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Research Article

Comprehensive Rehabilitation Action Protocol for Total Knee Arthroplasty

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Abstract

Introduction: Total knee arthroplasty is an effective technique that has been shown to provide pain relief and recovery of function in most patients when non-surgical therapeutic measures fail. It involves the replacement of the knee joint by a prosthetic mechanism. Physical therapy is an important part of restoring mobility after surgery.

Objective: To establish a guide for the pre and post-operative rehabilitation treatment that will be applied to patients with total knee arthroplasty.

Methods: As a search strategy, the Health Information Locator (LIS) located on the Cuban Rehabilitation Medicine portal at Informed was accessed. A systematic review was carried out, by means of electronic search and in libraries of national and foreign medical journals indexed in Scielo, Imbiomed and Pubmed for 10 years. The search strategy was developed in the period from January to May 2021.

Conclusion: The application of a rehabilitation protocol for patients in the pre- and post-operative period of total knee arthroplasty contributes to the improvement of the prognosis and quality of life of these patients. To achieve greater success after surgery and reduce both hospital costs and rehabilitation time, it is important to prepare the patient pre and post-operatively by teaching exercises focused on improving both muscle and joint levels.

Keywords: *Total Knee Arthroplasty; Rehabilitation; Pre- and Post-Surgical Care; Rehabilitation Protocol*

Introduction

The knee is one of the joints that is responsible for the transmission of loads and movement of the lower limb, constituting the largest joint in the body and perhaps the most complex. At present, total knee joint replacement surgical procedures are becoming more and

more frequent in our society; This can be of great importance if one considers that life expectancy is increasing. Total knee replacement (TKA) is an effective and safe surgical procedure that restores knee function and improves the quality of life of patients with advanced osteoarthritis [1-3].

There are a myriad of prosthetic elements and they can be classified: according to the degree of limitation into non-limited (there is no means of union between the femoral component and the tibial component) and limited; depending on the type of fixation in cemented (use of methyl methacrylate derivatives) and non-cemented; According to the compartments to be replaced in unicompartmental (Femoro-patellar prosthesis or Femoro-tibial prosthesis), bicompartmental (internal and external femoro-tibial compartments) and tricompartmental (they replace the femoral, tibial and femoro-patellar articular surfaces) [4,5].

Knee replacement surgery was first performed in 1968. Since then, improvements in surgical materials and techniques have greatly increased its effectiveness. Total knee replacement is one of the most successful procedures in all of medicine. According to the Agency for Healthcare Research and Quality, more than 600,000 knee replacements are performed each year in the States [3,6].

By 2050, it is estimated that worldwide 22% of the population will be over 60 years of age and 4.5% over 80 years of age. According to a United Nations report, in the year 2050 Spain will be the oldest country in the world; 44.1% of the Spanish population will be over 60 years of age. At present, and due to this aging population, in developed countries there has been an increase in the prevalence of disabling joint diseases. In general, the joints most at risk for this type of disease are the hip and knee. [2,4,7].

Replacement of the knee joint and placement of a prosthesis is indicated when the degree of pain and deterioration of the joint is disabling and prevents the patient from walking. The most frequent causes are repeated injuries to the joint and joint damage (osteoarthritis, rheumatic, degenerative disease, among others), which produces progressive deterioration of the joint surface or inflammation. The continuous rubbing of the joint surfaces is very painful and makes movement difficult. The reason why this procedure is carried out is because of the pain that the patient refers and that does not improve with drug treatment, in addition to that it does not allow him to sleep, and the activities of daily life are abnormal [6,8].

TKA is one of the techniques that constitutes one of the greatest therapeutic advances in the field of orthopedic surgery. This intervention has proven to be one of the most cost-effective medical activities [9,10].

In most cases, the lack of strength of the quadriceps, as well as the absence of active work on the part of the patient after a TKA, can explain the difficulty of these to perform eccentric activities, such as sitting or descending stairs. To the difficulty of carrying out an analytical work of the same, the weakness of this due to the muscular atrophy is added, being able to delay the functional recovery up to 6 months or more after the surgery [11-14].

Therefore, it is necessary to individualize and personalize the rehabilitation treatment in response to the unique needs of each person [15,16].

Scientific evidence has not only shown that there is a loss of strength in the knee extensors and flexors after TKA, but also that there is a weakness in the plantar flexors and extensors of the ankle, along with atrophy of the hip abductor, being these last muscles are essential to be able to carry out a correct ambulation [4,17,18].

Rehabilitation treatment, among other reasons, is responsible for the functional results are now better than 15 or 20 years ago. Therefore, TKA rehabilitation programs must effectively target all major muscle groups in the lower extremities to achieve optimal results [19-21].

Objectives of the Study

General

- Establish the guide for the pre and post-operative rehabilitation treatment that will be applied to patients with total knee arthroplasty.

Specific

- Provide adequate care to patients operated on with total knee arthroplasty, who are part of the hospitalization program of the healthcare center.
- Improve the physical condition and quality of life of patients operated with total knee arthroplasty.

Methods

As a search strategy, the Health Information Locator (LIS) located on the Cuban Rehabilitation Medicine portal at Infomed was accessed. A systematic review was carried out, by means of electronic search and in libraries of national and foreign medical journals indexed in Scielo, Imbiomed, Google Scholar and Pubmed for 10 years. The search strategy was developed in the period from January to May 2021. The following keywords were used for the search: total knee arthroplasty, rehabilitation, pre- and post-surgical care, rehabilitation protocol.

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 patients with a diagnosis of knee pathology who will undergo total knee arthroplasty admitted to the orthopedic room, with criteria of the pre and post-operative rehabilitation program.

Inclusion criteria

Painful joints, with or without deformity due to:

- Osteoarthritis (OA) of the Knee (Gonarthrosis).

- Rheumatoid arthritis (RA).
- Post-traumatic arthritis (TA).
- Other non-septic arthropathies.

Exclusion criteria

- History of recent, present or latent infection.
- Presence of neuropathic joint (controversial).
- Patient with poor general condition and/or high surgical risk.
- Instability of the collateral ligaments.
- Difficulty with soft tissue coverage.
- Absence or loss of the knee extensor mechanism.

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
- Adjustable ankle weights
- Proprioception discs (wood and inflatable)
- Foam rolls
- Foam wedges
- Cold/ice packs
- Quadriceps bench

- Therapeutic bicycle
- Parallel bars
- Analgesic and/or electromotive current generating equipment
- Crutches
- Goniometer (with the goniometer the degrees of flexion and extension of the knee joint are measured).
- Metric tape with a scale from 0 cm to 100 cm to assess the following parameters:
    a. The perimeter of the operated knee.
    b. The width of the passage.
    c. The distance between the steps.
    d. The functional scope.

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.
- WOMAC questionnaire (Western Ontario and McMaster Universities index) It is an instrument that evaluates the effectiveness of total knee arthroplasty.

Procedures

Pre-operative rehabilitation

Its objective is: to relieve pain, relax the contractured muscles, expand the articular arches and improve the tone and trophism of the affected muscles, strengthen the muscles especially, of the quadriceps femoris, hamstrings and triceps sural, train the patient in the use of aids for walking and in activities of independence, improve respiratory capacity and achieve psychological adaptation for the procedure to be subjected, which will allow the patient to go in better conditions to the act surgical.

In this phase, the following activities are carried out

- Information to the patient.
- Home conditioning.
- General strengthening exercises.
- Isometric exercises of both femoral quadriceps: 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.
- Strengthening of the quadriceps muscles without weight, in both concentric and eccentric travel.
- Strengthening of the knee flexor muscles.
- Open and closed kinetic chain work.
- Functional electrical stimulation of the quadriceps femoris and hamstrings and triceps sural.
- Transcutaneous nerve stimulation (TENS) in the painful area.
- Respiratory 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.
- Ambulo therapy (gait training with crutches).

Post-operative rehabilitation

After the surgery is applied at 48 hours and the drain is removed, another re-consultation will be made with the MFR specialist who will indicate the post-operative rehabilitation treatment.

The objectives in this phase are

- Ease the pain.
- Restore adequate functional mobility.
- Improve range of motion of the knee to achieve full extension and flexion of 900.
- Strengthen the muscles of the knee.
- Re-educate gait pattern with medical assistance devices
- Make transfers without needing help.
- Get the patient to perform, independently, the activities of daily life.
- Prevent complications (prolonged bedridden, deep vein thrombosis, pulmonary embolism, pressure ulcers, etc).

Treatment guidelines: All personnel who will be in contact with the patient must comply with the biosafety control measures established by MINSAP [22].

General standard precautions

- Hand washing before and after receiving the patient with hydroalcoholic solution or 0.1% hypochlorite.
- 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.
- Maintain a safety distance of 2 meters whenever possible.
- Minimize exposure times, as well as the number of people who are present in the work room.
- 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.
- The gloves will be removed, if any, and hands will be washed with hydroalcoholic solution or 1% hypochlorite before and after carrying out any activity. evaluative and rehabilitation with the equipment used in the laboratory of high technology, physical therapy and occupational therapy.

Results and Discussion

Rehabilitative approach

1. Postural treatment:

a. Avoid placing pillows under the knee.

b. Keep the operated knee always extended when you are resting in bed.

c. When sitting for a long time (more than 30 min) alternate periods with the knee in flexion and extension.

d. If there is a tendency to flexion contractures, a roller can be placed behind the ankle.

e. Elevate the lower limbs or wear elastic stockings for the first 48 hours.

2. Respiratory physiotherapy: Respiratory exercises are essential to avoid respiratory complications (hypostatic pneumonias) several times a day, diaphragmatic breathing, high rib and low rib.

3. Cryotherapy: Application of cold packs on the surgical area, 20 or 30 minutes every 4 to 6 hours, mainly after continuous passive mobilization (in the first 24 hours the application intervals should be shorter, 5 to 10 minutes each time); to counteract edema, pain and bleeding.

4. Continuous passive mobilization (CPM): The use of CPM is recommended, from the day after surgery for a period of time, daily, which should be progressive according to the patient's tolerance, until reaching a time of application of 4 to 8 hours a day, divided into periods of 1 to 2 hours at a time, about 4 times a day maximum. Regarding the degrees in the first 48 hours, mobility ranges greater than 40º of flexion are not used and the progression of no more than 10 daily; after the 3rd day continues the progression trying to reach at least 90º of flexion to the 7th day if possible. This treatment favors joint width, relieves pain, reduces the incidence of deep vein thrombosis, improves wound healing and prevents joint stiffness.

5. Excitomotor electrical stimulation is recommended in selected patients (where there is a significant active extension deficit, intense muscle atrophy and difficulty in performing active exercises), it is very useful to advance in the recovery of this muscles necessary for gait achievement. Rectangular pulse trains will be used with pauses that triple the pulse time, bipolar method, insisting on the rectus anterior and vastus medialis of the quadriceps, 10 minutes. Sometimes it is necessary to stimulate the hamstrings.

6. TENS currents for pain relief can be applied to the quadriceps at analgesic doses or at intensities below the analgesic threshold.

7. Pulsatile magnetic therapy with a frequency of 75 Hz and intensity of 1.5 Mt.

8. Exercises:

a. The day after the operation, exercises in bed, starting with static exercises, quadriceps, glutes and hamstrings with a frequency of 10 minutes per hour, at least 10 hours a day.

b. In the operated limb, in addition, flexion extension exercises of the ankle, insist on plantar flexion and, in addition, free exercises of the fingers. Also on the second day, gentle active assisted exercises, hip flexion and abduction and flexion extension of few degrees of the knee and isotonic quadriceps strengthening exercises, at the limit of pain, about 10 to 20 repetitions, 2 times a day, will be started. Encourage the patient to actively achieve it. Fundamentally, insist on the vastus medialis, responsible for the last degrees of knee extension.

c. To the 2nd day also free exercises of the upper extremities and the lower limb not intervened, in all possible joint range.

d. You will be taught exercises in a sitting position, generally to the 2nd day of surgery or when you remain in that position for 30 minutes, 2 times a day:

   i. Free knee extension to strengthen quadriceps.

   ii. Free knee flexion to strengthen the hamstrings.

   iii. Active, self-assisted knee flexion, placing the good leg in front and the heel of the leg over the ankle of the operated leg and pushing back to try to increase knee flexion.

e. To the 5th or 7th day, if the evolution of the wound allows it, progress will be made in assisted active knee flexion extension and in passive extension of the last degrees of knee extension. The punctuality of performing the exercises in the physiotherapy room will be evaluated, so that you leave the bed.

f. From the 2nd or 3rd day, the patient will be trained in transfers from supine to sitting and sitting to standing, if there are no signs of orthostatic hypotension, they are performed on the non-operated side and with the help of 2 people, one of whom will hold the operated lower limb in extension. The other assistant will take care of the drainage and the intravenous route, while the patient uses the trapezius and his healthy lower limb. When standing up, with the operated lower limb extended, it will not support it until it is in an upright position.

g. Reeducation of gait. In accordance with the criteria of the orthopedic surgeon, the physiatrist may indicate the support of the operated lower limb at 48 hours (2nd postoperative day) once the drainage has been removed at the level of the surgical wound. This includes several aspects, namely:

   i. Selection and adaptation of walking aid. Try to use from the beginning, the type of canes that you will use at home, if possible 2 forearm crutches with the ideal height, to prevent the patient from leaning while walking.

   ii. If you start on the 2nd day of surgery, you will do it on flat terrain and it is enough that that first day you walk about 5 meters. You should progressively increase your walking distance on even surfaces.

   iii. The 5 aspects to re-educate in the march are

      - Reciprocal and well-coordinated pattern with the aids.
      - Knee flexion operated during the swing phase.
      - Support with the heel and propulsion with the forefoot in the stance phase.
      - Teach him to perform turns: do not turn on the prosthetic leg.
      - Way of approaching the chair or the edge of the bed.

- The going up and down of stairs is recommended for the out-of-hospital period and will only be indicated in the in-hospital period, if the patient has stairs for access or within their home. In this case, he is guided to go up with the healthy lower limb and go down with the operated lower limb, with double support of both upper limbs.

- The knee extension splint is recommended in many centers to use during the first days to: maintain knee extension at night and compensate for quadriceps insufficiency during ambulation, placing the knee passively in extension. It is only used until the quadriceps allows good knee control, around the 3rd to the 5th postoperative day.

In cementless prostheses, total support depends on the evolution of the patient and in cemented prostheses, total support is 100% in the first 24 to 48 hours.

The progressive withdrawal of external support will only be done with the consent of the orthopedic and physiatrist, after a clinical radiological evaluation and provided that the quadriceps has a muscle score of 3+ to 4, according to the muscle balance scale, with notation from 0 to 5 The crutch on the operated side will be removed first, keeping the one on the healthy side until the orthopedic and physiatrist indicate to remove the latter.

Other information that the patient needs are: vehicle driving, sexual activity, sports, etc. Although each case is evaluated individually, the first 2: driving and sexual activity, may start between the 6^{th} and 8^{th} postoperative weeks.

Regarding sports, first specify which sports you should not practice: no jumping sports, no racing, no skiing, no weight lifting, no contact sports. You can perform sports such as swimming, tennis, golf, after a full recovery from surgery, and when an osteointegration of the prosthesis has been achieved.

Take into account the risk factors for postoperative complications related to the patient; chronic administration of steroids, smoking, obesity, diabetes, hypovolemia, peripheral vascular disease, nutritional disorders, administration of immunosuppressants.

The greatest potential complication of a knee replacement is infection, which when deep, requires surgical treatment and removal of the prosthesis.

In obese patients, more complications may appear: healing disorders, avulsions of the internal collateral ligament and infections are frequent.

Another complication is knee stiffness (related to postoperative pain and lack of early mobility to try to achieve a functional range of motion, causing difficulty in achieving full knee extension or flexion.

Difficulty achieving full knee extension

- Walk backwards.
- Perform passive extension with the patient in the prone position with the knee off the table with or without weight on the ankle (should be avoided if contraindicated by the condition of the posterior cruciate ligament post-arthroplasty).
- Extension in eccentric contraction, performed by the physiotherapist, passively extending the patient's leg and then holding the leg, trying the patient to lower it slowly.
- Standing patient flexes and extends the affected knee using a system of pulleys or bands to exert resistance.
- Electro stimulation if the problem is active extension.
- Passive extension with a pillow or towel placed under the ankle, pushing the patient down on the femur.

Difficulty achieving knee flexion

- Passive flexion stretches.

- Sliding with the help of the force of gravity on the wall.
- Stationary bike, pedal backwards and then forwards when you can make a full turn of the pedals.

Recommendations

- You must not gain weight.
- Do not carry heavy weights.
- Don't walk fast.
- Don't run.
- Don't jump.
- Do not sit in low seats.
- Avoid falls.
- Some technical aids or adaptations are recommended that allow them to compensate for the limitations that these patients have to carry out their daily activities. Eg: for the dress (long shoehorn, shoes with elastic laces or moccasin type and achievers for clothes or dressing stick); for the bath (long-handled sponges, bath chairs and handrails).

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
Process indicators	**Plan %**	**Well**	**Regular**	**Bad**
Percentage of patients in which it was achieved / older adult patients with indication for total knee 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

Table 1

Conclusions

The application of a rehabilitation protocol for patients in the pre- and post-operative period of total knee arthroplasty contributes to the improvement of the prognosis and quality of life of these patients. To achieve greater success after surgery and reduce both hospital costs and rehabilitation time, it is important to prepare the patient pre and post-operatively by teaching exercises focused on improving both muscle and joint levels.

Conflict of Interests

The authors declare that they have no conflict of interest.

Bibliography

1. Nicolino T., *et al*. "Complications of Total Knee Arthroplasty According to Season of the Year". *Acaro Magazine* 4.1 (2018): 7-10.

2. Bengoa Velarde and Bullón Posadas. "Functional results of knee prostheses performed with or without use of the tourniquet at the Edgardo Rebagliati Martins National Hospital 2018 – 2019" (2019).

3. Montero-Quijano M. "Anterior knee pain in patients operated on for knee arthroplasty with or without replacement of the patellar component 30.3 (2016): 119-122.

4. Durán C Juan J., *et al*. "Total knee arthroplasty: Functional evaluation and complications. Traumatology and Orthopedics - Hospital Obrero N ° 1, 2010-2015 59.2 (2018): 27-33.

5. Avendaño FE., *et al*. "Early results of the revision of hip prostheses using a double mobility cup cemented over an acetabular reinforcement ring [specialty thesis]". Bogotá: Nueva Granada Military University, Colombia (2016).

6. Pou Pérez L. "Physiotherapy in knee arthroplasty" (2017).

7. Pimienta CI., *et al*. "Joint replacement surgeries in young patients". *Revista Cubana de Reumatología* 19.2 (2017): 79-86.

8. Ibarbia Carreras Marisel., *et al*. "Rehabilitation program in total knee arthroplasty". *Revista Cubana de Ortopedia Y Traumatología* 33.1 (2019): e161.

9. C Closa F., *et al*. "Home rehabilitation after total knee arthroplasty: cost-effectiveness study" 48.3 (2014): 138-143.

10. Robles-Espinoza AI., *et al*. "Generalities and concepts of quality of life in relation to health care". The resident". *Review and Opinion* 11 (2016): 120-125.

11. Aguirre EC., *et al*. Colombian Journal of Orthopedics and Traumatology 28.3 (2014): 101-106.

12. Martín de Amesti., *et al*. "What are the benefits and risks of total arthroplasty in arthrodesic knees?" *Medwave* 18.5 (2018): e7258.

13. Abulhasan J and Gray M. "Anatomy and Physiology of Knee Stability". *Journal of Functional Morphology and Kinesiology* 2.4 (2017): 34.

14. Guerrero Bermúdez. "Corrective Physiotherapy of the Elderly Gait with Total Knee Prosthesis" (2019).

15. Narváez A., *et al*. "Clinical case study: knee arthroplasty" (2018).

16. Puga Martínez G., *et al*. "Quality of life in patients over 60 years of age who underwent HAEV total knee arthroplasty from January 2015 to December 2019" (2021).

17. Vaso Kecojevic., *et al*. "Arthroscopic Anatomy of the Knee Joint and Portals". *Intechopen* (2019): 1-18.

18. Neira FA., *et al*. "The American Academy of Orthopedic Surgeons 2015 Clinical Practice Guideline on the Surgical Management of Osteoarthritis of the Knee". *Academy of Orthopedic Surgeons. AAOS* (2019): 0-0.

19. Lopera-Vasquez JP. "Health-related quality of life: exclusion of subjectivity". *Ciência and Saúde Coletiva* 25.2 (2020): 693-702.

20. Ahmad Raeissadat., *et al*. "Correlation of Western Ontario and Mcmaster Universities Osteoarthritis (WOMAC) and Short Form 36 (SF36) Questionnaires in Patients with Knee Osteoarthritis" 2 (2017): 1-5.

21. Rehabilitation of Total Knee Prosthesis: Indicated exercises" (2016).

22. Milanés L. "Covid-19: Protocol and biosafety in Cuba (+ Infographics)" (2020).

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