

Physiotherapy management of functional activity disorders of knee dekstra et cause post-op anterior cruciate ligament reconstruction

Yery Mustari¹, Ghina Agrifina Kaharuddin^{1*}, Rahsinta Eka Febrianty¹, Chaerunnisa Chaerunnisa¹, Nuraeni Nuraeni¹

¹Physiotherapy Department Faculty of Nursing, Universitas Hasanuddin Makassar, Indonesia, Indonesia

**Correspondence: Ghina Agrifina Kaharuddin, Physiotherapy Department Faculty of Nursing Universitas Hasanuddin Makassar, Indonesia, Indonesia. Email: ghinagrifina@gmail.com

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ABSTRACT

Introduction: anterior cruciate ligament injury is one of the common knee injuries among athletes, which can cause functional activity impairment of the knee, such as pain, edema, range of motion limitation, contracture, and anxiety. Anterior cruciate ligament reconstruction is a surgical procedure that aims to restore the stability and function of the knee. Patients who undergo Anterior cruciate ligament reconstruction require appropriate physiotherapy management to accelerate the healing and recovery process.

Aim: this study aims to determine the physiotherapy management of functional activity disorders of the knee joints and the causes of postoperative anterior cruciate ligament reconstruction.

Methods: this study used a case study method with a research subject of a 24-year-old male who suffered an anterior cruciate ligament injury on the right knee and underwent Anterior cruciate ligament reconstruction. Data were collected using instruments such as the VAS pain scale, goniometer to measure a range of motion, MMT to measure muscle strength, and international knee documentation committee questionnaire to measure functional activity.

Results: showed a decrease in pain, an increase in range of motion, an increase in muscle strength, and an increase in functional activity on the right knee caused post-op Anterior cruciate ligament reconstruction after receiving physiotherapy intervention for 9 sessions.

Conclusion: physiotherapy management given in the form of electrical muscle stimulation, prone hang, passive range of motion exercise, patella mobilization, isotonic & isometric strengthening, and walking exercise, as well as education, can help overcome functional activity impairment on the right knee et cause post-op anterior cruciate ligament reconstruction.

Keywords: anterior cruciate ligament; anxiety; knee joint



INTRODUCTION

The anterior cruciate ligament (ACL) is an essential structure in knee joint kinematics because it prevents anterior translation of the tibia and excessive knee rotation (Buckthorpe *et al.*, 2021). ACL injury is a knee injury often experienced by athletes, especially those who do activities that involve twisting, changing direction, or kicking. ACL injuries can cause the knee to become unstable and risk further damage to the meniscus and cartilage. Anterior cruciate ligament reconstruction (ACLR) is the surgical procedure of choice to restore stability and function to a knee that has suffered an ACL injury (Eliya *et al.*, 2020). Patients undergoing ACLR usually require physiotherapy rehabilitation to speed up the healing process, increase the range of motion, strengthen the muscles around the knee, and prevent complications such as joint stiffness, infection, or graft failure (Porrino *et al.*, 2020). In Indonesia, data regarding the incidence of ACL and ACLR injuries is still limited. However, based on an observational study conducted in four hospitals, the average cost per ACLR procedure was USD 2,853 (IDR 40.4 million), mainly due to the cost of orthopedic implants (USD 1,387; IDR 19.6 million). The study also showed that the national burden of ACLR reached USD 367.4 million (IDR 5.2 trillion) per 100,000 patients for ACLR with additional meniscus treatment and USD 271.3 million (IDR 3.8 trillion) per 100,000 patients for ACLR procedures isolated (Reza and Tiara, 2022).

Physiotherapy management for functional impairment of the knee undergoing postoperative anterior cruciate ligament reconstruction is crucial. This step refers to returning optimal knee functionality and mobility after surgery (Nelson *et al.*, 2021). Physical therapy will focus on restoring muscle strength, balance, flexibility, and coordination of movements to restore daily activities effectively. With the right approach, patients can restore high levels of functional activity and reduce the risk of repetitive injury to knees that have undergone anterior cruciate ligament reconstruction surgery (Glatke, Tummala and Chhabra, 2022). Introduce methods and techniques to be used in physiotherapy sessions, such as specific exercises to strengthen the muscles around the knee, balance exercises to improve stability, and massage or massage techniques that can help reduce swelling and increase blood flow to the affected area (Irianto *et al.*, 2023). A holistic and coordinated approach between the medical team and physiotherapist, postoperative physiotherapy management can help patients recover optimally and reduce the risk of complications and recurrence of injuries (Jenkins *et al.*, 2022). Functional activity disturbances in the right knee postoperative anterior cruciate ligament (ACL) reconstruction refer to challenges in daily activities and sports-related movements due to surgery and recovery. ACL reconstruction is a standard orthopedic procedure to restore stability and function to the knee joint after ACL injury (Carter, Webster, and Smith, 2021).

However, successful surgery is just one aspect of the overall recovery process. Physiotherapy plays a crucial role in managing functional activity disturbances and optimizing the outcomes of ACL reconstruction. Managing functional activity disturbances involves a comprehensive approach that integrates various physiotherapy techniques, exercises, and strategies tailored to the patient's needs (Shahid, Kashif, and Shahid, 2023). This includes addressing pain management, improving range of motion, enhancing muscle strength and endurance, promoting neuromuscular control, and facilitating a safe return to sports and daily activities. In this context, physiotherapy management focuses on restoring functional abilities specific to the right knee while considering the unique challenges and goals of postoperative ACL reconstruction. The following sections will delve into the detailed strategies and interventions used in physiotherapy to effectively address these functional activity disturbances (Patterson *et al.*, 2021). The physiotherapy rehabilitation process, in this case, focuses on maintaining and increasing the strength of the core muscles and lower extremities, preparing the patient to jog, and training the patient's brain coordination through agility training. Returning to futsal is the ultimate goal of physiotherapy rehabilitation in this case (Nathania *et al.*, 2023).

Physiotherapy interventions for patients with post-op cases of ACLR include range of

motion exercises, muscle strengthening exercises, balance exercises, functional exercises, and modalities such as electrical stimulation, bracing, and water therapy. Physiotherapy intervention aims to improve knee function, reduce pain and edema, increase self-confidence and readiness to return to daily activities or sports and prevent re-injury. Physiotherapy rehabilitation protocols can be adjusted to the patient's condition, the type of graft used, and the surgical technique performed.

MATERIALS AND METHODS

This case study and field research, with a sample of 24-year-old patients after anterior cruciate ligament reconstruction due to a soccer injury. Primary data was obtained through autoanamnesis, alloanamnesis, and physical examination. This research was conducted at the Makassar Physiocenter Clinic. Informed consent and patient-related information were obtained from the patient and the local physiotherapist. Patients receive physiotherapy intervention in 2 sessions per week. The evaluation was carried out after 9 interventions. Patients are given electrotherapy, such as electrical muscle stimulation, prone hang position, and several exercises, such as strengthening and ROM exercises, which can reduce pain, increase muscle strength, and increase ROM for patients with ACL reconstruction surgery.

RESULTS

The male patient, on behalf of Mr. F, who is 24 years old, came to physiotherapy at one of the Makassar Clinics on November 27, 2023. The patient came for physiotherapy with the main complaint of pain and stiffness in the right knee area when doing movements like bending and straightening the knee. Previously, the patient underwent reconstructive surgery on September 29, 2023. From the results of the static inspection of the patient, the general condition was found to be: the patient came with a semi-flexed knee, edema, atrophy of the quadriceps, hamstring, and gastrocnemius muscles, and visible incision scars on the anterior aspect of the right knee. Meanwhile, the general condition was found for dynamic inspection: The patient walks using sticks and a brace on the right knee with an abnormal walking pattern but supports the left side for loading. A warm temperature and edema were found during palpation, but no tenderness was found in the right knee area. The primary motor function examination showed that the patient experienced limitations but no pain during active flexion and extension of the right knee. Then, limited ROM and pain disappear at the end of the movement during passive flexion and extension of the right knee. For TIMT, the patient can resist resistance in every movement, both flexion and extension of the right knee. The results of the pain examination showed that the patient no longer felt silent or tender pain, but there was still mild movement pain (2), which came and went. This statement is also supported by the right knee ROM examination results: S.0o.0o.113o. From the results of the examination that had been carried out, it was found that the patient experienced atrophy of the quadriceps, hamstring, and right gastrocnemius muscles.

The patient's examination showed blood pressure of 140/80mmHg, pulse 85 times/minute, and breathing 22 times per minute. Examination of muscle quality values based on Manual Muscle Testing (MMT) obtained a value of 4 with muscle weakness in the gastrocnemius and anterior tibialis muscles. Pain examination using the Visual Analog Scale (VAS) revealed silent pain with a score of 3, tenderness with a score of 8, and movement pain with a score of 6. Range of Motion (ROM) examination using a goniometer was obtained for passive (S.10°-0°- 20°) and passive (R.10°-0°-10°). Examination of daily activities shows that physical activities such as walking and praying are disturbed. Anxiety level examination uses the Hamilton Rating Scale Anxiety (HRS-A) with a score of twelve (mild anxiety). The physiotherapy problems that can arise are primary problems in pain. In contrast, secondary problems include limited range of motion (ROM) in ankle movements and muscle weakness in the gastrocnemius and anterior tibialis muscles. In contrast, complex problems include limitations in daily living (ADL) activities, such as walking and praying. The goals of physiotherapy consist of the short-term term, namely reducing pain, increasing left ankle mobility, increasing left ankle ROM, and reducing

anxiety, and the long-term goal, namely improving the quality of functional activities.

Table 1. Physiotherapy Programs

Problems	Modality	Doses
feeling of anxiety	Therapeutic communication	F: Every therapy meeting I: Interpersonal approach Tc: Focused patient T: During therapy
Muscle atrophy	Transcutaneous Electrical Stimulant (TENS)	F: Every therapy meeting I: 40 Hz Tc: Coplanar on Quadriceps muscle T: 10 minutes
Joint mobility limitation (including pain at the end of movement)	Exercise therapy	F: Every therapy meeting I: 20 times repetition Tc: Passive movement T: 10 minutes
		F: Every therapy meeting I: 3 set Tc: Passive patella mobility T: 5 minutes
		F: Every therapy meeting I: Level 1 and Level 2 T: Cycling on a static cycle T: 10 minutes
Muscle weakness	Exercise therapy	F: Every therapy meeting I: 6 times repetition, 2 set T: Passive extension knee with band T: 10 minutes
		F: Every therapy meeting I: 3 times repetition, 2 set T: Straight leg raises with load 1 kg T: 10 minutes
Sub-acute inflammation (Swelling)	Exercise therapy	F: Every day I: 3 set T: Elevate the leg T: 15 minutes

*F : Frecueny; I: Intensity; Tc: Technique; T: Time

Table 2. Physiotherapy Evaluation

Parameter	Before	After	Description
	Silent pain: 0	Silent pain: 0	a decrease in movement pain
	Tenderness: 0	Tenderness:	
	Movement pain: 0	0	
	2	ment pain: 1	

(Goniometer)	.113°.	.120°.	is an increase in the range of motion of the joint.
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Source: Primary data 2023

The table above shows a decrease in the patient's movement pain. Apart from that, there are also changes in the ROM value, namely in the left knee flexion movement.

DISCUSSION

Establishing a clinical diagnosis of Post ACL Injury Reconstruction in Mr. F is based on the results of the history and physical examination based on the clinical manifestations of the ACL case. Clinical manifestations of ACL injury include a "pop" sound when the knee moves, pain, swelling, muscle weakness, limited movement, decreased balance and decreased ROM. Meanwhile, for clinical manifestations after ACL reconstruction, patients will feel pain, swelling, muscle atrophy, stiffness in the knee when moved, reduced muscle strength and ROM, and impaired functional activities. The patient feels movement pain in the right knee; the leg cannot be bent maximally, and the leg feels heavy and weak. The patient came to the Physiocenter clinic using crutches and a brace on the right knee with an abnormal walking pattern but leaning to the left side for loading. The results of the static inspection examination showed an incision mark on the anterior aspect of the right knee. ACL tears are caused by direct or indirect trauma to the knee. Direct trauma occurs due to a direct impact on the knee when the knee moves laterally or anteriorly, causing ligament tears. Indirect trauma is caused by landing in a hyperextended state after performing a jump along with a rotational movement under valgus stress (Zumwalt, [2023](#)). For anxiety problems, it was found that the patient experienced mild anxiety, so the patient was given modalities in the form of therapeutic communication. Therapeutic communication helps patients identify pain problems, reduce burdens, and reduce anxiety levels (Cohen, Vase, and Hooten, [2021](#)). Post-ACL reconstruction conditions can cause problems such as pain, edema, decreased joint range of motion, and reduced muscle strength (Ketiga and Putra, [2021](#)). Based on this, patients who undergo early ACL reconstruction have better quality. Regardless of factors such as age, gender, and morbidity, patients wait 3 months for reconstruction (Saki et al., [2023](#)).

Physiotherapy is competent in carrying out post-injury rehabilitation, especially post-ACL reconstruction. Physiotherapy aims to restore body function and movement throughout the life cycle. This includes preventing re-injury, restoring functional abilities, and re-optimizing performance. The results of the patient's evaluation of the pain level in the knee area after reconstruction using the Visual Analog Scale (VAS) for the pain felt by the patient there was a decrease in movement pain after 9 therapy meetings. The reduction in pain that occurs is influenced by electrotherapy intervention in the form of electrical muscle stimulation, on the mechanism that occurs after ACL reconstruction by inhibiting pain stimuli from entering the brain by stimulating sensory neuron cells to the substantia gelatinosa and limiting nociceptors from conveying pain information to the brain (Comitato and Bardoni, [2021](#)). The medial pathway overlaps with the salience and stress networks, explaining that behavioural relevance or meaning determines the suffering associated with painfulness. Genetic and epigenetic influences trigger chronic neuroinflammatory changes which are involved in transitioning from acute to chronic pain (De Ridder, Adhia and Vanneste, [2021](#)). Obtained in the management of physiotherapy in post-op cases of the anterior cruciate ligament phase 1 is proven to reduce pain and increase muscle strength (Christivana and Susilo, [2023](#)).

The patient's quadricep muscle strength increased from a score of 4 to 5. Muscle strengthening exercises are a priority after ACL reconstruction to restore muscle strength (Buckthorpe and Della Villa, [2020](#)). Strengthening exercises for the muscles in the thigh and lower leg areas are progressively given (De Almeida *et al.*, [2020](#)). Exercises in the form of isometric movements can speed up the metabolic rate and rebuild muscle tissue lost after ACL surgery, resulting in weak knee joint muscles, especially in the quadriceps muscle group (Seehafer et al., [2021](#)). Strengthening exercises activate muscle work and speed up metabolism to facilitate

blood flow by carrying nutrients throughout the body (Narici et al., 2021). Meeting the energy needs of the muscles can increase muscle strength around the knee joint. This can train the quadriceps muscle group and muscles around the knee joint that experience weakness after ACL reconstruction (Nuccio et al., 2021). Education strategies to improve the patient's understanding of the condition and manage pain are supported by research. Strong evidence continues to support the primary role of exercise therapy and load progression to achieve long-term improvements in pain and function (McClinton, Cobian and Heiderscheit, 2020). There was a change in ROM in knee flexion and extension measurements after 9 meetings because the intervention positively impacted increasing knee ROM.

CONCLUSIONS

This case report describes the clinical presentation and physiotherapy management in a case of Postoperative Anterior Cruciate Ligament (ACL) Reconstruction. A 24-year-old male patient with complaints of functional activity disorders on the right side of the knee received a physiotherapy program for 2 sessions per week for 2 weeks. The physiotherapy program provided includes therapeutic communication, Electrical Muscle Stimulation, Prone Hang, passive ROM exercise, patella mobilization, isotonic & isometric strengthening, and walking exercise, which has a positive effect on reducing pain as well as reducing anxiety as well as increasing mobility and ROM in the knee so that it can slowly increase the patient's functional activity which had limitation or disorder. The physiotherapy program must be individualized, considering the severity and clinical presentation of the patient. The limitation of this report is that the physiotherapy program sessions given to patients were concise. However, the results were satisfactory, resulting in reduced pain and increased patient mobility after the program.

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Conflict of Interest

None declared

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