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# REHABILITATION THERAPY AFTER TOTAL HIP ARTHROPLASTY

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**Abstract**

The purpose of our study is to present some general aspects regarding approach to the therapeutic path in the case of the hip prosthesis following a trauma to the lower limb and femoral neck fracture in the elderly. This surgery seems quite easy nowadays, when the surgical techniques are a real progress in terms of means of investigation and treatment. However, the approach must be taken on a case-by-case basis. To understand the pathophysiological mechanisms and the application of the therapeutic means in hip prosthesis, we will present a case study in which we will apply specific kinetic means to post-surgical recovery.

## Introduction

The femoral neck fracture is a pathology that can be caused by trauma, but aging can be a determining factor. Aging promotes the appearance of osteoporosis, more precisely bone deconditioning, which is why even a minor trauma can cause this type of fracture. As a factor that favors the occurrence of femoral neck fracture, we mention the elderly, especially women, they are more prone to osteoporosis, which has a particularly important role in these types of fractures, osteoporosis degenerates bone tissue, it becomes more therefore fragile and fractures occurring much more easily. In the case of the elderly, even a slight fall can cause a femoral neck fracture. Other causes that may contribute to this type of fracture are: various pathologies of the hip, which cause a degeneration of the articular cartilage, such as osteoarthritis, inflamed hip, also trauma of the pelvic bones or of the hip joint [8, 10 p. 297].

Femoral neck fractures and peri-trochanteric fractures are equally common and account for over 90% of proximal femoral fractures. The most common fractures occur in the femoral neck area. The hip joint is a spheroidal one, where two bones, the pelvic bones, through the acetabular cavity and the femoral bone through the femoral head come into contact. The femoral head has the shape of a "half-ball", just below the femoral head is the neck of the femur, which, during the fracture, loses its continuity, being full (with or without movement) or incomplete [3, 5 p. 343].

The femoral neck fracture in the context of falling, with displacement has as clinical aspects, different signs and symptoms felt by the patient at the level of the hip joint: inability to make movements immediately after the fall; severe pain; total load limitation of the affected leg; the vicious attitude of the hip highlighted by an external rotation and adduction; shortened limb on the affected side. Pain appears in the groin area during palpation, and swelling of the area may even be present.

Prophylactic treatment is an important one, because by observing it, the production of the fracture can be eliminated, by preventing osteoporosis, achieving by observing a healthy diet, a lifestyle with moderate physical activity.

Surgical treatment or hip arthroplasty: the hip joint is replaced by a prosthesis, which can be total or partial depending on the degree and location of the fracture. Total prostheses represent the replacement of both the femoral head and the neck, and the acetabular cavity with material for osteosynthesis [5 p. 348-350;7 p 78-79;10 p. 309-315] .

In current practice, cemented prostheses and non-cemented prostheses are used, the cemented ones are indicated for the elderly, because the bones have reached maturity. Due to the prosthesis, patients will avoid long-term immobilization, and recovery goes faster. The recovery goal is aimed at recovering the orthostatism, gait and finally social reintegration [12].

The hip prosthesis is generally made of metallic material such as titanium or ceramic and as main components the prosthesis has, the femoral component, more precisely the metal rod that enters the femoral bone and in the upper part of the prosthesis we find a metal head that is polyethylene coating. Depending on the patient's age, the prostheses are divided into, cemented prosthesis and uncemented prosthesis. The cemented prosthesis is recommended for femoral neck fractures in the elderly due to the fact that that bone has reached full maturity, and is no need to change it, although the aging process continues. In the case of femoral neck fractures, prosthesis is the best option because recovery is much faster, the patient can return to daily activities in a much shorter time. Total hip arthroplasty (THA) is one of the most cost-effective and consistently successful surgeries performed in orthopedics. The most common indication for THA includes end-stage, symptomatic hip OA [9].

In addition, hip ON (osteonecrosis), congenital hip disorders including hip dysplasia, and inflammatory arthritic conditions are not uncommon reasons for performing THA. Hip ON, on average, presents in the younger patient population (35 to 50 years of age) and accounts for approximately 10% of annual THAs [1].

THA provides reliable outcomes for patients' suffering from end-stage degenerative hip osteoarthritis (OA), specifically pain relief, functional restoration, and overall improved quality of life [2, 6].

Recent studies have shown that osteoarthritis is not limited to the destruction of hyaline cartilage, but affects the entire joint, including the subchondral bone [4].

During a hip replacement, the head of the femur is replaced with a prosthetic head a shaft, and the joint surface of the acetabulum is lined with a bowl-shaped synthetic joint surface. A partial hip replacement can also be done for neck of femur fractures (mostly displaced) where only the femoral part is replaced. Osteoporosis and osteo-malacic disease are significant factors responsible for the high incidence of hip fractures within the elderly population. THA is contraindicated in the following clinical scenarios: local, hip infection or sepsis; remote (i. e. extra-articular) active, ongoing infection or bacteremia; severe cases of vascular dysfunction [11].

*Aim of the work,* the surgical and therapeutic approach to prosthetic neck fractures by prosthesis, as well as the realization of a therapeutic path by specific kinetic means.

*Research objective:* analysis of the specialized literature regarding the rehabilitation therapy after total hip arthroplasty; identification and understanding of the pathophysiological mechanisms that lead to the femoral neck fracture as well as its reduction by prosthesis; realization of a therapeutic route through physiotherapy in order to rehabilitate the prosthetic patient in a short time.

**Materials and methods**

72-year-old patient, victim of an accidental fall injury. He presents in the emergency department with pain and total loss of the left lower limb function.

Clinical and radiological examination establish the diagnosis of GARDEN IV left femoral neck fracture and indications for surgical treatment. After the preoperative preparation (ultrasound, biological tests, pre-anesthesia consultation), surgery is performed under spinal anesthesia, performing hemiarthroplasty of the left hip with AUSTIN MOORE cervical- cephalic endoprosthesis. Radiological examination showed that the endoprosthesis was correctly located. The evolution under analgesic treatment, thromboprophylaxis, erythrocyte mass transfusion was favorable for pain symptoms, aseptic surgical wounds to be healed, showing no signs of infection.

Recommended: changing the dressing every 3 days with removing the threads every 14 days; joint mobilization; no support on the lower left limb, always using the walking frame device; in case of complications, the patient should be transported urgently to the emergency unit; administration of anticoagulants for a period of 30 days.

Contraindications and precautions for hip prostheses: avoiding flexion over $90^0$; avoidance of adduction (foot-to-foot position); avoidance of internal or external rotations; during sleep, putting a pillow between your legs to prevent

adduction; use of a lift in the toilet seat; use a long-handled heater to avoid bending over $90^0$.

In order to achieve a post-operative kinetic therapeutic route, the functional residual must be established, at the moment of starting the actual program. Following the identification of post-operative medical prescriptions regarding indications and contraindications, we performed a somatic-functional examination in order to establish immediate and long-term objectives. We performed some somatic-metric measurements of the lower limbs but also a table with ADLs. When measuring the length of the lower limbs after surgery, the patient has a difference of 1-2 cm less in the operated leg, the measurement was made in decubitus but also in orthostatism, a heel is recommended. Regarding the perimeters, amplitude of movement at the level of the hip joint in table no.1 and no.2 you can see the differences made by minus, due to the deconditioning process that was installed during immobilization and traumatic labor.

These measurements are made in supine position, using a tailoring meter (measurements made in centimeters) for the perimeters, and a goniometer for the range of motion (ROM).

Table no.1 Somatic-metric measurements of the lower limb obtained at the initial assessment

| Somatic-metric measurements of the lower limbs obtained at the initial assessment (perimeters in cm) | | | | | | |
|---|---|---|---|---|---|---|
| Lower limb | Proximal perimeter of the thigh | Medial perimeter of the thigh | Distal perimeter of the thigh | Proximal perimeter of the calf | Medial perimeter of the calf | Distal perimeter of the calf |
| Left | 52 cm | 44 cm | 34 cm | 32 cm | 34 cm | 18 cm |
| Right | 54 cm | 46 cm | 35 cm | 34 cm | 36 cm | 19 cm |

Table no.2 Initial measurements of pelvic bones, femoral bone and joint (the hip joint) biomechanics.

| Biomechanics/initial assessment of the pelvic bones and the femoral bone (the hip joint) | | | | |
|---|---|---|---|---|
| Lower limb | Flexion | Extension | Adduction | Abduction |
| Left | $35^0$ | $7^0$ | $0^0$ | $12^0$ |
| Right | $90^0$ | $17^0$ | $16^0$ | $25^0$ |

To start the program, we will establish the necessary objectives in order to maintain, increase and regain functional autonomy at physiological parameters: preservation of function / maintenance of the trophic mechanisms; pain relief; maintaining / increasing joint mobility; maintaining / increasing muscle strength;

recovery of orthostatism / gait; increase proprioceptive abilities; safe recovery of ADL.

In order to achieve these objectives or implemented kinetic methods collaborated with those in allopathic medicine. Pain relief was achieved with the help of medication prescribed by the attending physician, and as kinetic therapy or used specific postures and mobilizations. Maintaining the trophic mechanisms were also supported with the help of medication accompanied by mobilizations and postures that increase arterial and venous blood circulation and lymphatic circulation. In the following stages we will aim to work to increase mobility and muscle strength both through assisted free exercises and through exercises with resistance, resistance submitted by the therapist or some helpful objects. Initially we will work from supine position and then gradually we will move on to exercises at the edge of the bed, and with the walking frame. When the orthostatic position is reached, a specific program for the recovery of proprioceptive abilities in static and dynamic is started. This program will start with alternating loading from one leg to the other, laterally, then front / back. The loading on one leg is not allowed without support, then working with the walking frame, after that, walking with two crutches, then with a single crutch, and finally the support will be given up.

**Results**

Following the program that was carried out at the patient's home 3 times a week for a period of 10 weeks, the results are particularly good if we take into account the patient's age and the functional balance from which we left.

Table no.3 Somatic-metric measurements of the lower limb obtained at the initial-final test.

| Somatic-metric measurements of lower limbs at initial and final testing (perimeters) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lower limbs | Proximal perimeter of tight | | Medial perimeter of tight | | Distal perimeter of tight | | Proximal perimeter of the calf | | Medial perimeter of the calf | | Distal perimeter of the calf | |
| | T.I | T.F | T.I | T.F | T.I | T.F | T.I | T.F | T.I | T.F | T.I | T.F |
| left | 52 cm | 53 cm | 44 cm | 45 cm | 34 cm | 35 cm | 32 cm | 33 cm | 34 cm | 35 cm | 18 cm | 18 cm |
| right | 54 cm | 55 cm | 46 cm | 46 cm | 35 cm | 35 cm | 34 cm | 34 cm | 36 cm | 36 cm | 19 cm | 19 cm |

Table no.3 shows the values achieved at the initial and final evaluation, so you can follow the positive differences obtained from the recovery program completed by the patient. Also, in the same context, we can see the dynamics of the values of the results of the somatic-metric evaluation and perimeters of the lower limb.

Table no. 4. Initial-final measurements on the joint balance of the pelvic bones, femoral bone and joint (hip joint)

| Biomechanics / assessment of the pelvic bones, femoral bone and joint (hip joint) initial and final testing | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Lower limbs | flexion | | extension | | adduction | | abduction | |
| | right | left | right | left | right | left | right | left |
| IT | 90 $^0$ | 35 $^0$ | 17 $^0$ | 7 $^0$ | 16 $^0$ | 0 $^0$ | 25 $^0$ | 12 $^0$ |
| FT | 100 $^0$ | 90 $^0$ | 18 $^0$ | 12 $^0$ | 20 $^0$ | 5 $^0$ | 30 $^0$ | 25 $^0$ |

Regarding the results of the evaluations that represent the range of motion of the hip joint, in table no.4 are presented the values that can confirm the positive evolution. Table no.5 shows the results obtained by the patient in the evaluation of the ADLs, which were included in the evaluation scale. The final results show a positive score which confirms the effectiveness of the program and the kinetic approach established on the patient with the hip prosthesis.

Table no.5 ADL score.

| Activity | The description | Initial score | Final score |
|---|---|---|---|
| Corporal hygiene | Automatism | 2 | 2 |
| | Partial help | 1 | |
| | Total help | 0 | |
| Dressing | Automatism | 2 | 2 |
| | Dressing autonomy, but help to put on shoes | 1 | |
| | Total help | 0 | |
| Going to the bathroom | Autonomy | 2 | 2 |
| | Help | 1 | |
| | Needs help going to bed | 0 | |
| Transfer to bed or armchair | Independent | 2 | 2 |
| | Help | 1 | |
| | Unable | 0 | |
| Eating | Eat alone | 2 | 2 |
| | Helped to keep the cutlery | 1 | |
| | Unable | 0 | |
| Climbing the stairs | Independent | 2 | 2 |
| | She needs help | 1 | |
| | Unable | 0 | |

| Initial ADL score | Final ADL score |
|---|---|
| 6 | 12 |

- Stage I → 10-autonomy;
- Stage II → 8-10- represented by quasi-independent;
- Stage III → 3-8-represented by assisted independence;
- Stage IV → 0-3-stage of total help (dependency);

**Conclusions**

- Preservation of function by maintaining the mechanisms of trophic mechanisms in the musculoskeletal system in the prosthetic patient is an essential factor in the economy of the therapeutic path;
- The establishment of the functional residual is decisive in the elaboration of the kinetic recovery program for the prosthetic patient;
- Applying the specific means of post-traumatic recovery at an early stage is essential in order to achieve positive results;
- The recovery of ADLs will be achieved gradually and the increase of proprioceptive capacities will be a factor of stability in order to carry out activities in safe conditions.

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