
Physiotherapy Management for Reconstruction of Anterior Cruciatum Ligament (ACL) With Achilles Graft: A Case Study

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Abstract

Introduction: Anterior Cruciatum Ligament (ACL) reconstruction is an action performed by performing surgery to restore the repairation function and joint stability by grafting the ACL using tendon tissue. Ligament replacement using other materials (graft) will usually be taken from the patellar tendon or hamstring tendon in the patient himself (autograft). The physiotherapy management provided is expected to be able to help the recovery process in ACL reconstruction cases.

Case Presentation: Mr. G aged 38 years working as a private employee performed an ACL reconstruction with an achilles graft on his left leg which had been diagnosed with ACL rupture by doctors after performing an MRI. This injury is caused because the patient is hit by an impact during football. The operation was carried out on October 28, 2021 at Harapan Bunda Hospital. The patient after undergoing surgery one week later did physiotherapy at Esa Unggul Clinic so it still includes phase 1 rehabilitation.

Management and Outcome: The physiotherapy program used cryotherapy, strengthening exercises and isometric exercises for 2 sessions/week for 4 week. The evaluation carried out the Numeric Rating Scale (NRS) to measure the pain, Manual Muscle Testing (MMT) to measure the muscle strength and goniometer to measure the Range of Motion (ROM) of knee joint.

Discussion: After being given a physiotherapy program for 4 weeks, the results can reduce of pain in knee joint sinistra from 8 to 0, increasing the MMT of knee joint from 2 to 4 and increase ROM of active motion of the regio knee from the first week of S:0° - 0° - 45° to S:0° - 0° - 120°.

Conclusion: Physiotherapy management in cases of ACL reconstruction with achilles graft used cryotherapy, strengthening exercise and isometric exercise can reduce pain, increase muscle strength and ROM.

Keyword: Anterior Cruciatum Ligament (ACL), achilles graft, cryotherapy, strengthening exercise and isometric exercise.

Introduction

Sports injuries are defined as all forms of abnormalities and damage that occur in the body both to the structure and function of the body that cause pain due to physical activity and exercise both directly and indirectly (Simatupang, 2016). There are generally two types of injuries experienced by athletes, namely overuse and acute trauma. Overuse or what is often referred to as excessive use is often experienced by athletes, this begins with the use of excessive and continuous force for a long time. Acute trauma itself falls into the category of severe injuries where this occurs suddenly, such as tearing of ligaments, tendons, muscles or sprains or even the occurrence of fractures. When an injury occurs, usually the body will give a body response such as the onset of redness, swelling, heat, pain and a decrease in body functions (Setiawan, 2011).

As much as 60% of sports injuries occur in the lower limbs and 16% of injuries in the lower limbs are caused by tears in the ligaments (Lambers *et al.*, 2012). One of the ligaments in the knee that often suffers from injuries is the Anterior Cruciate Ligament (ACL). This injury usually occurs in sports that make many changes in the direction of movement, sudden changes in speed and sports that use zigzag movements such as basketball, volleyball, futsal and football (Ikhwan Zein, 2015). The causes of ACL can experience rupture include direct or indirect contact that occurs in the knee. Direct contact is due to the presence of force from the side and outside such as an example of a direct impact on the knee. Indirect contact can cause ACL rupture when the foot lands after jumping with a hyperextensive knee position with excessive pelvic rotation of the foot, resulting in unstable rupture and the tibia bone moving too freely. The prevalence of ACL injuries in the United States is around 200,000 with 95,000 of them experiencing ACL rupture and 100,000 being constructed by ACL reconstruction every year (Santoso *et al.*, 2018). The annual incidence of ACL injuries was recorded at 68.6 per 100,000 people and 70-80% of ACL injuries due to non-contact exercise with knee valgus and twisting mechanisms (Yuliana & Kushartanti, 2020).

Case Presentation

Mr.G aged 38 years working as a private employee had an ACL reconstruction with an achilles graft on his left leg which had been diagnosed with ACL rupture by doctors after performing an MRI. This injury is caused because the patient is hit by an impact during football. The operation was carried out on October 28, 2021 at Harapan Bunda Hospital. The patient after undergoing surgery one week later did physiotherapy at Esa Unggul Clinic so it still includes phase 1 rehabilitation.

The patient came to the Esa Unggul clinic on November 4, 2021 with the condition that he was still wearing crutches while wearing a shirt, still bandaged with incision wounds, there was oedema in the incisi area, could not walk treading and the pain was still very pronounced.

Management and Outcome

The pain and swelling that arises after ACL reconstruction can be controlled by applying ice packs/cryotherapy. Cryotherapy can degrade prostaglandins that strengthen sensitivity pain receptors and other subcutaneous on the spot who suffered an injury with inhibits the inflammatory process and stimulates the release of endorphins. Cryotherapy can reduce the transmission of pain through A-delta fibers and C-fibers that small diameter and activating transmission of more A-beta nerve fibers fast and great (Ovi *et al.*, 2021). One of the exercises needed to rehabilitation for ACL reconstruction is strengthening exercise and isometric exercise. The purpose of strengthening exercises is to increase the strength of connective tissues such as tendons, ligaments and intramuscular connective tissue. this can happen because when doing strengthening exercises there is an increase in the number of sarcomeres and muscle fibers (actin and myosin filaments needed in muscle contraction), so that with the formation of new muscle fibers muscle strength can increase (Peramana, 2021). Isometric exercises are forms static exercises that make muscles contracting and generating force in the absence of changes in length muscles and without any changes in the joints who are involved. Although there is none movement in the joints, however voltage produced by muscles (Widodo *et al.*, 2022).

Table 1. The dose of treatment rehabilitation for ACL reconstruction

Intervention	Dose				Information
	Frequency	Intensity	Type	Time	
Cryotherapy	2 times a week	-	-	15 minutes	Cryotherapy given can cause local vasoconstrictions, thus inhibiting afferent fibers that will reduce pain sensations.

Strengthening exercise	2 times a week	50-100 repetitions	Strengthening exercise	10-15 minutes	Strengthening exercises that can be given is heel slides. Heel slide exercise is an exercise strengthening of limb muscles by means of sliding heels.
Isometric exercise	2 times a week	10 repetitions, 3 sets	Isometric exercise	10-15 minutes	Isometric exercise that can be given are quadricep set exercise and hamstring set exercise.

Table 2. Evaluation of NRS

NRS	Movement	T1	T2	T3	T4
Active	Knee flexion	8	6	2	0
	Knee extension	8	6	2	0
Passive	Knee flexion	7	5	1	0
	Knee extension	6	4	1	0

Table 3. Evaluation of MMT

MMT	T1	T2	T3	T4
Knee	2	3	3	4
Ankle	4	5	5	5
Hip	5	5	5	5

Table 4. Evaluation of ROM on Knee Joint

ROM	Regio	T1	T2	T3	T4
Active	Dextra	S:0° - 0° - 140°	S:0° - 0° - 140°	S:0° - 0° - 140°	S:0° - 0° - 140°
	Sinistra	S:0° - 0° - 45°	S:0° - 0° - 50°	S:0° - 0° - 95°	S:0° - 0° - 120°
Passive	Dextra	S:0° - 0° - 140°	S:0° - 0° - 140°	S:0° - 0° - 140°	S:0° - 0° - 140°
	Sinistra	S:0° - 0° - 75°	S:0° - 0° - 85°	S:0° - 0° - 85°	S:0° - 0° - 120°

Discussion

Cryotherapy helps the process of reducing pain, this is because cryotherapy was able to slow down the delivery so that there are fewer pain impulses that are able to reach the brain. Pain can also be influenced by the production of endorphins, the higher the level of endorphins, the pain will decrease, and can help increase endorphins production (Seingo et al., 2018). Physiologically basically the theory "gate control", explained how pain or pain impulses are modulated where the flow of afferent pain impulses can inhibited or passed on in substance gelatinous dicorda spinal or nucleus so that impulses that give rise to various sensations can be transmitted together, modified and inhibited. Gate control theory states that intermediate cells function as a gateway and each transmission cell and will usually inhibit the activity of cells intermediates are influenced by the balance between afferent impulses and those carried on the axons thick, myeline fibers A and B with fibers (the thin non meilinzation slow conduction). Fibers A and B transmits impulse that bring sensations general and nature as an inhibitor, whereas C fibers transmit impulses which are related to pain and removes the effects of obstacles from the cells intermediary. Here it is considered that the gate is also affected by the fibers of desenders in the system of reticular activity and that this is a mechanism by which input sensoeic alternatives can degrade or eliminate the perception of pain. Cryotherapy is a stimulus in the skin with innervation purpose of large delta A fibers to block the pain stimulus that passes through the fibers Little C. In order to reduce or relieve excitatory in nerve endings or blocking the direction in which the pain impulses are running towards the tinkering. Cold compress (ice) is believed can produce or discharge endorphins which is useful for blocking the pain delivery stimulus. And cold compresses (ice) are believed to be able to give a temporary feeling of comfort to pain and divert focus attention to the given stimulus (Kombong, 2018).

Strengthening is all contractionary form of active exercise its dynamic and static muscles are held by the outside style that is applied manually or mechanically. Program elements rehabilitation that is important for a person with impaired functioning and program components integral conditioning for those who wants to upgrade or maintain health and physical fitness, improving performance of motor skills. The purpose of being given linking exercises is to increase the strength of connective tissues such as tendons, ligaments and intramuscular connective tissue, increase the density of bone mass, while the strengthening exercises used in this case are strength training with loading from body, neuromuscular control exercises and programs rehabilitation is very effective in increasing muscle strength and increasing functional activity in athletes (Kaya *et al.*, 2019).

Isometric exercise is a type of contraction exercise in muscles in the absence of changes in muscle length and not followed by any change in joint movements. Exercises of this type of isometric often called static contraction is muscle contraction where the joint is a static state (Wibowo *et al.*, 2017). One of the isometric exercises is a quad set exercise. Quad set exercises can activate the work of the quadriceps muscles. If the quadriceps muscle is activated then there will be muscle contrast that causes myofibrils in muscle fibers increase so that density (density) capillaries in muscle fibers and also the amount of protein will also increase. Because the exercises that are done will cause the muscles to become more trained and causes the muscles to experience enlargement so that with the occurrence of hypertopy, muscle strength will also increase. Hamstring setting exercise is also included in one type of isometric exercise that can be given. This exercise will help the motor of the recruitment unit increase. Because the motor recruiting unit increases, the components activated muscle fibers will also increase so that muscle contractions will increase which causes an increase in muscle strength in this is the hamstring muscle. So the more the number of motor units that activated it will cause strong hamstring muscle contractions and can increases hamstring muscle strength (Devi., 2019).

Conclusion

Physiotherapy management in cases of ACL reconstruction with achilles graft used cryotherapy, strengthening exercise and isometric exercise can reduce pain, increase muscle strength, and ROM.

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