the recovery of patients with coxarthrosis, from the perspective of social reintegration.
6. The clinical examination of the subjects confirmed their ability to sustain the effort involved in the recovery program.
7. The program was differentiated according to the age and level of physical training of each participant.

Research Hypotheses

The application of a recovery program based on classical, specific and non-specific means of physical education and physical therapy, designed according to a methodology perfected and validated by clinical experience, has the potential to improve the quality of life and support the social reintegration of patients with coxarthrosis.

The level of functional recovery and social reintegration, including professional, in patients with degenerative diseases of the coxo-femoral joint is significantly influenced by the type of treatment applied (conservative or radical).

Organization and Conduct of the Study

The subject was selected from patients with rheumatic diseases of the coxofemoral joint, at the Ivakinetic SRL clinic in Târgoviște between 10 and 25. 05.2025

The patient benefited from his own recovery methodology. The character of the experiment we have carried out is a clinical one, natural not laboratory. This experiment aimed to optimize the quality of the recovery process, by facilitating the patient's relearning of the motor program, resuming walking in conditions as close to normal as possible. The improved recovery program was directed towards maximizing the functional remnant in the coxo-femoral joint, aiming at the social reintegration of the members of the experimental group, which is a novelty element.

Moreover, the research aims to demonstrate that an active approach, based on patient involvement and progressive dosing of effort, can produce significant changes even in the case of a chronic degenerative disease.

Particular Aspects Regarding the Treatment of Coxarthrosis

In joint mobilization exercises, the concern to exercise, or methodically strain the joints within the limits of their normal form and functions predominates. During these exercises, not only the mobilization of the joint takes place, but also the stimulation of muscle and nerve functions.

The elements that define the content of physical exercise are:

- the movements of the body or its segments.
- physical exertion (determined and characterized by volume, intensity, frequency and complexity).
- psychic effort (volitional, moral, engaging in all the psychic processes required).
- joint mobilization.
- knowledge of the anatomical and functional data of the joint.
- joint stress through passive, free active and active exercises with resistance.

Physical exercise involves not only systematic repetition, but also the possibility of building, assembling on the basis of the learned movements a motor behavior specific to the subject, who has assimilated a material that he then externalizes in the form of motor behavior.

The characteristics of the movement, trajectories, directions, amplitudes, speed of execution, are required to be permanently adequate to the situations, to the objectives pursued, which implies a permanent use of the feedback. Physical exercise involves mechanisms of regulation and self-regulation, as it favors the circulation of information in both directions: from the command center to the periphery and vice versa. Physical exercise as a system subject to regulation and self-regulation has superior capacities for choosing the optimal execution variants, for balancing the internal and external environment

The physical exercises indicated in the recovery of coxarthrosis are initiated and completed from and in various fundamental and/or derived positions.

Fundamental Positions

- standing (orthostatism)
- seated (standing)
- lying down (dorsal, lateral and ventral decubitus)
- on the knees (quadrupeds)
- Suspended

The therapeutic physical exercise indicated in the recovery of coxarthrosis has the following structure:

- the starting position - adopted from a fundamental or derivative position.
- execution of movement - by concentric contraction of agonists, eccentric contraction of antagonists and static contraction of fixators.
- maintaining the position obtained - by static contraction – isometric.
- Return to the starting position by reversing agonists and antagonists

As the distal end of the mobile segment is free or fixed on an immobile point, muscle activity takes place in a closed or open kinematic chain.

Ways of applying the exercises indicated in the recovery of coxarthrosis.

- group exercises (group therapy) - are used in patients with the same type of conditions, with similar symptoms, close ages, of the same sex and in the same evolutionary phase of the disease
- individual exercises are recommended for situations that require the supervision of a single patient; When the execution reaches the imposed parameters, the patient will be aware of the need to repeat the exercises outside the gym hours.

Active Exercise
It is achieved by repeated voluntary muscle contractions with or without displacement of the joint segments. Repeated mobilizations with the displacement of the joint segments become dynamic exercises and those without displacement become static exercises.

Dynamic Physical Exercise
They are based on isotonic contraction, during which the length of the muscle fiber changes and muscle tension remains constant. In a dynamic physical exercise, dynamic contractions alternate with static contractions.

From a technical point of view, active mobilization occurs assisted, freely, with resistance.
Assisted active mobilization, also called active-passive, is the lightest isotonic contraction, performed by the patient with the patient's own force of the affected segment or segments, helped by external forces represented by: gravity, physiotherapist, pulley assemblies, etc., without replacing the mobilizing muscle force.

It is considered, after isometric contraction, the 2nd time of muscle strength recovery after immobilization in a plaster cast, provided that stable starting positions are adopted.

Free active mobilization is called pure active because it is performed exclusively by the subject without external facilitating or resistive interventions.

Active mobilization with resistance occurs with the partially resistive intervention of external forces, with values lower or higher than the mobilizing force.

The agonist muscle groups that act against external resistance make an effort to defeat or give up:

- when agonists overcome external resistance, the movement is concentric; executes at the pull command;
- when, although contracting, the agonists are defeated by external resistance, the movement is eccentric; Executes on push or resist command
- The effects of dynamic exercises affect the skin of the active and passive elements of movement, the circulatory system and the neuro-psychic sphere.

Static Physical Exercise
It is performed by isometric contractions without displacement of the joint segments.

During contractions, the length of the muscle fiber remains constant while muscle tension reaches maximum values, by activating all the motor units of the respective muscle group. In reality, there is a microdisplacement, negligible, between the moment of increased muscle tension and that of relaxation. Isometric contraction occurs when the muscle works against resistance equal to its maximum force or when trying to move a weight greater than the subject's force. These lengths are derived from the values of the joint angles. Each joint has a specificity of the angle at which the increase in maximum muscle strength can be achieved, depending on the static or dynamic role of that muscle in daily life or professional activity.

In isometric contraction, the force developed in the muscles is maximum, but due to the onset of fatigue, it is maintained at this value only for limited periods of time. That is why isometric contractions interrupted by rest periods are used in practice. The duration of an isometric contraction is limited to 6 seconds for the untrained, followed by a relaxation of 8-10 seconds. It is the so-called intermittent static mechanical thing.

Isometric contractions are also used in proprioceptive facilitation (NPF) techniques, which promote body stability (postural tone) and muscle mobility.

Passive Physical Exercise
It is performed without voluntary muscle contractions, the joint segments being mobilized by external forces, which replace the mobilizing muscle force. If the patient is conscious, he must be involved in the recuperative act, through somato-sensory participation, during the program and through mental participation outside it, trying to recall through evocation techniques the mobilization of the respective segments.

From a technical point of view, passive mobilization can be achieved:
- Purely assisted
- Self-passive
- By mechanical therapy with pulleys and by traction
- Through forced mobilizations under anesthesia and in the form of passive-active manipulations

Purely assisted passive mobilization is performed by the physiotherapist, it is also called manual mobilization and is considered the most precise form of passive mobilization.

Self-passive mobilization is passive mobilization performed directly by the subject, with the help of a part of the body or indirectly, by means of installations (strap and plate).

Passive mobilization through mechanotherapy is achieved by assemblies of pulleys driven by the force of gravity, mechanical systems of weights and levers.

Passive-active mobilization is a form of passive mobilization applicable to muscles with low muscle shape that cannot overcome the inertia of the limb on which it acts.

The movement is performed in 2 phases:
- passive by external forces, which stimulate the antagonistic movement (most often the physical therapist's manual force)
- active in the 2nd phase, when stimulated by the stretch - reflex the movement will be able to be performed by the subject by his own strength.

Exercises With Suspensions
They represent, along with those with pulleys, forms of mechanotherapy and consist of passive, self-passive and active mobilizations with resistance. The suspension suppresses, for therapeutic purposes, the forces of gravity acting on the body or its segments.

Pulley exercises are performed by means of circuits represented by assemblies composed of:
- 1,2,3 pulleys
- String (strings)
- Fastening systems
- Weights (counterweights)

Indications for Surgical Treatment
Surgical treatments are further described as indications because some of the subjects choose investigations and benefit from osteotomies and hip arthroplasties (total uncemented, cemented

prostheses):

- In incipient coxarthrosis (with persistent pain), sometimes secondary to malformations and architectural defects, surgical correction prevents the accentuation of disabling lesions. In the case of prearthritic, asymptomatic malformations, however, conservative medical treatments are preferred, postponing corrective surgery.
- In established and evolved coxarthrosis, surgical techniques are selected according to the intensity and persistence of pain, the degree of hip instability and motor deficit and age. The indication for corrective osteotomy (frontal, sagittal or axial) requires a thorough preoperative study (clinical, radiological, coxometric).
- In simple coxofemoral dysplasia, which becomes painful at the age of 20-40 years (the most common cause of secondary coxarthrosis), the coxa valga is corrected by variation osteotomy, and for the correction of cotyloidal aplasia (with a reduced angle of coverage of the femoral head), the osteoplastic sponge is practiced (through a graft taken from the iliac wing, the surface and depth of the cotyloid cavity are increased).
- In cases of incipient coxarthrosis, secondary to hyperanteversion, rotational osteotomy is performed.
- In unilateral, advanced and disabling coxarthrosis, in a younger subject, most specialists practice arthrodesis. This suppresses pain, the stability of the hip is good, and the loss of mobility on the diseased side is compensated by good mobility of the opposite hip and lumbar spine. Support on the lower limb - on the side of the arthrodesis - is allowed only after 3 months.
- In bilateral coxarthrosis, with advanced and disabling lesions in subjects over 60 years of age, bilateral arthroplasty or only on one side is recommended, on the opposite side either an arthrodesis or an osteotomy is performed.

If the lesions predominate on the copulum or also involve the femoral head and the cotyle, arthroplasty is performed with the interposition of a vitalium dome. If the coat is not affected, the cervico-cephalic prosthesis is used. In case of very advanced injuries of the cotyl and femoral head, a total prosthesis is recommended (the indication is based in particular on the degree of disability).

Deformed arthrosis with disabilities benefit from surgical orthopedic treatment covering a wide spectrum of techniques, from arthrodesis and osteotomies to prostheses which represents significant progress, usually with excellent results. Orthopedic surgery is also increasingly recommended for correcting prearthritic deformities. Studies are also underway for the development of immunomodulators: antibodies, anti-bone tissue and anti-connective tissue.

This provides a complete picture of the patient's performance on the bio-psycho-social level.

Elaboration of general and experimental conclusions:

- Arguing the criteria for confirming or denying the results.
- The elements of originality in the research carried out are represented by: The methodology of the application of physical exercises, respectively of the specific means of physical education and kinetotherapy in order to recover patients with coxarthrosis in order to their social reintegration

Creation of Differentiated and Individualized Programs for the Patient

Limitation of hip movements was evaluated for flexion, extension and abduction, with the possible score ranging in the range of 3-9 for each hip, following changes in the score as a result of recuperative treatment.

The values of the score for hip mobility were assessed with:

- 1 for bending >90 0 ; 2 for 70 -90 0 , 3 for values <70 0
- 1 for extension 20-30 0 ; 2 for 5-15 0 , 3 for 0 0 or flexum
- 1 for abduction 35-450 ; 2 for 25-35 0 , 3 for < 25 0

In severe chronic diseases of the lower limbs - bilateral coxarthrosis, coxarthrosis, coxitis - the use of classic physical therapy methods superimposed on psychological ones facilitates the process of motor relearning, in the sense of decreasing the recovery time of the motor program and obtaining higher functional parameters, given that both psychological and kinetic methods relate to the invoked variables of each patient.

Recovery of Joint Mobility

Re-education of flexion

a) By adopting certain posts.
b) Through passive mobilizations

These are performed by flexing the thigh on the pelvis or the pelvis on the thigh; The knee should always be flexed to relax the hamstrings.

c) through self-passive mobilizations
d) by active movements
e) through facilitation methods

The facilitation of hip flexion is given by the scheme: flexion - abduction - external rotation associated with abduction, supination and extension of the leg and toes, regardless of the position of the knee (preferably flexed). The limitation of flexion given by extensor hypertonia benefits from the following techniques:

- Slow inversion (IL) - dorsal decubitus at the edge of the bed, the diagram of the diagonal DIE is performed; The patient's active movement is contracted by the physiotherapist, but without blocking it. No breaks are made by immediately switching from one scheme to another; the movement is ample on all possible amplitude.
- Slow reversal with opposition (ILO), in the above technique a short isometry is introduced at the end of the diagonal stroke
- Rhythmic initiation (IR), in fact a passive mobilization, then passive - active, but executed diagonally.
- Relaxation - opposition (RO), the most valuable technique for increasing mobility.

a) In the antagonistic scheme: supine position at the edge of the bed on the affected Ml side. The hip is mobilized in extension-abduction-internal rotation, with the knee stretched (or flexed) and the leg in extension and eversion. The physiotherapist tries to initiate from this position, a diagonal movement DIF, but the patient holds, and the isometry is performed. After 5-6 seconds it slowly relaxes. When the extensor is completely relaxed, the patient takes the thigh actively in flexion, up to the maximum limit - it is repeated several times.
b) In the agonistic scheme: Ml is worn diagonally DIF, as long as the extensor retraction allows; at this maximum point, the patient actively tries to continue flexion, but the physiotherapist opposes it (isometry); then relaxation, immediately followed by the active movement of continuing

flexion.

c) Rhythmic rotation (RI): supine position, grip on the femoral condyles; Internal-external rotations are performed (the patient is as relaxed as possible), then the hip is passively mobilized on the DIF, forcing flexion.

Re-Education of the Extension

The re-education of the CF extension can be done:

a. By adopting certain positions. In this set of exercises the knee will always be extended, to put tension on the anterior right.
b. Through passive mobilizations. The same general rule is observed during these exercises: during the forcing of the CF extension, the knee remains extended.
c. Through self-passive movements:
d. The affected limb lying on a straight plane stretches the psoasiliac strongly in fact, the exercise is even called the inguinal stretch; at the same time the flexion of the opposite CF is forced.
e. Through facilitation methods. The impossibility of extension, determined by hypertrophy, contracture or retraction of the psoasilac, is corrected by the techniques we mentioned in flexion re-education, but with the inverted schemes.

Abduction Re-Education

For a pure abduction, external rotation should be carefully avoided, especially at higher amplitudes of thigh abduction. It is carried out:

a. By adopting certain positions
b. Through passive mobilizations
c. Through self-passive movements

The exercise is effective, because the sitting position relaxes the ligaments of the CF joint, allowing greater abduction amplitudes and, in addition, the variation of the angle of flexion of the thigh, which corrects the inclination of the pelvis if necessary

a. By active movements: at 900 and perform abductions.
b. Through facilitation methods

The scheme to facilitate hip abduction is DIE: extension - abduction, - internal rotation, with eversia and flexion Exercise 8 - The patient in supine position, with Ml placed on a glossy plate: perform abductions - Healthy Ml fixed (or not) with a belt; Also from the supine position, flexes the plantar knee of the foot (stretched knee). The inability to abduction due to the retraction of the opponents (abductors) has, especially, clinical expression in the case of concomitant bilateral abduction of the thigh; therefore, it is preferable to approach the bilateral symmetrical scheme (BS) on DIE, which however requires two physiotherapists. In the slow inversion (IL) technique, work will be done on the diagonals of DIE and DIF. Given the particularities of action of the abductors, the facilitation techniques with relaxation-opposition isometry or slow inversion with opposition to promote the abduction movement, are executed in a more particular way. In the antagonistic scheme of the relaxation-opposition technique, the thigh goes into maximum internal rotation and abduction. The physiotherapist tries to perform the external rotation with abduction, but the patient holds in isometric contraction. In the agonistic scheme the thigh is carried in external rotation, abduction, extension or flexion to the maximum point. The physiotherapist here opposes the continuation of this movement.

Of great value is the technique of rhythmic rotation.

Abduction Re-Education

It can only be achieved either by associating flexion (less often extension), or by releasing the contralateral limb. Cases in which abduction re-education is an important objective are much rarer.

a. By adopting certain positions
b. Through passive mobilizations
c. Through self-passive movements
d. Through active movements

Re-Education of Rotation

The re-education of the CF rotation is done:

a. By adopting certain positions
b. Through passive movements
c. By active movements
d. Through facilitation methods. No matter what facilitation techniques are used, external rotation must be coupled with abduction and internal rotation with abduction.

To complete the proximal pivot (peripheral) scheme, flexion or extension is associated, at your choice. On this principle, the desired diagonals will be selected.

Combined Passive Mobilisations

Analytical mobilizations, for each type of movement described, are often not enough to increase joint mobility.

The ligaments, muscles, joint capsule have oriented fibers both obliquely and spirally, so in order to stretch them, it is necessary to perform multidirectional mobilizations – combined.

a. By extension-abduction-external rotation

This method stretches the gluteus minimus and the tensor fascia lata

b. By flexion-abduction-internal rotation

Through this maneuver, the pelvic floor muscles are stretched

a. By extension-abduction-internal rollover

Specific Pull-Ups

Of great efficiency in CF remedies, both articular and especially periarticular causes, traction at this level proved to be of great efficiency, which require a good technique from the physiotherapist, as well as sufficient strength.

There are two types of hip pulls:

- External, in the direction of the femoral neck
- On the longitudinal axis of the femur

External Pull-Ups

a. Caudal Pulls

Regaining the mobility of the hip joint in addition to the above exercises can be greatly helped by applying heat beforehand, relaxing massage or performing many of the exercises in warm water. Pain being an obstacle in achieving maximum amplitudes of motion, it will be attempted to be sedated by all means. The hip in general, allows you to perform exercises above the pain threshold.

b. Physical Hip Mobility Dysfunctions

Initially, the patient's minimum hip mobility score was 6, and the maximum value was 14. In the end, the minimum value of the hip mobility score decreased to 4, and the maximum value to 11, so the hip mobility improved.

c. Physical Dysfunctions

Hip mobility

In the case of hip mobility, the difference between the final and initial average values is significant. The role of the recovery program designed and applied to the patient is confirmed. The evaluation was carried out with the help of standardized tools,

such as the goniometer for measuring mobility and the WOMAC questionnaire, frequently used to assess the functional status in arthrosis [1-10].

Results

The results obtained confirm the hypothesis that an individualized physical therapy program can significantly contribute to the improvement of symptoms and improvement of the function of the coxo-femoral joint. The reduction of pain and the increase in the capacity for effort implicitly led to an increase in autonomy and, in the future, to a more efficient social reintegration of patients. Compared to the control group, which followed only conventional treatments (anti-inflammatory drugs, passive physiotherapy), the patient who benefited from an active, personalized program had superior results in all functional plans evaluated.

Another important aspect is the motivational component: the patient's active involvement in their own recovery process played an essential role in maintaining adherence to the program and in achieving functional progress.

General Conclusions

- Coxarthrosis is a disease that, through specific consequences such as: pain, loss of joint mobility, reduced ability to move, can induce the sufferer a decrease or loss of independence and restrictions in interaction with society. Consequently, improving the program of physical exercise and applied physical therapy can contribute to increasing the chances of social reintegration of some patients suffering from this disease.
- People with disabilities are a problem for society because they use health services more frequently, require more visits to the doctor, investigations, medication, and hospitalization, consequently involving higher costs for society.
- Increasing the effectiveness of prevention and treatment methods through physical exercise leads to benefits for both the individual and society, as it can reduce the costs that society has to allocate to the care of individuals with coxofemoral joint disorders.
- The new therapeutic guidelines in the recovery of patients with coxofemoral suffering through the use of physical exercise can be of real use in their social reintegration, if the link between social reintegration and the functional performance of the individual is taken into account.
- Therapeutic physical exercise finds wide applications in the major departments of rehabilitation, being indispensable both for medical recovery and mental rehabilitation, as well as for professional re-education and social reintegration.

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