

EFFECTIVENESS OF EARLY POSTOPERATIVE EXERCISE PROGRAM IN POST HIP ARTHROPLASTY PATIENTS

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ABSTRACT

Background: Patients with arthroplasty surgery will have several changes in functional activities and daily routines due to altered joint and muscle function due to decreased strength and limited range of motion after arthroplasty surgery. Post-hip arthroplasty conditions require comprehensive treatment so as not to cause impairment/disability that will interfere with function and gait. However, early postoperative exercise program for prevention is remain unknown. **Methods:** The study was quasi experimental. This research was conducted on patients in the inpatient room of Orthopedic Hospital Prof. Soeharso Surakarta. Assessment and evaluation of post-hip arthroplasty results using the Harris Hip Score functional index before and after being given an exercise program. **Results:** The statistical test showed that the data was not normally distributed ($p < 0.05$) and the results of the influence test using the Wilcoxon Test showed that there was an effect of early postoperative exercise on reducing pain ($p = 0.005$) and increasing the Harris Hip Score (HHS) index. The result of the action is that there is an increase in functional ability in post-hip arthroplasty patients. **Conclusion:** Early exercise in post-hip arthroplasty condition accelerate recovery and improve functional ability.

INTRODUCTION

The hip joint is one of the large weight-bearing joints which is a component of the walking process. The hip joint is known as the ball and socket joint. This joint is formed by the acetabulum which is part of the pelvic bone and the upper end of the femur is called the head of the femur.

The hip joint has a big role in the walking
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process. When walking, the hip joint will move in flexion or extension (Ng *et al.*, 2019). Because of the mobility of the hip joint, this joint often has problems. Problems that often arise in the hip, whether degenerative or not, such as osteoarthritis, rheumatoid arthritis, post-traumatic hip, and avascular necrosis which can cause pain and instability in the hip joint which can
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interfere with daily activities (Blakeney *et al.*, 2019).

The problem of prolonged pain greatly interferes with daily activities. If the condition cannot be treated conservatively, further action will be taken in the form of hip joint replacement surgery with arthroplasty. Arthroplasty is a joint replacement surgical procedure that aims to restore decreased joint function, reduce pain caused by osteoarthritis, fractures, dislocations, congenital deformities, and problems related to the hip due to other causes. another. Damage to the cartilage in the hip joint will be replaced with an artificial material by means of surgery. The damaged cartilage will be replaced with an artificial material made of metal or fiber (Pereira *et al.*, 2016).

Arthroplasty is a joint reconstructive surgical procedure performed to relieve pain in the joints and aims to restore joint function so as to improve the patient's quality of life. Arthroplasty is an intervention that is safe enough to relieve pain and reduce disability/impairment so that you can carry out normal activities. Arthroplasty procedures are getting better and better every year. Based on data from Organization for Economic Cooperation and Development (OECD) which obtained from 32 countries, the number of hip arthroplasty procedures has increased since 2000. As many as 306 per 100,000 Swiss

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population received hip arthroplasty. Of the 306 arthroplasty procedures, 180 came from those over 65 years of age. Looking at these data, more than 50% of arthroplasty procedures are performed on elderly people (Giesinger *et al.*, 2020). In elderly people often suffer from joint disease due to the degeneration process. In the UK in 2021 it is estimated that the prevalence of the procedure will rise to 40% due to better functioning of the end result of surgery (Lehza *et al.*, 2013). Data for 2019 at the Orthopedic Hospital Prof. Dr. R. Soeharso Surakarta which is a national referral hospital in the field of orthopedics and traumatology, the number of hip arthroplasty cases reaches 134 per year. This condition may increase in the following years. Along with changing lifestyles and lifestyles.

Hip Arthroplasty or what is often referred to as Total Hip Replacement (THR) is a total replacement of a damaged hip joint. Arthroplasty indications are elderly patients who have degenerative joint disease. Of course, not only for elderly patients, younger patients are also an appropriate indication for arthroplasty, especially in patients with joint destruction. According to Pivec *et al.* (2012) in the UK Indications for hip replacement are osteoarthritis (93%), osteonecrosis (2%), fracture of the neck of the femur (2%), hip joint dysplasia (2%), and inflammatory

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arthritis (1%). Osteoarthritis is the most common cause of arthroplasty. Risk factors for osteoarthritis are women, advanced age (>65 years) and obesity.

A person or patient after arthroplasty surgery will experience several changes in carrying out functional activities and daily routines. This is due to altered joint and muscle function due to decreased strength and limited range of motion after arthroplasty surgery. Post-hip arthroplasty conditions require comprehensive treatment so as not to cause impairment/disability that will interfere with function and gait. These conditions can reduce the normative value of individuals when compared to the same age up to two years after surgery. Many patients experience reduced ability to low levels and moderate activity after hip arthroplasty surgery. About 33% of post-hip arthroplasty patients do not do sports or hobbies that were previously often done because of fear. These conditions and disorders can occur due to fear and are less progressive in carrying out recovery after surgery (Madara *et al.*, 2019).

Physiotherapy is a service carried out by physiotherapists to optimize the quality of life by developing, maintaining and restoring movement and function that are potentially impaired by aging, injury, disease, physical disorders and environmental factors throughout the life cycle, through manual methods, increased

mobility, use of equipment, function training, and communication (WPT, 2020). Physiotherapy focuses on function, movement, and optimal use of potential and uses a physical approach to promote, maintain and restore physical, psychological and social well-being. In post-arthroplasty conditions, of course, physiotherapy programs have an important role to optimize the patient's physical abilities and prevent further problems (Kisner *et al.*, 2018).

The duration of the patient's stay in the hospital was 4-6 days with the protocol that the patient was trained to use crutches or other walking aids before being discharged. In general, patients can start supporting their body weight without the help of tools at 6-8 weeks after surgery according to the patient's ability (Tile *et al.*, 2015). According to Aresti *et al.* (2017) the principles of rehabilitation in postoperative hip arthroplasty patients are: 1). Improve strength, balance, and range of motion of the joints; 2). Correct gait disturbances, especially abduction function; 3). Increase functional exercise so that it can improve daily functional activities.

Exercise therapy/therapeutic exercise is a program for patients/clients that is structured systematically for body movements, postures, or physical activities that have specific goals (Pristianto *et al.*, 2018). According to Kisner *et al.* (2018)

exercise therapy has the aim of restoring, improving physical abilities, preventing health-related risk factors and optimizing health and fitness factors. The postoperative period for total hip replacement (total hip arthroplasty) underwent a standard physical therapy protocol that included education, pain management, Range of Motion (ROM), and muscle strengthening. In the post-hip arthroplasty condition, exercise is given as early as possible or is called early postoperative exercise. The early postoperative exercise program for patients receiving hip arthroplasty is carried out to increase circulation so as to prevent blood clots from occurring. This exercise can also increase muscle strength so that it can encourage the function of the hip joint to move as well as possible. At the beginning the exercise will feel a little uncomfortable, but this exercise can speed up recovery and reduce postoperative pain. The physiotherapy rehabilitation program in this phase has the aim of helping to reduce pain levels, increase joint mobility, restore functional that is still possible to achieve, identify and prevent possible complications after surgery.

The exercises carried out are generally divided into two, namely exercises in bed (lying/sitting) and if it is possible to exercise outside the bed (standing/walking). Exercises performed on the bed such as the ankle pump, which push

the foot down (dorsiflexion) and up (plantarflexion). This exercise is performed in bed shortly after surgery until recovery. Ankle pump exercise performed regularly are aimed at maintaining circulation and preventing Deep Vein Thrombosis (DVT) and thromboembolism (Kisner *et al.*, 2018). Kisner et al in 2018 stated that ankle pumping exercise accompanied by deep breathing significantly increased blood flow velocity above average in the femoral vein. A muscle setting exercise program involves very low isometric contractions performed without resistance. This exercise is used to reduce spasm and to promote relaxation and circulation after injury to soft tissues during the acute (high-actuality) phase. In hips undergoing arthroplasty, exercises in the form of joint mobility/motion exercises are expected to be able to maintain the Range of Motion (ROM) of hip extension movements. Hip extension and flexion are necessary in the gait phase. In addition, changes and decreases in muscle strength in the lower extremities and changes in ROM in the knee and ankle make the walking pattern unstable. The strength of the leg muscles keeps the body from falling. Meanwhile, ankle control has a role as shock absorption and momentum determinant (Rofi'atin & Perdana, 2020).

Based on the description above regarding the problems found in post-hip arthroplasty patients and the forms of

exercise that can be given, this study will see how the results of giving exercise as early as possible. The form of exercise given of course adjusts to the patient's condition and ability.

METHODS AND MATERIALS

The design in this study was a quasi-experimental design on patients with pre and post-test designs, namely by comparing the scores before and after the intervention of early postoperative exercise and education. The ten subjects were recruited from inpatients hip arthroplasty patients who visited the Physiotherapy room in Orthopedic Hospital Prof. Soeharso Surakarta during January to June 2020.

The outcome measurement in this study were Harris Hip Score (HHS) to assess and evaluate the functional index. HHS also measures the pain, gait, daily activities, deformity, and range of motion (ROM) (Bawono *et al.*, 2018). In addition, pain level measurements were also carried out using the Visual Analogue Scale (VAS). The data interpreted descriptively by mean and frequencies. This research was conducted based on the Ethical Clearance number 2636/B.2/KEPK-FKUMS/XI/2019.

RESULTS AND DISCUSSION

Table 1. Characteristics of Respondents

Criteria	Frequency	Percentage
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	(n)	(%)
Gender		
Male	3	30
Female	7	70
Age		
56-60	4	40
61-65	6	60

Based on the characteristics of the respondents, there were 10 respondents (3 males and 7 females) with an age range of 56-65 years. The average value of HHS Pre is 53.2 points and HHS post is 72.6 points. For the VAS value, before being measured it was 4.9 points and after being given the action 4.07 points. Individual data can be seen in Graphs 1 and 2.

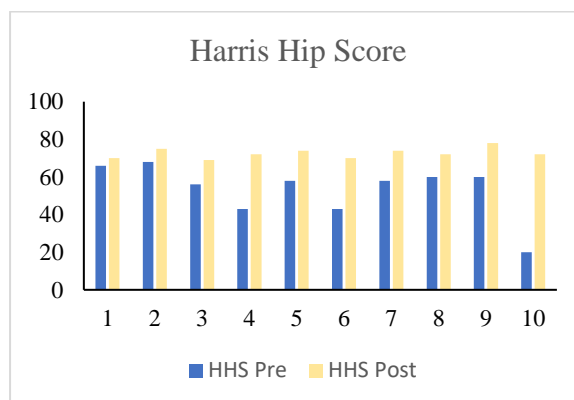


Figure 1. Graph of HHS Evaluation Results

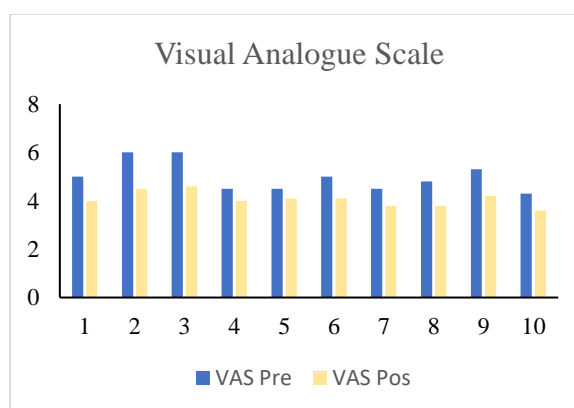


Figure 2. Graph of VAS Evaluation Results

Based on statistical tests, the data were non-parametric after normality test was carried out using the Shapiro Wilk Test ($p < 0.05$) and the effect was tested using the Wilcoxon test, there was an effect of early postoperative exercise treatment on increasing HHS scores ($p = 0.005$) and decreasing pain using VAS ($p = 0.005$).

The study, which was conducted for six months on 10 patients after hip arthroplasty, showed significant improvement based on an evaluation using HHS and VAS. From the graph, it can be seen that in 10 patients there was an improvement which was measured before and after the program was given.

Many post-hip arthroplasty patients experience limitations in social participation. This is due to a progressive decrease in muscle strength, decreased joint range of motion, as well as difficulties in dynamic exercise in the early post-hip arthroplasty. This is also correlated with the condition of the insurance system claims that have a time limit for outpatient visits for physical therapy. The exercise therapy program that was given from the start to overcome functional limitations after hip arthroplasty was patient-centred. The program protocol that has just been developed and tested is currently very helpful in the recovery of patients in their functional activities and daily routines. This rehabilitation program was developed with

input from the clinical director, physiotherapists treating post-hip arthroplasty patients, clinical researchers, and surgeons. This program can reduce / reduce the initial postoperative controlled physical therapy visit (Madara *et al.*, 2019).

The physiotherapy rehabilitation program in the form of exercises as early as possible is given in stages starting from post-surgery (exercises in bed) to getting up and standing then preparatory exercise to walk plays a role in maximizing function that leads to a condition of patient independence. Further to suppress and reduce the risk of postoperative complications, such as hip dislocation, DVT, infection, pulmonary embolism, and other risks. This program also provides a form of exercise therapy that aims to train and restore functional abilities not only in the area undergoing surgery but also in the general body. Specifically, the exercises started from transfer training, gait training, and exercises for the patient's daily activities. This program is implemented from the initial recovery phase up to the first three months.

Ankle pumping exercises serve to increase the activity of the plantar flexor muscles. In general, the target of this exercise is for postoperative rehabilitation, overcoming the condition of patients with swelling (oedema), management of patients with long bed rest (immobilization). One of

the contraindications to this exercise is the presence of heavy bleeding, even to an open wound, requiring immobilization (Lee *et al.*, 2020). This ankle pumping exercise can be combined with Abdominal Deep Breathing (ADB). The study results showed a significant increase in the mean peak blood flow velocity in the femoral vein. These results indicate that this combination exercise program can be recommended in patients at risk of Deep Vein Thrombosis (DVT) or other blood stasis conditions. Of course, further studies are needed to be applied to patients after heart, lung, or other orthopedic surgery. Other motion exercises performed on the bed are: 1) Ankle rotation, the patient rotates the ankle in and out; 2) Bed-supported knee bends, performed with the sole of the foot against the bed and pulling the sole of the foot towards the buttocks and returning it to its original side (try not to turn the knee inward); 3) Buttock contraction, done by tightening or contracting the gluteus/buttock muscles; 4) Abduction exercise, performed by opening the legs according to the patient's ability; and 5) Quad set, performed by tightening the quadriceps/thigh muscle group with the knees straightened. These exercises also target increasing muscle strength (strengthening exercises), especially around the incision area. Strengthening exercise aims to increase muscle strength in the lower extremities. Decreased muscle

strength due to the implications of surgery/surgical injuries and muscle inactivity that leads to atrophy. the role of Strengthening exercise to increase muscle strength and restore muscle size, shape, and structure (Schache *et al.*, 2016).

Range of Motion (ROM) exercise serves to reduce pain, stiffness and decreased range of motion. There are three types of ROM exercises, namely passive movement, free active movement, and active assisted movement. Passive movement is a movement that is produced by external force or force without any muscle contraction (Pristianto *et al.*, 2018). ROM exercises with passive movement target muscles that have not been able to contract. Free active movement is an active contraction of the main muscle that is the driving force so that there is an increase in tone, muscle mass and muscle strength (Talan *et al.*, 2016). ROM exercises in the form of active movement are applied to regions that are able to move, for example apart from the area where the incision is made. Active assisted movement is an active movement performed by the muscles against the joints but still need help from other muscles or other people to move. The form of ROM exercise is the implementation of joint mobility exercises carried out by patients and assisted by physiotherapists (Yang *et al.*, 2019).



Figure 3. Exercise in Bed (Bed Mobility)
1st day after surgery

The next physiotherapy exercise program is targeting pelvic stabilization and leg muscle ability. These exercises are good for improving and maintaining function and strength in the pelvic and hip regions so that wrong movement patterns do not occur. If the patient has problems with the lower back, hip, knee, and ankle, it will have an impact on pelvic and hip stability inefficiencies. Exercises from the pelvis to the legs, of course, do not only target the operated leg (arthroplasty) but also the healthy leg (unoperated/contralateral). In healthy limbs, exercise is expected to be able to maintain the condition of muscle strength in the pelvic region and the hip and even the legs as a whole. The limb that is not operated on (contralateral) will be a support when standing or walking, so it is necessary to prepare and maximize the function of the healthy leg. This limb function will play a major role in activities during the healing process and the implementation of the exercise program.

After surgery the patient is trained and taught to stand to restore strength so that the patient can stand up independently. While doing the standing exercise, the patient holds the walker/walker around the bed. When the patient is standing, the patient can perform the following exercises: 1) Standing knee raises, the patient raises the knee towards the chest but should not exceed the hip; 2) Standing hip abduction, the patient moves the leg to the side with the knee straight; 3) Standing hip extensions, the patient moves the leg back. In this standing exercise, it is also directed to balance exercises. Balance exercises can help overcome distractions and reduce the risk of falling (Fikriyah *et al.*, 2021). Balance exercises can aid post-operative functional recovery and rehabilitation. Balance training has the potential to restore joint proprioception and posture control (Mistry *et al.*, 2016).

Walking exercises with assistive devices can be performed after the patient is able to stand and there are no complications in the arthroplasty area. Weightbearing in walking exercises refers to the surgeon's recommendation, for cemented or uncemented actions in the operation. The limitations of joint motion that are often experienced by patients after arthroplasty surgery in this early phase are determined and adjusted to the patient's condition. In patients who have a history of dislocation

and a history of revision surgery will have a very high risk of re-dislocation, it is necessary to adjust it according to the condition of each patient. Physiotherapy will minimize and reduce the length of the hospitalization process. Because early ambulation will speed up recovery. Subsequent programs for short-term outpatient physiotherapy (<1 year) in arthroplasty patients showed better gait outcomes than those with end-stage osteoarthritis with conservative management (Pivec *et al.*, 2016). At the beginning of the exercise the patient was allowed to retain partial weight bearing (PWB) after the first six weeks followed by full weight bearing (FWB). With the efficiency of muscle performance and earlier functional recovery will support an increase in quality of life. Arthroplasty and functional exercises have the same contribution in improving the stability and functional region.



Figure 4. Exercises to stand and walk with a walker and assistance

The need for restoration of daily functional activities is a primary need that cannot be avoided. This includes the role in the social life of the community. However, in the application of functional recovery education, many face several obstacles related to patients, namely patient awareness of the importance of functional recovery, gender, age, weight, contra lateral hip functional status, comorbidities, and even the patient's mental condition. Family environmental factors are also one of the factors that determine the success of further education programs that must be carried out at home. Such as walking up and down stairs, wearing shoes or sandals, and going up and down means of transportation.

CONCLUSIONS AND SUGGESTIONS

The implementation of the physiotherapy program in the form of early postoperative exercise for patients with post-hip arthroplasty conditions in the inpatient room of Orthopedic Hospital Prof. Soeharso Surakarta obtained a significant increase. The exercise program in the form of exercises in bed given as early as possible after surgery and gradually according to the patient's development as well as providing standing and walking exercises using assistive devices. There was an increase in the patient's mobility and confidence on the

third day after hip arthroplasty surgery. The average ability of the patient is able to walk using a walker with a partial weight bearing technique but is still under assistance and supervision. The training program is continued with outpatient and home programs as well as education.

Advice for medical personnel and patients, exercise can be started as early as possible to prevent complications from bed rest and decreased physical ability. After returning from the hospital, patients should still be given a home program as a follow-up and given instructions for exercises that can be done at home. This is to maximize functional improvement and prevent unwanted complications after hip arthroplasty.

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