

## MANAGEMENT PHYSIOTHERAPY POST INJECTION OF THE PLATELET RICH PLASMA (PRP) IN THE CASE OF ANTERIOR CRUCIATE LIGAMENT TEAR: A CASE REPORT

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### ABSTRACT

**Background:** Anterior Cruciate Ligament (ACL) tear is a partial or complete tear of the ACL ligament. A torn ACL doesn't heal on its own. ALC tear can be treated with surgical and non-surgical procedures, namely Platelet Rich Plasma (PRP) injection and exercise.

**Objective:** To report on the results of therapy in the treatment of ACL tears with PRP injection and exercise

**Methods:** Respondents aged 30 years experienced an ACL tear. After the PRP injection therapy, the patient was treated with Transcutaneous Electrical Nerve Stimulation (TENS) and an exercise program: quadriceps setting, hamstring setting, Straight Leg Raise (SLR), gluteus setting, bridging, walking squat, step up and step down, and balance training for approximately 1 hour each training session for 3 weeks with meetings 2 times a week

**Results:** Prior to the intervention, the patient complained of pain in his left knee and limited functional activities such as standing for more than 20 minutes, going up and down stairs and praying. Results after 3 weeks of physiotherapy intervention, there was a decrease in pain (silent pain: from 7 to 0, motion pain: from 10 to 5, tenderness: from 8 to 3) and an increase in functional activity.

**Conclusion:** Observation of post-PRP injection on the ACL tear with Transcutaneous Electrical Nerve Stimulation (TENS) modality and an exercise program designed systematically and given from the start provide benefits in increasing functional activity.

**Keywords:** ACL tear, Post PRP injection, Exercise Program

## **INTRODUCTION**

The Anterior Cruciate Ligament (ACL) is one of the ligaments in the knee joint, which consists of two bundles, namely Anterior-Medial and Posterior-Lateral. The ACL connects the femur to the tibia to keep the knee stable (Siegel, 2012). ACL injuries are the most common knee injuries and the highest frequency of injury incidents in individuals who are active in sports. 78% of these injuries occur during soccer, baseball, basketball, and skiing training (Fernandez, et al., 2019). If the knee is injured, it increases the risk of tissue damage to cartilage, degenerative meniscus, and functional instability (Smith, 2014).

The most common history of ACL injuries is due to non-contact decelerations, jumping, or sudden movements when making changes in movement (Siegel, 2012). If the ACL injury occurs in direct contact, one third of patients have a history of knee hyperextension and knee valve stress.

Prior to surgical or non-surgical treatment for ACL injuries, someone with an ACL injury is given first treatment in the form of ice packs, elevation and limiting movement of the knee joint after injury. If the ACL injury affects other tissue structures around the knee, such as the Posterior Cruciate Ligament (PCL), Medial Collateral Ligament (MCL), and Lateral Collateral Ligament (LCL), then reconstructive action is necessary (Siegel, et al., 2012). However, some people with ACL injuries who have comorbidities such as chronic heart, kidney and liver disease choose treatment by conservative, rehabilitative, exercise programs, or PRP (Platelet Rich Plasma) injections (You, et al., 2019).

## **CASE PRESENTATION**

A 30-year-old patient at the Sport Injury Life clinic in Surakarta with an ACL injury had PRP injections on March 2 and started therapy on March 3. Currently, the patient is doing an exercise program at an early stage. Complaints of pain in the anterior part of the left knee, and when standing for more than 20 minutes, the patient suddenly feels like he will fall, causing some functional activities to be disrupted, such as standing for more than 20 minutes, going up and down stairs and praying.

Pain assessment uses the Visual Analog Scale (VAS), where the physiotherapist 1) Explains to the patient the purpose of the measurement, 2) Explains to the patient that the right angle means no pain, the middle means moderate pain and the left corner means very pain (front VAS) , 3) Instruct the patient to choose or move the direction of the VAS arrow on the pain scale according to the intensity of pain felt when still/not moving (silent pain), 4) The physiotherapist presses the area of the body (anterior part of the left knee) the patient is complaining of or other body parts that are affected. The related person then asks the patient to choose/move the direction of the VAS arrow on the pain scale according to the intensity of pain felt when the area is pressed (tenderness), 5) Move the body area (left knee flexion) the patient is complaining or other related body parts and then ask The patient selects or moves the direction of the VAS arrow on the pain scale according to the intensity of pain felt when moved n by a physiotherapist (motion pain), 6) Record and then interpret the meaning of pain expressed by the patient by comparing the pain measurement tools available on the back of the VAS. The VAS scale scores 0-1: no pain, 1-3: mild pain, 3-7: moderate pain, 7-9: severe pain, 9-10: very severe pain.

Balance check using Stork Balance Stand Test, performed to check balance. The Stork Balance Stand test or commonly called one leg stand (standing on one leg) is a measuring tool to assess the ability of static balance (Subarkah, 2015). The Stork Balance Stand Test is a test that requires equipment that is easily available, such as stopwatches and stationery. Method of conducting the test: 1) The patient stands on one leg, on the dominant leg (left foot), 2) The other foot is placed on the inner knee of the supporting leg, 3) Both hands are placed on the waist, 4) With the signal ' 'Yes", the patient raises the heel of the foot, so that it only rests on one foot (toe-to-toe), 6) Maintain the position for 60 seconds, without shifting the position of the pedestal and the heel does not touch the floor. 7) Timing starts when the patient starts to lift the heel of the foot (toe) until he loses balance (Subarkah, 2015).

The Stork Balance Stand Test protocol is that the subject must stand on one leg alternately with a break of 1 minute, with 2 trials with the hands on the waist. After doing the test, the subject is asked to do the test again for a maximum of 2 minutes. The total time the subject stood was recorded. Stork Balance Stand Test results score <10 seconds (Poor), 10-24 seconds (Fair), 25-39 (Average), 40-50 seconds (Good), >50 seconds (Excellent) (Rahman, 2017).

The physiotherapy program was carried out for 3 weeks with meetings 2 times a week. In the first week of therapy, it aims to reduce pain, swelling and muscle activation. The intervention was icing on the left knee by putting ice cubes into the ice bag, then the ice bag was covered with a towel, after which it was attached to the left knee for 10 minutes before and after exercise. The exercises given are quadriceps setting of 10 repetitions of 2 sets, hamstring setting of 10 repetitions of 2 sets, Straight Leg Raise (SLR) of 10 repetitions of 2 sets and gluteus setting of 10 repetitions of 2 sets with contractions for 30 seconds.

In the second week of therapy, it aims to reduce pain, muscle activation and increase proprioception. The intervention was given icing on the left knee for 10 minutes before and after exercise, electrical stimulation in the form of Transcutaneous Electrical Nerve Stimulation (TENS) electrode pads were installed on the anterior and posterior parts of the left knee with a frequency of 10-100 Hz, burst stimulation current, duration 200 s , the intensity according to the patient's tolerance (1-100 mA) for 20 minutes, the purpose of giving TENS is to reduce pain and tissue regeneration, including bone, ligaments, connective tissue and skin (Fitriyani, 2014). The exercises given are quadriceps setting of 10 repetitions of 3 sets, hamstring setting of 10 repetitions of 3 sets, SLR (Straight Leg Raise) of 10 repetitions of 2 sets with a weight of 1 kg and gluteus setting of 3 sets by holding for 60 seconds, leg curl 10 repetitions for 3 sets.

In the third week of therapy, it aims to improve balance. The intervention was given in the form of icing on the left knee for 10 minutes before and after exercise. The exercises given were bridging 10 repetitions of 2 sets, walking squats for 3 sets, step ups and step downs for 10 repetitions of 2 sets, balance training for 10 repetitions of 2 sets.

## RESULTS

### 1. Evaluation of pain reduction

Table 1. Evaluation of pain reduction

	T1	T2	T3
Silent pain	7	5	0
Tenderness	8	7	3

Motion	10	8	5
pain			

Based on the results of the VAS (Visual Analog Scale) examination in table 1, it shows that silent pain decreased from 7 to zero, left knee anterior tenderness from 8 to 3 and left knee flexion motion pain from 10 to 5.

## 2. Evaluate balance measurement

Table 2. Evaluation of balance measurements

T1	T2	T3
20 Sec (Fair)	40 sec (Average)	46 sec (Good)

Table 2 shows a significant increase in the patient's balance ability which increased by 26 seconds from the first week to the third week.

## DISCUSSION

The study, which was conducted for 3 weeks on post-injection patients with Platelet Rich Plasma (PRP) cases of ACL tears with 6 meetings in 3 weeks, was able to reduce the value of stationary and moving pain and an increase in the respondent's balance ability.

Research by Fernandez et al., 2019 explains that PRP injection in orthopedics has many advantages for patients in several cases, such as accelerating bone healing, improving vascularization after grafting in a short time, helping the healing process, regeneration or tissue repair. This injection can also be given after ACL reconstruction surgery to speed healing.

The therapy program after PRP injection is focused on slow healing and a wide range of motion exercises. After going through the first phase, strengthening exercises and neuromuscular control exercises begin to emphasize the injured extremity, and in the final stage of rehabilitation, exercises are focused on controlling dynamic stability and changes. joint movement (Van, 2011). In the study of You et al., 2019, it stated that in patients who combined PRP injection with

thermotherapy, electrotherapy and an exercise program, it would accelerate the healing process by reducing pain, reducing swelling, and increasing functional activity compared to conservative therapy alone. PRP injection and an exercise program that is run can be an option for the ACL tear rehabilitation process.

In this case study it was observed that silent pain decreased significantly. After 3 weeks of therapy, the silent pain was zero. This is because several interventions and exercise programs in the early stages are immediately given to patients for the healing process, such as the provision of Transcutaneous Electrical Nerve Stimulation (TENS). TENS has several advantages because it is non-addictive, meaning non-invasive analgesia that is easy to use and can provide analgesia continuously for various conditions. Administration of TENS intervention at high frequency (90-130 Hz) aims to reduce pain based on gate control theory. Pain is caused by small nerve fiber activity, by providing stimulation to large sensory nerve fibers so that they can block pain. Pain can be reduced and provide stimulation to the fibers found in muscles so that sore muscles reduce the release of neurotransmitters such as aspartate and glutamate and increase the release of endogenous opioid neurotransmitters that work like endorphins. Given a low frequency (2-5 Hz), TENS can stimulate the body to release endorphins and can stimulate large diameter sensory neuron cells to enter first to the gate in the substantia gelatinosa and inhibit small diameter nociceptor cells to provide information to the brain, thus stimulating pain does not reach the brain and makes pain significantly reduced (Santoso, 2018).

Various exercise programs such as quadriceps setting, hamstring setting, SLR (Straight Leg Raise) and gluteus setting can also cause muscle tissue vasodilation so that the tissue can be drained of blood containing oxygen and nutrients. Vasodilation of these blood vessels will facilitate the metabolic system so that pain substances such as bradykinin, prostaglandins and histamine will be wasted in the blood stream so that pain will decrease, which refers to the gate control theory, namely if the fibers are large in diameter (A Beta) or small in diameter (A Beta). A Alfa), activates T cells and at the same time these impulses can trigger gelatinous substance cells which have an impact on closing the gate so that pain transmission does not reach the brain and causes pain to decrease or disappear (Syahputra, 2021). Based on the results of research

conducted by Azka (2014), it stated that light and moderate intensity exercise is effective for achieving optimal muscle strength and function without causing significant muscle damage.

Eccentric exercises such as quadriceps setting, hamstring setting, and gluteus setting are exercises that are given in the early stages of treatment. These exercises aim to activate muscles and help the post-injury recovery process. Eccentric exercises are more effectively used in the early phase of recovery compared to concentric exercises for the quadriceps, hamstring and gluteus muscles (Milandri, 2021).

Meanwhile, the patient's balance ability, which was evaluated using the Stork Balance Stand Test, showed a significant improvement. Where the patient is currently in good balance ability (good). Balance exercises are effective for reducing knee instability. Balance exercises in knee or ankle rehabilitation are very important to restore strength to the muscles and ligaments and damaged tissues around the joints. Lower extremity coordination movements through balance exercises increase the sense of proprioception (Dae Yun, 2010). As a follow-up exercise for the first phase that aims to reduce pain, balance exercises need to be performed on ACL tear patients to feel joint sensation and muscle strength. If pain decreases or disappears, it will affect balance (Milandri, 2021). Some balance exercises that can be done post PRP injection, such as bridging, walking squat, step up and step down, balance training (standing with one leg on the trampoline, walking lunges, side step up-step down, lateral lunges to balance, etc.) ) (Perfect Balance Clinic, 2018). Balance exercises carried out according to the patient's ability and tolerance after the first phase of exercise and strengthening will improve stability in the knee joint and affect balance improvement (Ni'mah, 2022).

## **CONCLUSION**

Research was conducted on respondents with post-PRP injection with the provision of TENS therapy and exercise therapy for 3 weeks, 2 meetings every week to achieve significant changes. The provision of physiotherapy in the form of icing and exercise programs resulted in a decrease in pain and an increase in balance in respondents post PRP injection.

## LIMITATIONS OF THE RESEARCH

This study has limitations such as the physiotherapist cannot fully control the respondent's activities at home, which can affect healing.

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