

Comprehensive Case Series on Exercise-Based Rehabilitation for ACL Patients: Insights and Outcomes within China's Healthcare Framework

Dai Haojie, Tanima Bhattacharya*

Department of Nutrition, Faculty of Applied Science, Lincoln University College, Petaling Jaya, Selangor Darul Ehsan, Malaysia

Corresponding author:

Prof. Dr. Bhattacharya T, Department of Nutrition, Faculty of Applied Science, Lincoln University College, Petaling Jaya, Selangor Darul Ehsan, Malaysia; E-mail: btanima1987@gmail.com

Received: 27-Sep-2024, Manuscript No. amhsr-24-150142;

Editor assigned: 30-Sep-2024, Pre QC No. amhsr-24-150142 (PQ);

Reviewed: 14-Oct-2024, QC No. amhsr-24-150142;

Revised: 21-Oct-2024, Manuscript No. amhsr-24-150142 (R);

Published: 28-Oct-2024, DOI: 10.54608.annalsmedical.2024.171

Abstract

The primary aim of this review is to examine the impact of exercise-based rehabilitation on the recovery of ACL patients within the Chinese healthcare system. Key recovery indicators for ACL injuries included enhanced muscle strength and proprioception, significant improvements in functional stability, restored full range of motion, pain relief and a reduced risk of re-injury. Relevant scholarly sources were gathered through comprehensive online database searches. The findings demonstrated that exercise rehabilitation programs played an important role in the effective treatment of ACL injuries in Chinese patients. The literature revealed that aquatic exercises and Nordic hamstring routines were particularly successful in improving muscle strength and proprioception. Additionally, suspension training was shown to enhance functional stability and support the return to play. Furthermore, the study indicated that rehabilitation training was effective in relieving pain and improving range of motion in ACL patients. Finally, eccentric kinetic exercises proved to be effective in minimizing the risk of re-injury and were beneficial as a post-injury physical activity. The study recommends targeted exercise-based rehabilitation therapies and, when necessary, the incorporation of combined exercise treatments for ACL patients.

Keywords: Rehabilitation; Exercise; China; Healthcare; ACL; Patients

Introduction

The Anterior Cruciate Ligament (ACL) injury is a common and significant ligament injury in active sports, with reports indicating that as many as 2,000 cases occur annually in Hong Kong alone [1]. The ACL is an important component of the knee structure, playing an essential role in kinematics by preventing excessive loads and controlling the anterolateral translation of the tibia. Rehabilitation of the ACL has been shown to reduce varus and lateral rotation stresses. ACL injuries present a complex neurophysiological challenge, affecting functionality, limiting range of motion and increasing the likelihood of re-injury, particularly in athletes [1].

Due to its kinematic intricacies, ACL injuries lead to both subjective instability and clinical symptoms such as pain, emphasizing the importance of rehabilitation. As highlighted by Saki et al., ACL injuries are prevalent among athletes and can range from minor sprains or tears to severe cases involving complete ligament rupture [2].

In the event of a total rupture, surgical reconstruction is often required, though it does not always guarantee a return to pre-injury levels of athletic performance [1]. Rehabilitation is essential not only post-surgery but also for conservative treatment options. Moreover, complications such as cartilage and meniscal damage, as well as bone contusions and microfractures, can impact the management of ACL injuries. Therefore, rehabilitation programs must account for these associated injuries. Ultimately, ACL rehabilitation is important for restoring full knee range of motion, rebuilding strength and proprioception, achieving functional stability, reducing the risk of re-injury and facilitating a successful return to sports activities.

Case Presentation

Case 1

A 36-year-old woman who suffered from a fall on her bike broke ACL

Basic information:

- **Patient:** Ms. Deng, 36
- **Cause of injury:** Accidental fall on bicycle
- **Injury:** Anterior Cruciate Ligament of left knee (ACL) fracture

Rehabilitation process:

- **Diagnosis and surgery:** Ms. Deng quickly went to the hospital after her injury and was diagnosed to have an ACL rupture. Subsequently, she underwent knee arthroscopic Anterior Cruciate Ligament (ACL) repair at Xiangya Hospital of Central South University. The fractured ligament was successfully repaired to its original position.
- **Postoperative rehabilitation:** Ms. Deng followed the doctor's instructions to carry out systematic rehabilitation training, including controlling pain and swelling, restoring joint motion and strengthening muscle strength.

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

How to Cite this Article: Haojie D, et al. Comprehensive Case Series on Exercise-Based Rehabilitation for ACL Patients: Insights and Outcomes within China's Healthcare Framework. *Ann Med Health Sci Res.* 2024;14:10.1054-1056.

- **Recovery results:** After a period of rehabilitation, Ms. Deng's knee function was restored and she was successfully discharged from hospital and continued her rehabilitation training at home.

The Figure 1 describes movement involves a sequence where the right move mirrors the left. Begin by stepping the left foot to the left, with knees slightly bent. Bring both hands to your chest, then extend the right hand outward with the palm facing inward and eyes looking straight ahead. The right hand forms a "claw" shape, pulling toward the Zhongfu acupoint near the shoulder. At the same time, the left palm forms a figure-eight shape, rotating inward and pushing outward at shoulder level, similar to drawing a bow. As you do this, lower into a squat with the left leg while extending the right leg straight into a lunge on the left side. Hold the position for 2-3 seconds, maintaining focus on your left hand.



Figure 1. Trainer training 1st set of knee rehabilitation exercise.

In the Figure 2 right palm moves in an arc to the right, reaching shoulder height, while the left hand transitions into a palm position. Simultaneously, the left foot steps back into a standing position.



Figure 2. The 2nd set of Knee rehabilitation exercise.

The right and left actions are opposite, performed once each. With five fingers together and body flat, the left hand forms an eight-palm shape with heavy shoulders, dropped elbows

and flexed wrists. The elderly can adjust the "ma bu" (horse stance) as needed. This movement stimulates acupoints on the Du meridian and lung meridian, enhances lower limb muscles, improves balance, coordination and forearm strength and increases wrist flexibility. It helps correct poor posture, like hunchbacks and rounded shoulders and prevents shoulder and neck issues (Figure 3).



Figure 3. The 3rd Set of rehabilitation exercise.

Case 2

A 13-year-old boy broke the ACL after he walked down the stairs.

Basic information:

- **Patient:** Mr. Yu
- **Cause of injury:** Fell down the stairs
- **Injury:** Left knee ACL fracture, left knee lateral half torn moon plate

Rehabilitation process:

- **Operation:** The boy underwent ACL reconstruction surgery and suture of meniscus injury in hospital.
- **Postoperative rehabilitation:** After surgery, the boy received rehabilitation treatment due to limited movement of the left knee joint and abnormal walking. The rehabilitation process includes restoring normal motion of knee joint, strengthening muscle strength training, restoring normal gait and balance stability training.
- **Recovery results:** After several treatments, the boy's knee function improved significantly and he was able to walk normally and attempt to return to movement.

Case 3

A 21-year-old man who is playing basketball causes ACL breakage.

Basic information:

Patient: Mr. Li

Cause of injury: Sprained his right knee while playing basketball. The ACL of the right knee was ruptured with meniscus injury and lateral collateral ligament injury

Rehabilitation process:

Operation: Mr. Li underwent ACL reconstruction surgery, meniscectomy and lateral collateral ligament enhancement in hospital.

Postoperative rehabilitation: After surgery, Mr. Li underwent rehabilitation for knee extension restriction and occasional soreness and tingling sensation. The rehabilitation process includes relaxing the tense muscles, activating the perigeniculate muscles, improving the stability of the knee and strengthening the function of ascending and descending stairs.

Recovery results: After systematic rehabilitation training, Mr. Li's knee function was restored and he was able to walk normally and try light exercise.

The patient is placed in a supine position. The practitioner uses the thumb pad to apply horizontal pressure, moving from the outer to the inner side of the rectus femoris attachment points along the upper edge of the acetabulum, targeting tender areas in Figure 4. The area is divided into 3 to 5 sections, with each section rubbed 5 to 15 times, moving from inner to outer.



Figure 4. Strategies involved in enhancing knee stability.

Results and Discussion

Exercise-based rehabilitation practices have proven effective in addressing the challenges associated with ACL injuries. A variety of exercises, such as Nordic hamstring, aquatic exercises, Suspension Training (SET), rehabilitation training and isokinetic exercises, have shown significant benefits in improving muscle strength, proprioception and joint mobility [3-5]. For instance, aquatic treadmill exercises are effective for reducing weight-bearing on the injured joint while promoting endurance and strength. Nordic hamstring exercises help restore the range of motion and reduce the risk of further injury by strengthening the muscles around the knee. Similarly, SET enhances neuromuscular coordination, stability and energy potential.

Isokinetic exercises, such as leg curls and squats, are conducted at constant speed with varying resistance, supporting muscle strengthening in controlled movements [1]. Combining these exercise techniques can optimize recovery for ACL patients; however, some studies argue that not all exercise-based rehabilitation methods are equally effective. High-intensity

exercises, for example, may not be suitable for reconstructing ACL injuries. Instead, early intervention using chain kinetic exercises has proven more effective. Therefore, rehabilitation programs should be carefully tailored to the individual's condition to achieve the best outcomes [6].

In rehabilitation, ACL injury recovery is divided into early, intermediate and advanced stages. During the early stage, the knee must be stabilized using braces and muscle atrophy is prevented through exercises like ankle pumps and straight leg lifts. In the intermediate stage, flexibility, proprioception, balance and functional strength are gradually restored through exercises such as yoga, balance training and resistance muscle strengthening (e.g., wall squats and knee flexion exercises) [7,8].

Conclusion

Finally, advanced rehabilitation aims to optimize the range of motion, strength and functionality to allow patients to return to daily activities or sports. Rehabilitation services should be incorporated into medical insurance to improve accessibility and promote standardized rehabilitation practices. Proper oversight and standards are critical to ensure the quality and safety of rehabilitation services.

References

1. Ong MT, Chan JS, Man GC, Qiu J, He X, et al. Effect of eccentric isokinetic exercise on muscle strength and functional recovery after anterior cruciate ligament reconstruction. *Asia-Pacific Journal of Sports Medicine, Arthroscopy, Rehabilitation and Technology*. 2024;35:20-6.
2. Saki F, Shafiee H, Tahayori B, Ramezani F. The effects of core stabilization exercises on the neuromuscular function of athletes with ACL reconstruction. *Scientific Reports*. 2023;13:2202.
3. Bai L, Chen J, Chen J, Chen D, Dai X, et al. Clinical evidence-based guideline for the diagnosis and treatment of anterior cruciate ligament injury (2022 version). *Chinese Journal of Trauma*. 2022:492-503.
4. Chen J, Wu T, Guo Y. Nordic hamstring exercises in functional knee rehabilitation after anterior cruciate ligament reconstruction: A prospective, randomised, controlled study. *Scientific Reports*. 2023 Nov 3;13:19039.
5. Chan CX, Wong KL, Toh SJ, Krishna L. Epidemiology of patients with anterior cruciate ligament injuries undergoing reconstruction surgery in a multi-ethnic Asian population. *Research in Sports Medicine*. 2021;29:12-24.
6. DeBoer LB, Powers MB, Utschig AC, Otto MW, Smits JA. Exploring exercise as an avenue for the treatment of anxiety disorders. *Expert review of neurotherapeutics*. 2012;12:1011-22.
7. Jenkins SM, Guzman A, Gardner BB, Bryant SA, Del Sol SR, et al. Rehabilitation after anterior cruciate ligament injury: Review of current literature and recommendations. *Current Reviews in Musculoskeletal Medicine*. 2022;15:170-9.
8. Haojie D, Said MF. The impact of exercise-based rehabilitation on ACL patients: A comprehensive review in the Context of China's healthcare system. *International Journal of Religion*;5:8355-8364, 2024.