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Research Article

**ROLE OF PHYSIOTHERAPY IN THE MANAGEMENT OF  
ANTERIOR CRUCIATE LIGAMENT**Ahmed Mohamed Fathi Elshawi<sup>1</sup>, Arwa Ali S Alhumudh<sup>2</sup>, Feras Dhafer S Al Humuth<sup>2</sup><sup>1</sup> Saudi German hospital - Aseer<sup>2</sup> Jazan university- Jazan - Saudi Arabia**Abstract:**

**Introduction:** Anterior cruciate ligament (ACL) injuries sustained in sports or recreational activities are frequent worldwide and have a substantial financial impact on society as a result of lost productivity and increased medical expenses. In the case of an ACL ligament injury to the knee, physiotherapy is crucial. Rehabilitating patients as soon as the inflammation has decreased is crucial. The protocols for ACL rehabilitation differ widely, and practitioners cannot agree on much of anything. Over the past ten years, however, there has been a consensus to move away from conservative, standardized length protocols and towards more individualized, accelerated protocols that adjust in length and modalities in accordance with patient preferences and specific findings.

**Aim of the Study:** With an emphasis on cutting-edge techniques to address the unique needs of ACL-injured patients, this review outlines the most recent trends, viewpoints, and modalities in ACL rehabilitation research.

**Methodology:** The review is a comprehensive research of PUBMED since the year 2001 to 2023.

**Conclusion:** The new modalities being used in rehabilitation are accelerating patient recovery, and the approach has become more and more patient-dependent. For many ACL patients, reinstated in sports is a crucial factor, and psychological support is crucial to recovery. The most important component of the patient's care and management is physiotherapy. Physiotherapy plays a major role in managing patients both before and after ACL reconstruction and has a considerable impact on preventing ACL injuries.

**Keywords:** Anterior cruciate ligament (ACL) injury, rehabilitation, physiotherapy

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## INTRODUCTION:

The anterior cruciate ligament (ACL) is an important component in the kinematics of the knee joint because it can withstand loads from rotation and anterior tibial translation. About 85% of the total anterior translation restraining force is supplied by the ACL. It also avoids varus and valgus stresses, as well as excessive tibial medial and lateral rotation. Despite this, because the ligaments contain mechanoreceptors, its main function is proprioception. As a result, an ACL injury may be considered a neurophysiological dysfunction rather than a straightforward injury to the peripheral musculoskeletal system. A thorough rehabilitation program is required when an ACL injury occurs because of its intricate role in the kinematics of the knee, which results in both clinical signs and subjective instability.<sup>[1,2]</sup>

ACL injuries constitute the most common knee injuries among athletes. Women are 2–8 times more likely than men to suffer an ACL injury. Mild injuries, like minor rips or sprains, can range in severity from severe injuries, like a completely torn ligament. Surgical reconstruction is required when there is a complete rupture of the ACL and subjective and clinical signs of instability. It is not obvious, though, that an ACL reconstruction will inevitably result in a return to pre-injury levels of activity. Both conservative and surgical approaches are available for ACL rehabilitation.<sup>[3,4]</sup>

### Anatomy and Biomechanics

The anterior cruciate ligament is a band of dense connective tissue, stretching from the femur to the tibia. The ACL is inserted anterior to the tibia's intercondyloid eminence and blends in with the anterior horn of the medial meniscus. It originates from the posteromedial corner of the medial aspect of the lateral femoral condyle in the intercondylar notch. This ligament's function is to prevent the tibia from rotating on the femur and sliding forward. Because of this, the ACL is most vulnerable to damage when the knee is subjected to twisting or rotating forces. It is harder to sustain a high level of activity without the knee buckling or giving way after an ACL tear because the knee is less stable.<sup>[5]</sup>

### Physiotherapy Intervention in ACL Injuries

Post-operative casting, limited Range of Motion (ROM) and delayed weight bearing are some of the problems encountered in ACL injuries. In the case of an ACL ligament injury to the knee, physiotherapy is crucial. Both conservative and surgical approaches are available for ACL rehabilitation. For sedentary

patients, conservative treatment of an ACL injury may be the best option. The age of the patient, athletic endeavors, and most importantly, subjective instability symptoms during day-to-day activities should all be taken into account when making an ACL reconstruction decision. The ideal rehabilitation plan in those circumstances might involve a comprehensive program to reinforce and restore proprioception, a therapeutic program to fully regain range of motion, and training in normal gait patterns.<sup>[6]</sup>

Physiotherapy intervention can be divided into the following phases:

1. Acute Stage
2. Pre-surgical Stage or Conservative Treatment
3. Post-surgical Stage
4. Return to sport

#### Acute Stage:

Whether surgery is performed or not, the goal of physiotherapy management for an ACL injury is to restore stability, strength, proprioception, and range of motion. For certain patients, the recommendation to use crutches and eventually a knee immobilizer may be appropriate. To prevent quadriceps atrophy, prolonged use of the knee immobilizer should be minimized. In the acute and early subacute phases following injury, the following recommendations are advised to support pre-operative optimization.<sup>[7]</sup>

1. Flexion, or bending, is achieved by:<sup>[8,9]</sup>
2. Full extension is achieved by:
  - Passive knee extension: In addition to teaching exercises that add leverage to gently force extension, the physiotherapist can perform passive knee extension.
  - Static quads/SLR
  - Patellar self-mobilisations,
  - Heel Props
  - Prone hang exercise
3. Knee flexion/extension in sitting:
  - Passive knee bend: With manual therapy and teaching exercises that add leverage to gently force flexion, the physiotherapist can provide passive knee flexion.
  - Heel slides
  - Knee flexion in prone (gentle kicking exercises)
  - Wall slides
4. Ankle DF/PF/circumduction
5. Weight transfers in standing
6. Glutes medius work in side lying

### 7. Gluteal exercises in prone

#### Pre-surgical Stage or Conservative Treatment:

To maximize the result, it is crucial to get the knee prepared to undergo surgery as soon as the acute stage is over. Proprioception and strength must be the main areas of emphasis. The physiotherapist needs to maintain the injured knee in a quiescent state so that swelling is kept to a minimum and the range of motion is improved. Applying electrotherapy a few weeks before surgery can help achieve a full range of motion and reduce joint effusion.<sup>[10]</sup> Consequently, the patient will benefit from quicker motion and strength recovery following surgery. It is essential to provide alternative methods of reinforcing muscle strength and proprioception during the pre-surgical phase.<sup>[10,16]</sup>

1. Achieve and maintain full range of motion in extension and continue to improve range of motion in flexion with minimal swelling.
2. Improving proprioception by one-leg standing exercise.
3. Build muscle strength: muscle strength training can start as soon as 110 degrees of flexion are reached. Some workout examples are:
  - Swimming (refraining breaststroke)
  - Low-impact exercise equipment like a treadmill, stationary bike, and elliptical cross-trainer
  - Leg presses
  - Leg curls or leg extensions (Open-Kinetic-Chain)
  - Weight-bearing exercises (Closed-Kinetic-Chain exercises) such as squats, lunges, and steps up.

#### Post-surgical Stage:

Take into account signs of a successful outcome such as pain, swelling, muscular contracture, restricted range of motion, and unusual gait patterns. Three aspects are crucial in the post-surgery phase:<sup>[11]</sup>

1. Early weight bearing
2. Early terminal knee extension equivalent to the contralateral side
3. Closed and Open Kinetic Chain Strengthening Exercises.

The following exercise aids in achieving range of motion:<sup>[11,12]</sup>

- Bicycle that is stationary
- Gently stretching every muscle group, including the quads, standing quads, and kneeling hip flexors bolstering.
- Curls in the prone hamstrings.
- Constant step-ups with marching

- Ball squats, wall slides, and mini squats from 0 to 60 degrees
- Bridges and unilateral bridges, side-lying hip external rotation clamshells, bridges on physio balls, bridges on physio balls with roll-in, bridges on physio balls alternating, and hip hikes are exercises that strengthen the lumbar region. Proprioception and balance
- If the limited range of motion exists cardio, and rotational tibial mobilizations proceed in the late post-op stage.
- Pool jogging, stair climbing, elliptical, and flutter kick swimming bolstering.
- Leg press machine, seated hamstring curl machine, hip abductor and adductor machine, hip extension machine, Roman chair, and seated calf machine are among the exercise equipment.

#### Return to Sports:

It is advised that patients learn how to safely apply the brake in an emergency simulation before getting back behind the wheel. This will usually occur 4-6 weeks following right-sided ACLR and 2-3 weeks following left-sided ACLR. It is advised that patients achieve 95% knee flexion range of motion (ROM), full extension ROM, and no effusion or trace of effusion before starting to run again. Without experiencing pain, perform repetitive single-leg hopping (also known as "pogos"), alter-G running, aqua jogging, and single-leg hopping with an eccentric impulse greater than 80%.<sup>[13,16]</sup>

The Hop Test - Athletes who attempt to regain their previous performance levels may fail due to strength and power deficiencies following surgery, which could also be a risk factor for further injuries. Before returning to sports, researchers advise that the surgically repaired leg should function at least 90% as well as the uninjured leg. As part of a thorough physical and functional evaluation, three hopping tests can be utilized to help ensure that returning to sports following ACL reconstruction is both quick and safe. These three tests can be used in later stages of post-operative recovery to measure side-to-side differences and make sure the athlete's exercise regimen is effective in getting the injured leg back to the level of the uninjured leg.<sup>[14,15]</sup>

#### **CONCLUSION:**

It is possible to conclude that the most important component of the patient's care and management is physiotherapy. Physiotherapy is a key component of pre- and post-ACL reconstruction management, and it has a major influence on preventing ACL injuries.

The major goals are to restore muscle strength and proprioception as well as the full range of motion of the knee. To prevent re-injury, these goals must be met by engaging in simple, safe exercises and avoiding knee shear forces.

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