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Review Article

Comprehensive Rehabilitation Action Protocol for Hip Arthroplasty

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Abstract

In recent years, there has been an increase in the practice of hip replacement surgery. The good results obtained in this type of surgical practice have led to a greater emphasis on establishing the importance of the physiotherapeutic approach. Therefore, the authors propose an action protocol aimed at patients in the pre- and post-operative period of total hip arthroplasty. With the aim of establishing a guide for rehabilitation treatment during the hospital phase. All this, in order to prevent dislocation and avoid complications. The worldwide prevalence of these fractures increases with the age of the population, but their incidence increases more than could be expected due to the increase in the number of elderly people. It is concluded that the application of the rehabilitation protocol provides a multidisciplinary, specialized and safe medical assistance for patients in the pre and post-operative period of total hip arthroplasty and contributes to the improvement of the prognosis and quality of life of these patients.

Keywords: *Total Hip Arthroplasty; Rehabilitation Methods; Physiotherapeutic Approach; Pre- and Post-Surgical Care*

Introduction

Demographic changes in recent decades have led to an increase in the number of older adults. This increase has been accompanied by a higher prevalence of chronic non-communicable diseases such as osteoporosis and its consequences, including hip fractures [1,2].

Among the main causes of morbidity in the world is hip fracture, where the most affected population is adults. This greatly affects public health due to its high socio-economic cost and the disability it generates [3-5].

In the United States, an estimated 250,000 hip fractures occur each year; 80% of these in individuals over 60 years of age, particularly in postmenopausal women [6].

According to figures from the National Institute of Statistics and Geography (INEGI) for 2006, older adults (> 60 years) represented 5.3% of the population and it is estimated that this proportion will increase significantly to 11.3% by 2030 [7].

As in other countries, in Cuba traumatic hip injury is one of the diseases that generates high rates of morbidity and mortality. Therefore, the care of patients with hip fractures should be considered multidisciplinary [8,9].

The Cuban population is made up of more than 11 million inhabitants; 17.9% of Cubans are 60 years of age or older, a figure that will increase by almost 25% in 2025 [10].

Currently, it has acquired considerable importance in health institutions of any institutional order, both degenerative pathologies and hip fractures; considering that they have been gaining prominence in the daily consultation or morbidity that has to do with the increase in life expectancy, and therapeutic advances, which have as a basic purpose to reduce the functional disability derived from pain and the limitation of mobility, improving quality of life after hip replacement [11-14].

Arthroplasty or replacement of the hip joint is a surgical procedure in which the part of the affected or diseased joint is totally or partially replaced by an artificial one (prosthesis) [15].

However, it should be mentioned that there are several post-operative complications that occur after surgical intervention, which through early diagnosis can be prevented. The most frequent are dislocation of the prosthesis (commonly posterior), postoperative pain, secretions in the operative wound, thromboembolic disease, loosening of the prosthesis, dysmetria of the length of the lower limbs and lesions of the peripheral nerves. Hence the importance of the physiotherapeutic approach and pre-surgical care [16].

In the case of post-operative rehabilitation, it is important to carry it out early, fundamentally to avoid complications after the surgical intervention, speed up recovery and improve the activities of daily living of the patient, as well as prevent new emergency interventions that, in addition Increasing costs can lead to increased risk to the life of the patient [11,17-20].

Objectives of the Study

General:

- Establish guidelines for pre and post-operative rehabilitation treatment to be applied to patients with total hip arthroplasty.

Specific:

1. Provide adequate care to patients operated on with total hip arthroplasty, who are part of the hospitalization program of the healthcare center.
2. Improve the physical condition and quality of life of patients operated with total hip arthroplasty.
3. Standardize medical care, investigative, therapeutic and organizational behaviors for a better use of human and material resources.

Development

Protocol users

- Specialist physicians: Physical medicine and rehabilitation, orthopedics, internal medicine.
- Consultant physicians: Cardiologists.
- Technician or graduate in physical medicine and rehabilitation.

- Nursing graduates.

Universe

Hospitalized patients in the Orthopedic service room.

Origin of patients

The orthopedic and physiatrist, in a multidisciplinary team, will determine and select the patients who will undergo total hip arthroplasty admitted to the orthopedic ward, with criteria of the pre and post-operative rehabilitation program.

Inclusion criteria

Patient with hip joint disorders in which total hip arthroplasty may be indicated:

- Rheumatoid arthritis.
- Juvenile rheumatoid (Still's disease).
- Ankylosing spondylitis.
- Degenerative joint disease (osteoarthritis, hypertrophic arthritis)
- Capital femoral epiphysiolysis.
- Congenital hip dysplasia/dislocation.
- Coxa plana (Legg-Calvé-Perthes disease).
- Paget's disease.
- Traumatic dislocation.
- Acetabular fracture.
- Hemophilia.
- Avascular necrosis:
- After fracture or dislocation.
- Idiopathic.
- Capital femoral epiphysiolysis.
- Hemoglobinopathies (sickle cell disease).
- Renal disease.
- Induced by corticosteroids.

- Alcoholism.
- Caisson disease.
- Lupus.
- Gaucher disease.
- Nonunion, trochanteric and femoral neck fractures with
    - Head involvement.
- Bacterial arthritis or osteomyelitis:
    - Hematogenous.
    - Postoperative.
    - Tuberculosis.
- Congenital subluxation or dislocation.
- Arthrodesis and nonunion of the hip.
- Reconstruction failed:
    - Osteotomy.
- Dome arthroplasty.
- Femoral head prosthesis.
- Girdlestone technique.
- Total hip replacement.
- Arthroplasty with superficial remodeling.
- Involvement by bone tumors of the proximal femur or acetabulum.
- Hereditary disorders (e.g. achondroplasia).

Exclusion criteria

- Recent or current hip infections.
- Systemic diseases.
- Joint neuropathy.

- Tumors that destroy bone components.
- Localized infections.
- Partial or total failure of adductors.
- Progressive neurological deficit.

Resources to use

Human resources

- Specialist in Orthopedics - Traumatology.
- Medical Specialist in Physical Medicine and Rehabilitation.
- Technician and Graduates in Physical Therapy and Rehabilitation.
- Nursing graduates.

Material resources

- Stretcher or treatment bed
- Chair
- Adult parallel bars
- Analgesic and/or electromotive current generating equipment
- Vibrator
- Rollers
- Pillow
- Walker.

Consultation and evaluation

At the beginning of the rehabilitation process, the patient is evaluated by the multidisciplinary team that prepares the clinical history where the following data are collected:

- General data of the patient and the companion.
- Informed consent for the legal document.
- Preparation of clinical history.

- Date of admission to the institution.
- Consultation evaluation date: 4 - 7 days.
- Main clinical diagnosis.
- Main diagnosis of the disability for which it is rehabilitated.
- Other diagnoses of interest.
- History of the current disease.
- Positive data on questioning.
- Positive data on physical examination.
- Rehabilitating prognosis.
- Objectives of the rehabilitative treatment.
- Rehabilitation treatment guidelines.

Measurement instruments:

- Goniometry: Goniometers.
- Measurements: Tape measure.
- Scales: Harris, Daniels, Willians and Worthimham hip scale.
- Functional scales for assessing physical function: Functional Independence Measurement Scale (FIM) and Barthel Scale,

Procedures

Pre-operative rehabilitation

Its objective is to: relieve pain, relax the contractured muscles, widen the articular arches and improve the tone and trophism of the affected muscles, strengthen the muscles in general, train the patient in the use of walking aids and activities of independence, improve respiratory capacity and achieve psychological adaptation for the procedure to be subjected.

Pre-operative rehabilitation. In this phase the following activities are carried out:

- Information to the patient.
- Home conditioning.
- General strengthening exercises.

- Isometric exercises: These are body exercises that involve muscle tension but do not generate movement of contraction and extension of the muscles. These types of exercises consist of activating a muscle or group of muscles while maintaining a specific posture for a specific time. It should be repeated 5 to 10 times.
- Breathing exercises: Diaphragmatic breathing directing the air from nasal inspiration to the abdomen, as a reference it is important that the patient places his hands on the belly and observe how it rises when introducing the air. Then it would expel the air through the mouth helping to empty the air from the lungs by means of a slight pressure towards the posterior and cranial. This exercise will be done between 5 - 10 repetitions. It can also be performed in the supine position, sitting, and during ambulation.
- Use of walking aids.

Post-operative rehabilitation

It is important to know the approach route in the patient to be able to limit his movements. The most practiced is the anterolateral (Watson Jones type) so the patient should not perform the extension, external rotation and abduction movements.

Post-arthroplasty rehabilitation treatment should be individualized when the patient has undergone an osteotomy of the femur, enlargement or reduction, weight bearing should be delayed until some degree of bone union has taken place. Also when the patient has problems with stability due to shortening of the leg through the hip and in those who have suffered from recurrent dislocation because they may require the use of an orthosis.

The objectives in this phase are:

1. Prevent respiratory complications.
2. Prevent complications of circulatory disorders.
3. Maintain or increase hip mobility without pain.
4. Strengthen the muscles of the operated limb.
5. Prevent hip dislocation.
6. Educate the patient in the care of the prosthesis by making recommendations on activities of daily living and transfers.
7. Achieve functional recovery in the patient.
8. Re-educate walking with devices.

Treatment guidelines: All personnel who will be in contact with the patient must comply with the biosafety control measures established by MINSAP [21].

General standard precautions:

1. Hand washing before and after receiving the patient with hydroalcoholic solution or 0.1% hypochlorite.
2. Correct placement and removal of the personal protective equipment (PPE) indicated for each scenario detailed in this document, following the safety recommendations by the department of hygiene and epidemiology.

3. Maintain a safety distance of 2 meters whenever possible.

4. Minimize exposure times, as well as the number of people who are present in the work room.

5. Correct hygiene with 0.5% hydroalcoholic or hypochlorite solution in the workplace, as well as the equipment used after each patient and at the end of the day.

6. Gloves will be removed, if any, and hands will be washed with hydroalcoholic solution or 1% hypochlorite before and after performing any evaluation and rehabilitation activity with the equipment used in the high-tech laboratory, physical therapy and occupational therapy.

Rehabilitative approach

The most used physical agents are:

1. Magnetotherapy: At present it has been very useful in the treatment of prosthetic implants, due to its penetration capacity, its athermic, gentle, anti-inflammatory, regenerative and analgesic effects, being able to further reduce the time of disability. It is applied with local equipment or magnetic bed. The Mag 80 magnetic bed is applied transregionally 25 to 50% intensity, with a time of 30 minutes, they apply the D field supporting with conventional therapy and laser.

2. Hydrotherapy: It is the technique of choice due to its thermal effect, combined with the mechanical effect caused by the swirling of the waters and because of the possibility that the patient can perform without pain, the movement of the joint affects, taking advantage of the phenomenon of floatation.

3. Thermotherapy: Surface or deep heat will be used, preferably with short wave therapy for its power to penetrate the joints, continuous or pulsed, the recommended dose is 500 watts, for 10 minutes, and the inductors: space, air circumplode. Ultrasound is very useful in this period, continuous or pulsatile, in the affected hip at a dose of 0.6 to 1.2 watt cm2, head of 1 MHZ, for 10 to 15 sessions.

   Only one heat mode to be used will always be selected.

4. Electrotherapy: Both low frequency excitomotor currents and low and medium frequency analgesic currents are recommended. The excitomotives are used in different types as long as they are capable of producing an electrical stimulus that responds to an adequate muscle contraction. The most commonly used analgesic currents are diadynamic, TENS and interferential currents with a carrier frequency of 4000 Hz, an AMF of 80 Hz and a vector that can oscillate between 60 and 100 Hz. Treatment cycles are 10 to 15 sessions with 10-day intervals between cycles.

Right now

1. Place an anti-rotation splint to prevent external hip rotation.

2. Treatment to avoid circulatory disorders:

   a. Elevate the lower limbs to promote evacuation drainage.

   b. Early mobilization of the distal joints.

c. Use of elastic stockings.

3. To prevent respiratory complications it is necessary to: intensify respiratory gymnastics, diaphragmatic breathing high and low rib, fist-percussion and vibratory massage.

At 24 hours

1. Isometric quadriceps exercises, the patient is instructed to contract the quadriceps by pushing the knee down and holding it there for 10 seconds and then relaxing for at least 20 seconds. Repeat the exercise in sets of 20, several times a day.
2. Isometric glute exercises by squeezing the glutes in the same way as the quadriceps several times a day.
3. Mobility and stretching exercises. Practice the Thomas exercises daily to avoid hip flexion contracture, 5 times in each set and repeat 6 times a day.

After 3 or 4 days

1. Continue exercises to prevent circulatory complications.
2. Ankle movements up and down several times a day.
3. Perform knee mobilizations.
4. The sitting begins.
5. Active assisted mobilizations of the hip up to 90 degrees with the limb in triple flexion.
6. Perform strengthening exercises on the contralateral limb.

After 5 days

1. Free exercises will be indicated.
2. Start walking at three points with partial load maintaining the previous treatment.

After 7 days

1. The abduction movement will begin without exceeding 20 degrees.
2. Quadriceps and triceps sural strengthening exercises are indicated with progressive resistance but very slowly, for 6 weeks.
3. Increase ambulation with progressive loading, maintaining support with poles.
4. Proprioceptive neuromuscular facilitation techniques are useful only when the articular arches allow wide movements, diagonally and obliquely.
5. Stationary bicycle, with care that the saddle is placed high, between 4 to 7 days after surgery; The patient must stay on the healthy leg to sit on the saddle and then make the turn to place the operated leg, according to the patient's evolution, under the prescription of the specialist doctor the saddle should be lowered to increase hip flexion. At the beginning you can pedal without resistance and progressively increase the time, until 6 to 8 weeks after the operation, where progressive resistance is indicated.

At 21 days

Train in going up and down stairs. You should always go up with your good leg supported by crutches; to go down, support yourself on the lowest step with your crutches and first support with the operated one and then support the healthy one.

At 6 weeks

1. Withdraw a crutch, only place it on the healthy side, and withdraw to achieve free walking at three months, if there is no residual pain, hip instability, and complications.
2. Strengthening with assisted active exercises of hip flexors and glutes with little resistance and gradually increasing to achieve hip stability.
3. In the cemented modality, weight bearing according to tolerance should be with a walker for 6 weeks, using the cane in the contralateral hand for 4 to 6 weeks.
4. In the cementless modality, use the walker for 6 to 8 weeks, although some recommend up to 12 weeks and then a cane is indicated for 4 to 6 months.

Recommendations to avoid dislocation of the prosthesis during the first 3 months after surgery.

How to sleep:

- Keep your knees above the level of your hips with a pillow.
- You must use a loft bed about 60 cm from the floor.
- Avoid adduction of the hips in the supine position.
- To sleep use the operated side, placing a pillow between the legs and the thighs to avoid internal hip rotation.
- Do not remove the sheets or blankets with your legs extended.

How to lie down:

- You must sit on the edge of the bed, as close as possible to the headboard and so that the operated hip is on the side of the headboard.
- The patient must slide the buttocks back so that the operated leg rises first to the bed lying on the back moving with the body as a whole, leaving the legs apart, using if necessary, an attachment, to raise the operated leg.
- When getting up you should do it on the healthy side, keeping the operated side on the bed, while resting your healthy foot on the floor, then you should slide the operated leg keeping it straight until it can sit up, you can be helped by a family member to keep it extended, you should keep the body straight and support the weight of the body with your elbows.

How to use crutches:

- Keep the hips straight or somewhat rotated while standing, the elbows should be bent supporting their hands in the grip of the crutch, preferably the axillaries should be used.
- You must unload the weight of the body on both feet symmetrically.
- They should always be ahead of the feet.
- You must support the body with your hands and not with your armpits.

Sit down

- Use a chair with arm support placing a pillow to raise the height when sitting.
- Glue your back to the backrest until the back of the knee touches the chair.
- Place the crutch on the healthy side and should use it for support.
- Avoid raising the knee above the hip.
- Don't cross your legs.
- Avoid bending more than 80 degrees (touching feet, stretching stockings, picking up an object from the floor).

Walking up and down stairs with crutches

- You must go up with your good leg and help yourself with crutches and your hand to lift the operated leg and place it at the same level.
- Keep the crutches at the same level as the operated leg.
- To go down stairs you must place the crutches on the lower step then support

First the operated leg to unload the weight on the crutches, then the good leg should lower and lower slowly.

How to use the toilet

- You must place a pillow or cushion to raise the height.
- You must stick your back to the toilet, touching the sanitary cup with the back of your knees.
- You should sit slowly, keeping the operated leg in extension and the healthy leg in flexion.
- If you do not have an accessory, use a perforated chair maintaining the same care.
- To get up you must do it in reverse.

Stand

- Avoid internal rotation of the feet.

Take a bath

- When there is no bathtub to go out, you must lean on the crutches, removing the operated side first.
- Shower in bathtub to enter, start with the good leg and to leave with the operated one.
- In a seated bathtub, place rugs to avoid falls, enter and exit slowly.

How to dress

- Avoid hip flexion.
- Undergarments must be placed lying down or sitting, keeping the extension of the operated leg and separated from the body.

Other

- Do not carry heavy objects.
- Wear shoes with non-slip soles to avoid falls.
- Avoid extreme flexion of the hip, as long as the hands do not exceed the knees.
- Do not drive until authorized.
- Control body weight.
- Do not sit for more than an hour at a time.
- Avoid prolonged marches.

Evaluation and control of the protocol

To evaluate the results of this treatment, a final evaluation is carried out using the result indicators, and adherence to the protocol is monitored monthly using the indicators provided for this purpose. The evaluation and correction of the protocol will be carried out every 2.5 years.

Structure indicators		Plan %	Well	Regular	Bad
Human Resources	Specialist in Orthopedics and Traumatology, specialist in Physical Medicine and Rehabilitation, technician and graduates in physical therapy and rehabilitation, graduates in nursing.	95	95	--	<80
Material resources	Have the resources for the application of research	95	95	--	<80
Organizational	Organizational design availability to apply the protocol	95	95	--	<80
	Protocol data collection sheet	100	100	--	<100
	Electronic database	100	100	--	<100

Process indicators	Plan %	Well	Regular	Bad
Percentage of consultations made/number of specialized consultations	95	95	90 - 94	< 90
Percent treated patients/number of patients	95	95	90 - 94	< 90
Percentage of patients whose study is properly concluded/ patients included in the protocol	95	95	90 - 94	< 90

Outcome indicators	Plan %	Well	Regular	Bad
Percentage of patients in which it was achieved / older adult patients with indication for total hip arthroplasty	95	95	94 - 90	< 90
Percent patients who improved their functional capacity after treatment	95	95	94 - 90	< 90
Percentage of patients cured or improved with evaluation and treatment / patients treated	90-100	90 - 100	80 - 89	< 80

Conclusion

The application of the rehabilitation protocol provides multidisciplinary, specialized and safe medical assistance for patients in the pre and post-operative period of total hip arthroplasty and contributes to the improvement of the prognosis and quality of life of these patients.

Conflict of Interests

The authors declare that they have no conflict of interest.

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