PHYSIOTHERAPY REHABILITATION PROGRAM IN PHASE-2 *ANTERIOR CRUCIATE LIGAMENT* RECONSTRUCTION RECOVERY:*A CASE REPORT*

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Abstract

Background: *Anterior cruciate ligament* (ACL) injury is a common knee injury in both the general population and athletes. Structured and systematic and progressive rehabilitation is recommended in the post ACL reconstruction and conservative management, the goal of rehabilitation is to overcome neuromuscular related disorders, muscle strength deficits, joint scope of motion deficits, balance, knee stabilization, motor control and return to sports safely **Objective:** Physiotherapy rehabilitation program for phase 2 anterior cruciate ligament reconstruction recovery. **Methods: The**study used the *Case Report* method which was carried out at the K.R.M.T Wongsonegoro Semarang Hospital on a 25-year-old male patient diagnosed with postoperative ACL reconstruction *dextra* with complaints of pain in the left knee, swelling and limited knee bending. **Results:** Physiotherapy intervention in the form of *Excercise is* able to reduce pain, swelling, increase muscle strength and increase the scope of motion of the knee joint and improve functional activities. **Conclusion:**Based on research using this *Case Report, it* shows that the physiotherapy rehabilitation program on ACL reconstruction as a whole obtained the results ofchanges and improvements.

Keywords: Physiotherapy, ACL, ACLR and Sport Injury.

INTRODUCTION

Anterior cruciate ligament (ACL) injury is a common knee injury in both the general population and athletes. Structured and systematic progressive rehabilitation is recommended in post ACL reconstruction and conservative management, the goal of rehabilitation is to address neuromuscular-related impairments, muscle strength deficits, joint range of motion deficits, balance, knee stabilization, motor control and safe return to sport. (Vella Buckthrope & Della, 2020 dalam Korakakis et al., 2021)

ACL injuries are most commonly caused by non-contact or indirect injuries, with the percentage of non-contact ACL injuries being 37.5%-85%. (Åman et al.,2018;Fort-Vanmeerhaeghe et al.,2021) Non-contact ACL injuries Video analysis of ACL injuries shows that high-risk actions accompanied by dynamic knee valgus, almost full knee extension, total weight supported by the injured leg, bilateral tilt can cause anterior translation leading to ACL injury (Lucarno et al., 2021)

The anterior cruciate ligament is part of the ligament found in the knee joint

which has a function as a barrier to the movement of the tibia bone moving anteriorly and excessive rotation in the knee joint. (Filbay & Grindem, 2019). Postoperativechanges in ACL reconstruction can inhibit sensomotroric function, which is found around the knee that undergoes ACL reconstruction which can then cause clinical disorders such as loss of muscle strength, atrophy and changes in function (Adams et al., 2012)

METHODS

The research method used in this research is *single subject research*. Thisstudy involved a 25-year-old man who works as a teacher in the field of sports and a soccer athlete, the patient suffered a right knee injury in July 2021 due to the patient falling while jogging with his right leg into a hole. In November of the same year the patient underwent ACL reconstruction surgery at Kariadi Hospital Semarang, 3 weeks after the reconstruction surgery the patient developed an infection in the right knee and the patient underwent surgery to remove the infectious fluid. At the end of December 2021 the patient wasmreferred to undergo a physiotherapy rehabilitation process at the RSUD. KRMT Wongsonegoro Semarang. The patient visited physiotherapy with a condition using a cructh aid and a knee *brace* with a *tree point gait* pattern PWB (*Partial Weight Bearing*). Currently the patient is undergoing a physiotherapy rehabilitation program which is carried out 2 times a week.

The data collection method carried out is by conducting a physical examination of the patient. physical examination is carried out and *vital sign checks* (Table 1). Based on the findings of the static inspection examination, it was found that there was *oedema* on the right knee, there was an incision wound on the right knee and the wound bandagelooked wet. Dynamic examination of the patient walking using a *crutch* with a *tree point gait* pattern PWB (*Partial Weight Bearing*). Vital signs examination as a whole showed normal conditions in various aspects such as blood pressure, pulse, breathing and temperature.

Basic motion examination includes active motion, passive motion, and isometric examination. In active motion examination, it is found that there is a limited scope of motion in *flexion of the* right knee and accompanied by pain, in passive motion examination, it is found that there is a limited scope of joint motion and pain with *springy endfeel*.

Resistant isometric examination can be performed by patients with muscle

contractions without pain. This examination aims to obtain information that pain is not activated by muscle contraction, then in the palpation session found tenderness on the anterior of the right knee and obtained a local temperature difference in the knee caused by *oedema*. Examination of pain measurement using NRS (*Numeric Rating Scale*), measurement of muscle strength using a sphygmomanometer that has been pumped then the patient is instructed to press. In measuring *oedema* using a meterline compared to the left knee, measuring the scope of joint motion using a goneometer. Pain measurements are taken in 3 dimensions of pain at rest, pressure and motion (Table 2). From the measurement of muscle strength, it was found that there was a decrease in the difference in muscle strength of the *grop flexor* and *extenor of the* right knee compared to the left knee (Table 3).

Measurement of the scope of joint motion in patients includes examination of both knees and is found to be limited to the right knee, this measurement uses a goniometer (Table 4). Anthrophometric measurements obtained differences in bothlimbs (Table 5).

Table 1. Vital *Sign*

	Vital Sign	
1	Blood Pressure	127/92 mmHg
2	Pulse Rate	89x/min
3	Breathing	22x/min
4	Temperature	36.6 C
5	High	165 cm
6	Weight	62 kg

Table 2. Pain Measurement with NRS (*Numeric Rating Scale*)

NRS	T0
Silent Pain	0/10
Pressure Pain	6/10
Motion Pain	4/10

Table 3. Muscle Strength Measurement with Sphygmamometer

T0	Dextra	Sinistra
Flexor Group	60 mmHg	70 mmHg
Grop Extensor	70 mmHg	80 mmHg

Table 4. Measurement of Joint Movement Scope with Goniometer

Region	Treatment	AROM		PROM	
Knee		Dextra	Sinistra	Dextra	Sinistra
	T0	S 0°-0°-110°	S 0°-0°-135°	S 0°-0°120°	S 0°-0°135°

Table 5. Anthropometric Measurements

No.	Limb	Dextra	Sinitra
1	5 cm Above Tubersitas tibia	38 cm	38 cm
2	10 cm Above Tubersitas tibia	41 cm	41 cm
3	5 cm Below Tubersitas Tibia	32 cm	32 cm
4	10 cm Below Tibia	36 cm	36 cm

The physiotherapy process is given to patients while undergoing physiotherapy rehabilitation at the Hospital. KRMT Wongsonegoro Semarang and patients are also given *home program* exercises. early phase physiotherapy rehabilitation program after ACL reconstruction is to reduce pain, increase muscle strength, increase the scope of motion of the right knee joint, and improve the patient's functional activity ability.

Table 6. Interventions

Intervention	Dosage	Results
January 06, 2023		
SLR Resistance *Abduction Resistance* *Adduction Resistance* *Quad Set* *Ham Set* *Heel Slide* *Prone Hang* *Bridging*	F : 1 x /Day I : 15 seconds resistance, 8 seconds rest T : 10X Reps, 2 SetsT : *Excercise*	*Muscles Activation, Improved Range of Motion*
Home Program		
Intervention	Dosage	Results
January 10, 2013		
Squad *Lunges* *Side Lunges* Powered *Step Up*	F : 1 x/ Day I : 30-second hold T : 10X Reps, 2 SetsT : *Exercise*	*Strenghtening Muscles* *Reduce Oedema*
Heel Squad	F : 1X/ Day I : 1 Minute Hold,I : 5X reps, 1 Set T : *Excercise*	*Strenghtening Muscles*
Home Program		
Intervention	Dosage	Results
January 12, 2023		
Squad *Lunges Side* *Lunges* Powered *One Leg Standing* *Dynamic Squad* Cycling	F : 1X/Day I : 60-second hold (10 minutes cycling)T : 10X Reps, 2 SetsT : *Exercis*e	*Strenhgtening Muscles* *Improved Range of Motion*
Home Program		
Intervention	Dosage	Results
January 17, 2023		
Squad *Lunges Side* *Lunges* Powered *One Leg Standing* *Dynamic Squad* Cycling	F : 1X/Day I : 60-second hold (15 minutes cycling)T : 10X Reps, 2 SetsT : *Excercise*	*Strenhgtening Muscles* *Improved Range of Motion*

RESULTS

After being given a physiotherapy rehabilitation program at RSUD. KRMT Wongsonegoro for a span of 2 weeks with 4 interventions. Patients witha diagnosis of postoperative ACL reconstruction *dextra* have obtained the following results:

Table 7. Pain Measurement with NRS (*Numeric Rating Scale*)

NRS	T0	T4
Silent Pain	0/10	0/10
Pressure Pain	6/10	2/10
Motion Pain	4/10	4/10

From the pain examination table, at the initial pain measurement for tenderness6 and motion pain 4. After the physiotherapy intervention was given, the results showeda decrease in pain levels in the 4th treatment, as tenderness 2 and motion pain 4.

Table 8. Muscle Strength Measurement with *Sphygmamometer*

Muscle Group	T0		T4	
	Dextra	*Sinistra*	*Dextra*	*Sinistra*
Flexor Group	60 mmHg	70 mmHg	70 mmHg	80 mmHg
Grop Extensor	70 mmHg	80 mmHg	80 mmHg	85 mmHg

The results obtained from measuring muscle strength after physiotherapy intervention were found to increase muscle strength of the *flexor* muscle *group* and knee*extensor* muscle group and this increase in muscle strength occurred in both limbs of thepatient.

Table 9. Measurement of Joint Movement Scope with Goniometer

Region	Treatment	AROM		PROM	
		Dextra	Sinistra	Dextra	Sinistra
Knee	T0	S 0°-0°-110°	S 0°-0°-135°	S 0°-0°-120°	S 0°-0°-135°
	T4	S 0°-0°-120°	0°-0°-135°	S 0°-0°-125°	S 0°-0°-135°

In table 9, the measurement of the scope of joint motion obtained the results ofan increase in the scope of joint motion in flexion of the right knee by 10 degrees S 0°- 0°-110 ° to S 0°-0°-120 ° in active motion and 5 degrees in passive motion S 0°-0°-120° to S 0°-0°-125 °.

Table 10. Anthropometric Measurements

No.	Limb	T0		T4	
		Dextra	Sinisra	Dextra	Sinistra
1	5 cm Above Tubersitas tibia	40 cm	38 cm	38 cm	38 cm
2	10 cm Above Tubersitas tibia	41 cm	41 cm	41 cm	41 cm
3	5 cm Below Tubersitas Tibia	34 cm	32 cm	33 cm	32 cm
4	10 cm Below Tibia	36 cm	36 cm	36 cm	36 cm

The results obtained in table 10 anthropometric measurements on the legs are different on the right leg, there is a difference of 2 cm decrease at a height of5 cm above the tibia tuberosity and 1 cm below the tibia tuberosity. On the left leg there is no difference during therapy.

DISCUSSION

Rehabilitation physiotherapy program performed in ACLR phase 2. Initial exercises can start with bodyweight type exercises and can progress to *gym-based and a* mixture of resistance, balance and coordination exercises. The aim is to reduce pain, increase muscle strength, increase joint range of motion, and also reduce oedema in preparation for moving on to the next phase. This case report demonstrates the potential for effective improvement after rehabilitation following ACL reconstruction surgery. Rehabilitation performed in phase 2 of ACLR focuses on reducing pain, increasing muscle strength, increasing joint range of motion and reducing *oedema*, The most important goal of exercise and management in this phase according to Cooper & Hughes (2018) include *lunges, step ups, squats, bridging, calf rise* strengthening hip abduction balance and aerobic exercises such as cycling.

CONCLUSIONS

This case report is a physiotherapy program plan carried out after ACL Reconstruction and also includes a *home program* exercise plan carried out with monitoring by physiotherapy. The physiotherapy rehabilitation program after ACL reconstruction phase 2 resulted in decreased pain, increased muscle strength, increased joint range of motion, and reduced *oedema*. We recommend that the exercises given should use individualized, measurable principles and

choose exercises that can be generalized for all patient conditions. Physiotherapyshould provide appropriate clinical decisions on rehabilitation programs based on examination findings and findings of postoperative complications.

LITERATURE

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