THE BENEFITS OF KINETIC PROGRAM FOR PACIENTS WITH TOTAL HIP PROSTHESIS

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ABSTRACT: Background. The aim of this paper is to study the importance of kinetic treatment in the postoperative rehabilitation of muscle strength in order to restore joint range of motion (ROM), flexibility and improve gait for total hip prosthesis patients, also to relieve pain and for increase patient quality of life on long term. We consider that an individualized kinetic program is applied as early as possible for functional rehabilitation of the prosthetic hip then the socio-professional reintegration will be faster and the quality of life will increased.

Methods. A retrospective study on 15 patients who underwent a rehabilitation treatment after balancing prosthesis intervention from June 2017 to February 2018 at the Calafat Rehabilitation Hospital. 12 who participate to the kinetic program (B1 group), and 3 (B2 group) who are unable to benefit from this program due to major contraindications. The evaluations were performed at admission, during the kinetic program (after 30 days) and at the end of the program (after 90 days).

Results. There are significant differences between B1 group and B2. It's noted that hip joint ROM is higher for group B1 than group B2, the faster rehabilitation trend is observed for patients in group B1 due to the fact that they also work for the rehabilitation of muscle strength. The significant results of the active ROM is recorded at 90 days postoperatively, during this time the patients of the B1 lot gain a muscle hip joint strength.

Conclusions. The postoperative evolution of patients with total hip prosthesis requires a complex assessment to establish the patient's functional abilities. In this study we found that within the 30 and 90 day evaluation following individualized rehab programs compared to patients who didn't follow such a program, a feature highlighted in particular by the obvious improvement in functional abilities gait parameters at this patients.

Keywords: h*ip endoprosthesis, functional evaluation, kinetic therapy.*

Introduction

Balancing prosthesis intervention is now widely practiced, the purpose of this surgical procedure in which part of the injured joint components are replaced by artificial components improving mobility and reduce hip pain.

Among the prosthetic indications, the most common is hip arthritis. Other indications are: hip dysplasia, femoral head aseptic necrosis, fractures or dislocations of the proximal acetabulum or femur, rheumatoid arthritis, ankylosing spondylitis.

Prosthetic hip arthroplasty (endoprosthesis) has become one of the most successful orthopedic surgeries in recent decades, involving both physicians and bioengineers. Thus, the essential role of kinesiotherapy in biomechanical evaluation and functional rehabilitation of the endoprosthetic hip increases.

The aim of this paper is to study the importance of kinetic treatment in the postoperative rehabilitation of muscle strength in restoring joint amplitude and flexibility and normal gait to the patient with total hip prosthesis. This paper also analyze the functional and biomechanical changes occurring in patients who have undergone a balancing prosthesis intervention in order to propose customized kinetic programs for each patient. The exercises rehabilitation after surgery also helps relieve pain, restore joint mobility and for a long-term period also increase quality of life. Mobilization and muscle exercises of lower limb stimulate circulation and reduce the risk of blood clots (thrombophlebitis, embolism), increase muscle strength and coordination and thus decrease the risk of falling, avoiding fractures or dislocation of the prosthesis, and by early mobilization decreases the risk of lung infections and urination and bedsores. We consider that for the functional rehabilitation of the prosthetic hip if an individualized kinetic program is applied as early as possible, then the socio-professional reintegration will be faster and will also increase the quality of life by allowing the patients to return to their daily activities.

Materials and Methods

We performed a retrospective study consists of 15 patients, aged between 51 and 73 years who underwent a rehabilitation treatment after balancing prosthesis intervention from June 2017

to February 2018 at the Rehabilitation Hospital in Calafat. There's only take into consideration the cases with primary hip arthritis but also secondary to congenital hip dysplasia, both unilateral which, due to the age and unfavorable evolution of the arthritic process, required an indication for the prosthesis.

The study was performed postoperatively when the kinetic programs were applied. The tests were performed at first month and then after 3 months. To analyze the effectiveness of the proposed programs for the rehabilitation of patients after hip replacement we analyzed the hip functional evaluation, the amplitude of the hip joint movement as well as the muscular force of the hip by using articular and muscular testing.

The study included 15 patients who had recurrent total hip replacement evaluate for a period of 3 months, 12 patients who were shown to participate in the kinetic program, and 3 patients due to major contraindications (cardiovascular disorders) were unable to participate to the proposed kinetic program. Each of the subjects was tested with a goniometer to measure articular mobility. Tests were performed at admission (initially), during the kinetic program (intermediate) and at the end of the program (final).

Analysis of joint amplitude was performed at the level of the hip joint bilaterally by using a goniometer, testing both: active and passive mobility. The first evaluation of the amplitude of the movement was performed in a passive manner with the aim of determine the degree of passive mobility from the hip joint to identify possible ankylosis present at this level. At the same time, the patient notices and learns the movement he must perform when we test active mobility from this segment. Joint testing comprised 2 stages consisting of postoperative assessment at 1 month and 3 months respectively.

Muscle analysis is performed to determine the degree of muscle damage to evaluate the process in the postoperative and rehabilitation phase. Testing was done in a seated position, explaining to the patient during each test the movement he must perform. The muscular test was performed by the physical therapist in order to evaluate the strength of each muscle or muscle groups, helping to develop both the full functional diagnosis required to compile the rehab program and to quantify the results obtained by applying the program. It is therefore necessary to achieve the joint mobility rehabilitation in parallel with the restoring of muscle force that performs these movements.

Postoperative kinetic program proposed.

PROGRAM A - This program was performed by patients in the first days postoperatively. The number of repetitions was 2-3, in the 3-4 series, with a few minutes pause. This program was performed twice a day.

1. From supine, perform the abduction of the inferior limbs without lifting them from the bed plane;
2. From supine, lower limb abduction alternately with easy lifting of the bed;
3. From supine, flexion-extension from the knee joint without lifting the heel on the bed;
4. From supine, flexion-extension from the knee joint, with easy lifting of the limbs from the bed plane;
5. From supine, flexion - head extension on the trunk, for toning the abdomen;
6. From supine, with the knees bent on the ground, rises vertically, alternately, one leg, with the knee in the extension.

PROGRAM B - This program was designed to increase joint mobility and muscle strength. The number of repetitions was 4-5 in the 4-5 series, then 6-8 repetitions in 5 series. The breaks were accompanied by breathing exercises, relaxation exercises, or passive rest, with intervals of 3-5 minutes. After a period of time, the weight applied as counter-resistance increased from 1 kg to a maximum of 2-2.5 kg.

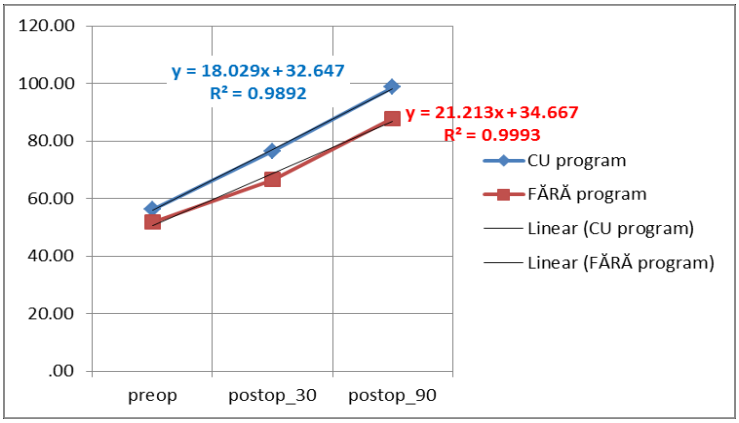
1. Posture on various scrolls to relax the joint capsule
2. Anti-stroke - to prevent edema of stasis;
3. Active extensions in the ankle joint;
4. In the Rocher cage, flexion-extensions with a weight of 500g, from the hip joint, the exercises are passive-active;
5. Isometric roots with sustained contraction 5 seconds, 10 reps, 3 series, 30 second pause;
6. Quadriceps isometry, with contraction 5-10 seconds, 10 reps, 3 series, with 30 second pause.
7. Lower leg knee flexions in the extension (lifting from the bed), holding 5-10 seconds. Repeat until fatigue occurs;
8. Initial ergometric bicycle without loading 15 minutes 2 times a day, extension knee; progressively increases the load on the affected lower limb by increasing the pedaling time to 20-30 min, 2-3 times a day;
9. Walking between parallel bars over small obstacles put in the patient's path to make him lift his knee;

10. Self-control in the mirror, exercises with self-control of body posture in the mirror.
Breathing exercises:
1. Hands on the abdomen, deeply inhale the abdominal wall, and expire slowly with pronouncing the letter "S" and lowering the abdomen;
2. Hands on the ribs, breathe so that in the hands of the inspirer to move away, and in the expiration to approach.
PROGRAM C - Included various exercises to restore the normal gait. During the first 2 days of surgery, the patient stayed in bed and performed active and assisted exercises without leaving the bed. From 3-5 days he was seated at the edge of the bed with his feet on the ground. The weight of the body was transferred to the seat and legs. From this position, anti-gravitational knee extensions and ankle mobilizations were performed, the patient was taught to pass from the bed to an adjacent chair, loading his lower limbs. Hip flexures were performed up to 70-80 degrees by bending forward of the trunk but with upper limb support. During this period, the moves from the bed to the chair or chair and vice versa, respecting the flexure of the hips up to 70-80 degrees.
From day 5 progressive walking started. The injured lower limb was partially supported on the ground, with about 8% of the body weight. He was looking for this to follow as much as possible the normal step. Start walking on the stairs with the frame, climb with the inferior healthy limb, get down with the operated one.
From day 6 onwards, exercise tolerance continued between parallel bars, with visual control in the mirror. From day 7 to 8, the load went up with an accent on the flexion-extension movement. In the first 2 weeks postoperatively continued the movement with the help of the frame, climbing and descending the stairs, observing and correcting the deviations along with active toning exercises both for the inferior operating limb and for the other healthy body segments. Restore the correct gait patterns with the balance of the pelvis, trunk, upper legs while walking. Balancing is restored using techniques that involve successive imbalances, learning to walk over obstacles, returns.
Walking with the stick was initiated after 6 weeks postoperatively when the patient was able to lean approximately 50% by weight on the affected foot and after ensuring the stability of the hip due to the toning of the hip stabilizers. The stick lasts for 6 months to protect the hip and prolong the life of the prosthesis.

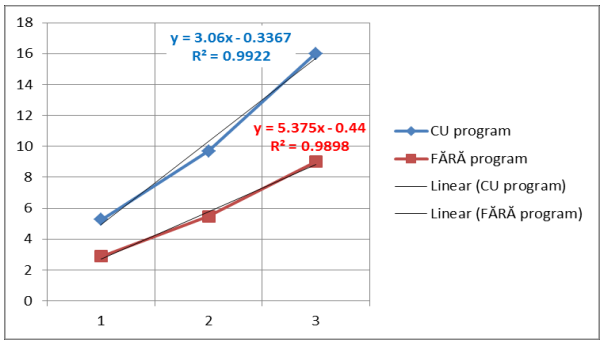
Results and discussions. 1. **Evaluating the motion amplitude of the hip joint between the study groups and the control group**

Graphic no 1. Differences between two lots in flexion movement.

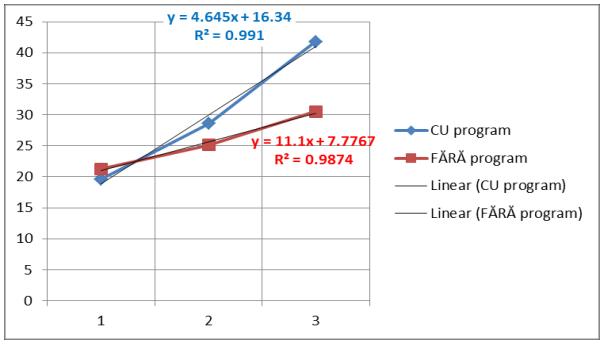
The tendency to improve flexion is clearly favorable for B1 group of patients



Graphic no 2. Differences between the two lots for the extension movement.
The tendency of improvement in extension is clearly favorable for patients in group B1.This trend is more pronounced than for flexion.



Graphic no 3. Differences between the two lots in abduction movement.
The tendency of improvement in abduction is clearly favorable for patients in group B1.



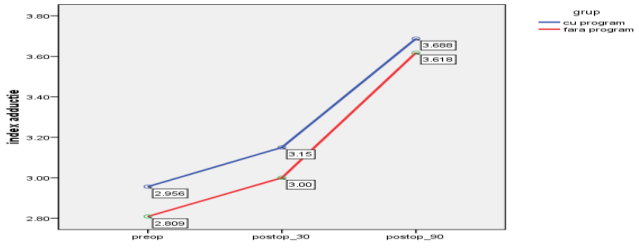
The results consists also in differences in internal rotation between the two lots of patients after the kinetic program was applied. The tendency to improve internal rotation is obviously favorable for patients in the B1 lot, even if the values intermediate (30 days) are higher for the group that did not follow a proposed kinetic program.

2. **Assessment of the muscular force of the pelvis and thigh by using muscular testing**

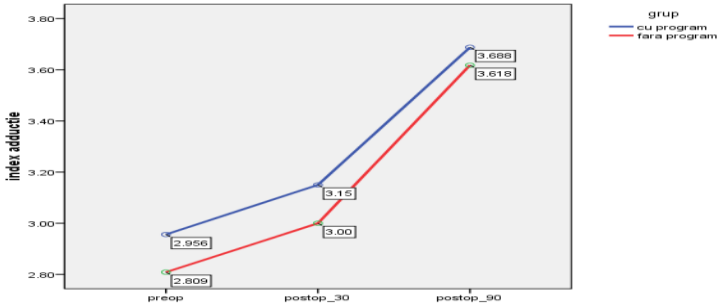
The tendency to improve the tone of flexor and extensor muscles is favorable for the patients in the group B1, with a slightly upward trend and maximum achievements better than the group that did not follow a kinetic program.

Graphic no 4. Muscular testing -abduction measurement;

The tendency to improve the tone of abductor and also for adductor muscles is favorable for patients in group B1, with a clear ascending trend and maximum values achieved better than the group that did not follow a rehab program.



Graphic no 5. Muscular testing -adduction measurement;



At the internal rotators muscles evaluation the study highlights a tendency to improve the tone of those muscles in B1 group patients with an obvious upward trend and the highest achieved values compared to the group that did not follow the proposed kinetic program.

For the final results, there are significant differences between the two groups, the B1 lot that performed a kinetic program and the lot B2 that did not perform such a program in a specialized medical rehabilitation centers.

In our hip amplitude assessment study, it is noted that the magnitude of the movement amplitude is higher for group B1 than group B2, even if these differences are not statistically significant; the faster rehabilitation trend is observed for patients in group B1 due to the fact that they also work for the rehabilitation of muscle strength. The significant difference in the rehabilitation of the active movement amplitude is recorded at 90 days postoperatively due to the fact that during this time the patients of the B1 lot obtained from the muscular rehabilitation programs a higher force which contributes significantly to the active movement thus resulting in amplitude of much higher movement compared to lot B2.

Conclusions

Structural changes in the hip, but especially the functional changes at this level due to the presence of pain, contractions and /or muscle retractions, constitute a factor limiting the mobility of the hip. Reducing pain with endoprosthesis does not implicitly lead to functional gait rehabilitation in these patients. By evaluating the functional amplitude of the hip and pelvis muscles, identify the most affected muscular groups along with the analysis of the amplitude of movement gives us the possibility to observe the changes in functional gait biomechanics and to set the goals for postoperative rehabilitation programs of walking to the patient with total hip replacement. The presence of pain in the affected hip caused the formation of habits and a static and dynamic stereotype on the injured lower limb causing abnormal overload at this level; these stereotypes have led to bilateral damage to the hip joints. Thus, after implanting the prosthesis, in order to protect the prosthetic implant, the patients generally maintained this stereotype, injuring even more this healthy hip. Overloading the healthy lower limb has led to symptomatology which will cause the static and dynamic stereotype that will damaging the prosthesis over time. The postoperative evolution of the patients with total hip prosthesis requires a clinical and functional assessment to establish the patient's functional abilities and to select the most effective techniques and methods of reabilitation. In this study we found, within the 30-day and 90-day evaluation, an enhanced tendency to improve the functional endpoint of the patient with hip endoprosthesis following individualized rehab programs compared to patients who did not follow such a program, a feature highlighted in particular by the obvious improvement in gait parameters to the patients who have undergone such rehabilitation programs.

All the authors have contributed equally in this work.

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