

Recovery Efforts for Patients After Anterior Cruciate Ligament (ACL) Reconstruction with Weight Training: A Literature Review

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Abstract

Background. Anterior cruciate ligament (ACL) injury is one of the most common knee ligament injuries, especially in athletes. Although ACL reconstruction is often required to restore stability to the knee joint, postoperative rehabilitation is essential to restore knee strength and function. Weight training is considered useful for recovery. However, not many studies have thoroughly studied this technique.

Objective. This study investigated how effective weight training is in improving the recovery ability of patients after ACL reconstruction, with particular emphasis on reducing pain and increasing joint range of motion (ROM).

Methods. is a literature review where analysis of various literature sources is carried out. Literature searches were conducted through google scholar and mendeley sources with a range of years between 2019-2024.

Results: The study showed that weight training improved patient recovery, with an average pain level of 5.75 in the first cycle and a ROM of 96.25°. In the second cycle, pain levels dropped to 3.00 and ROM increased to 101.25°. In the third cycle, the pain level dropped to 1.00 and the ROM increased to 115.00°.

Discussion. In rehabilitation post ACL reconstruction, organized weight training helps reduce pain, improve knee stability, and strengthen the muscles that support the knee joint. The success

of rehabilitation is enhanced by the application of varied exercises according to the stage of recovery.

Conclusion. This study found that gradual weight training can significantly accelerate the recovery process of patients after ACL reconstruction, by reducing pain and increasing ROM. These findings provide a strong basis for the development of more comprehensive rehabilitation programs in the future, as well as making weight training a standard technique in ACL injury recovery.

Keyword. ACL, risk factors, post-reconstructive therapy efforts.

Introduction

One of the important ligaments that stabilize the knee joint is the Anterior Cruciate Ligament (ACL).¹ The ACL is located inside the knee joint, connecting the femur (thigh bone) to the tibia (shin bone). The ACL is essential for controlling knee movement, especially during activities that involve rapid changes in direction, jumping and landing. One of the most common injuries sustained by athletes and physically active people is an injury to the ACL, which usually occurs due to a tear or sprain.^{2,3}

In sports that involve explosive movements, such as soccer, basketball, volleyball and skiing, ACL injuries account for about 20% of all sports injuries, according to the National Athletic Trainers' Association. Moreover, ACL injuries are quite common, according to epidemiology, occurring between 68 and 90 cases per 100,000 people each year.⁴ Interesting research shows that female athletes have a two to eight times greater risk of ACL injury than male athletes. Many variables, such as biomechanical, hormonal and muscle strength differences, influence this.^{2,5} It is important to note that the risk of ACL injury varies by population. Studies show that female athletes have a two to eight times higher risk of ACL injury than male athletes. Biomechanical, hormonal and physical differences between men and women are some of the causes of this higher risk. Women typically have lower muscle strength in the muscles that support the knee. They may also differ in the way they move and exercise. Many patients require a reconstructive surgical procedure to repair the torn ligament after an ACL injury. This method is used to restore knee function lost due to the injury. However, surgery is not enough to guarantee optimal recovery. Patients must undergo a comprehensive rehabilitation program after reconstruction to restore strength, stability and function to their knee joint. A successful rehabilitation program can help patients reduce pain, improve range of motion (ROM), and prepare them

to return to daily activities and sports.^{1,3}

One of the most effective rehabilitation methods to speed up recovery after ACL reconstruction is weight training. Weight training can strengthen the muscles that support the knee, including the quadriceps and hamstrings, which often experience weakness after injury and surgery. Weight training can also improve patients' joint stability and help them regain confidence in using their knees. Based on this background, this review aims to evaluate the effectiveness of weight training in the recovery of patients after ACL reconstruction. This review not only focuses on pain reduction and ROM improvement, but also aims to provide a deeper insight into the role of weight training in ACL injury rehabilitation. Through this review, it is hoped to gain a better understanding of effective rehabilitation methods and contribute to the development of better rehabilitation protocols for ACL injured patients.^{1,3}

Methods

The method used in this article is a literature review where analysis is carried out from various literature sources. Literature searches were conducted through google scholar and mendeley sources with a range of years between 2019-2024. The keywords used in the literature search are Prevalence of ACL incidence, Risk Factors for ACL, ACL post-reconstructive therapy efforts.

Discussion

Pain Reduction and ROM Improvement

Significant patient pain levels after surgery were demonstrated in the first cycle of rehabilitation, with an average of 5.75. However, by the third cycle, the pain level was significantly reduced to 1.00. The physiological processes that occur during exercise may contribute to this reduction in pain. Physical activity increases blood flow to the affected area, which accelerates tissue healing, and stimulates the release of endorphins, which are natural analgesics. Studies show that regular exercise reduces pain by increasing muscle strength, joint stability and flexibility.¹

Exercises that focus on mobility and muscle strengthening, such as heel slides, wall slides and straight leg raises, increase the flexibility of the muscles around the knee and lead to increased ROM during the rehabilitation process. Previous studies have shown that effective ROM recovery is essential for restoring knee function, allowing patients to return to daily activities more quickly and effectively.³

The Importance of Weight Training in Rehabilitation

Exercising the muscles that support the knee joint, especially the quadriceps and hamstrings, is very important. After ACL injuries and reconstructive procedures, these muscles often atrophy, which can lead to an unstable knee and increase the risk of re-injury. Patients can gradually restore the strength and flexibility of their knee muscles and joints through focused weight training. For example, exercises such as mini squats, leg presses and calf raises increase the strength of the muscles responsible for knee joint stability.^{5,6}

Development of proprioception-the body's ability to sense joint position and movement-is an important component of rehabilitation. Good proprioception is essential for reducing injuries and improving athletic performance. When you perform exercises such as box jumps and single-leg balance exercises, you are not only using your muscles, but also using your proprioceptive system. Research shows that improving proprioception can help reduce the risk of injury, especially in athletes and other highly vulnerable groups.⁵

Psychological Role in Rehabilitation

The psychological aspects of recovery are also important and should not be overlooked. Patients with ACL injuries or serious injuries often experience fear of pain or the possibility of re-injury. Improved physical strength and a successful rehabilitation process can increase the patient's confidence to return to activities. The results showed that patients experienced physical improvement and confidence over time. To reduce patients' anxiety and fear when they return to exercise, this is very important.⁶

During rehabilitation, psychological support is essential. Methods such as cognitive behavioral therapy and psychological support can help patients overcome anxiety associated with injury. By overcoming these fears, patients can more easily undergo rehabilitation and exercise programs. Research shows that postoperative patients recover better with rehabilitation that includes effective psychological approaches.¹

Implications for Rehabilitation Programs

This study provides physiotherapy practitioners and rehabilitation experts with important insights into how to create an integrated rehabilitation program. Weight training should be a major component of the rehabilitation protocol for patients recovering from ACL reconstruction. A holistic approach, which combines physical exercise with psychological support and pain management, is essential to help patients return to daily activities and exercise.^{3,6}

This study shows that a rehabilitation program involving weight training improves the recovery outcomes of patients post ACL reconstruction. Therefore, this study suggests that current rehabilitation protocols should be changed to include weight training as a primary method to restore knee function and prevent future re-injury. Therefore, it is hoped that this study will form the basis for the development of an improved, slurry-based rehabilitation program.^{3,6}

Conclusion

This study found that patients post Anterior Cruciate Ligament (ACL) reconstruction experienced a significant reduction in pain levels and increased range of motion (ROM) when they underwent a rehabilitation program with weight training. The rehabilitation cycle showed that weight training decreased patients' pain from an average of 5.75 to 1.00 and increased ROM from 96.25 to 115.00. This shows that weight training helps restore knee function and mobility after reconstruction.

This study also emphasizes how important weight training is to strengthen the muscles that support the knee joint, such as the quadriceps and hamstrings, which often become weak after injury or surgery. Weight training also improves proprioception and joint stability, both of which are very important for preventing re-injury.

The psychological aspect of rehabilitation is also very important. The improvement in patients' confidence and their physical progress suggests that a holistic rehabilitation approach, which combines physical exercise with psychological support, can improve overall recovery outcomes.

The results of this study suggest that physiotherapists and rehabilitation professionals should consider weight training as an important part of the rehabilitation protocol following ACL reconstruction. Thus, a comprehensive and evidence-based rehabilitation program can help patients return to daily activities and sports more quickly and safely. This research also paves the way for additional studies on more comprehensive rehabilitation techniques.

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