

# Rehabilitation after ACL reconstruction: two case reports

## Abstract

Rehabilitation after anterior cruciate ligament (ACL) reconstruction is critical to restore knee function, prevent re injury, and enable return to sport. Differences arise when meniscal surgery is concurrently performed vs. pure ACL reconstruction, especially with respect to weight bearing, range of motion, and progression of strength and functional tasks. Here, we present two cases: (1) a 28 year old footballer undergoing ACL reconstruction plus medial meniscus repair, and (2) a 24 year old athlete with isolated ACL reconstruction. We detail their surgical interventions, rehabilitation protocols, outcomes, and compare to literature to draw lessons for practice.

**Keywords:** rehabilitation, sports injury, return to sport, functional recovery, physiotherapy, ACL

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## Introduction

The ACL is essential for knee stability, particularly in pivoting sports. ACL rupture is common among footballers and young athletes. Meniscal tears often accompany ACL injury. When Medial meniscus is repaired rehabilitation tends to be more conservative in early phases (restricted weight bearing, restricted motion) to protect the repair.

Rehabilitation goals include: controlling swelling and pain; restoring range of motion (ROM), especially full extension; restoring muscle strength especially quadriceps and hamstrings; neuromuscular control and proprioception; functional performance; safe return to sport. Many studies compare outcomes of ACL + meniscus repair vs isolated ACL in terms of strength recovery, functional tests, time to return to sport. E.g., a cohort showed that at 6-8 months, muscle strength deficits were similar in many cases, but medial or bilateral meniscal repairs may cause more deficit in hamstrings strength.<sup>1</sup> Also, functional hop tests and limb symmetry indices are often used to assess readiness.<sup>2-4</sup>

## Case Report 1: ACL Reconstruction + Medial Meniscus Repair (28 Year Old Footballer)

## Patient details

| Feature             | Details                                                                                                             |
|---------------------|---------------------------------------------------------------------------------------------------------------------|
| Age / sex           | 28-year-old male                                                                                                    |
| Sport / background  | Footballer, playing at amateur / semi-professional level                                                            |
| Mechanism of injury | Non-contact pivoting injury, felt a pop, immediate swelling, instability                                            |
| Diagnosis           | ACL complete tear; medial meniscus tear (posterior horn or body) confirmed by MRI; no other major ligament injuries |

## Surgery

- ACL reconstruction using hamstring tendon autograft semitendinosus and gracilis
- Medial meniscus repair with all inside suture repair.

## Rehabilitation protocol

The protocol is more cautious due to the meniscus repair, especially in early phases. Below is a suggested phased program (adapted from literature + clinical practice):

| Phase                                                  | Duration     | Goals                                                                                                                                                            | Key Interventions / Restrictions                                                                                                                                                                                                     |
|--------------------------------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Phase 0: Preoperative (if applicable)                  | Weeks 0-2    | Control swelling, pain; protect knee; begin gentle ROM; prepare quads & hamstrings                                                                               | Cryotherapy; elevation; gentle passive ROM to tolerance; isometric quadriceps, hamstring co-contractions; avoid loading that stresses meniscus repair                                                                                |
| Phase 1: Early postoperative                           | Weeks 0-4    | Protect graft & meniscus repair; achieve full extension; minimal flexion (e.g. limit flexion to 90° initially or per surgeon); reduce swelling; activate muscles | Use brace as prescribed; non- or partial-weight bearing (often partial until week 4-6 depending on surgeon's protocol); pain / swelling control; passive / assisted ROM; quadriceps sets; straight leg raises; patellar mobilization |
| Phase 2: Intermediate                                  | Weeks 4-8    | Increase flexion; begin more weight bearing; improve muscle strength; neuromuscular control                                                                      | Gradual progression to full weight bearing; closed-chain strengthening as mini-squats, step-ups; balancing exercises; proprioceptive training; avoid deep squats or twisting loads; monitor for pain / swelling                      |
| Phase 3: Strength/ neuromuscular/ dynamic control      | Weeks 8-16   | Restore strength (quadriceps, hamstrings, hip muscles), dynamic control, gait normalization                                                                      | More challenging closed chain work; single-leg balance, perturbation; stationary bike, pool work if available; introduce jogging when strength and ROM adequate; plyometrics later in this phase                                     |
| Phase 4: Return to sport/ advanced functional training | Weeks 16-24+ | Return to non-contact sport first, then full sport; restoration of power; agility, sport-specific drills                                                         | Hop tests agility drills, change of direction, cutting; assessment of limb symmetry (ideally ≥90-95%); gradual return to training and matches under supervision                                                                      |

## Outcome

- By ~6 months: good ROM (full extension, flexion close to uninvolved side), muscle strength deficits reduced, satisfactory functional test outcomes (e.g. hop tests  $\geq 90\%$  symmetry).
- By 9-12 months: unrestricted return to competitive football assuming strength / neuromuscular control, no pain, no instability

**Case Report 2:** Pure ACL Reconstruction (24 Year Old Athlete)

## Patient details

| Feature             | Details                                                       |
|---------------------|---------------------------------------------------------------|
| Age / sex           | 24-year-old male                                              |
| Sport / background  | Athlete (e.g., track, football, gym workouts)                 |
| Mechanism of injury | Non-contact ACL rupture confirmed by MRI, no meniscal injury  |
| Diagnosis           | Isolated full-thickness ACL tear; all other structures intact |

**Surgery:** ACL reconstruction (hamstring autograft or other standard graft)

## Rehabilitation protocol

Because of the absence of meniscal repair, progression can be more aggressive, especially regarding weight bearing and range of motion, as long as graft fixation etc. allow.

| Phase                        | Duration    | Goals                                                                                           | Key Interventions / Restrictions                                                                                                                                                            |
|------------------------------|-------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Phase 1: Early postoperative | Weeks 0-2   | Control pain/swelling; achieve full extension; begin quadriceps activation; safe weight bearing | Immediate or early full weight bearing as tolerated; passive/assisted and active ROM exercises; brace if needed; isometric strength work; patellar, hamstring activation                    |
| Phase 2: Weeks 2-6           | Weeks 2-6   | Increase ROM (flexion), restore gait, begin closed chain strengthening                          | Progressive weight bearing; closed chain exercises e.g., mini squats, leg press; stationary bike; introduce proprioceptive work; no pivoting or high load twisting yet                      |
| Phase 3: Weeks 6-12          | Weeks 6-12  | Strengthening, neuromuscular control, functional movements                                      | More dynamic closed chain; single-leg work; balance, agility; jogging initiated when criteria met adequate ROM, strength, no pain                                                           |
| Phase 4: Weeks 12-24         | Weeks 12-24 | Advanced functional, sport simulation, return to sport                                          | Hop tests, agility, cutting, plyometrics; strength to $\geq 90\%$ limb symmetry; sport-specific drills; monitored return to sport around 6-9 months depending on criteria and sport demands |

## Outcome

- By ~4-6 months: good gains in strength, ROM; jogging and light sport drills possible
- By ~9 months: full return to training, matches; functional tests and physician clearance

## Comparison & Discussion

Early weight bearing / ROM tends to be more restricted in cases with meniscus repair, particularly medial meniscus repair, to protect the tear site. Some protocols require non weight bearing or partial weight bearing for several weeks. In isolated ACL, weight bearing as tolerated earlier is usually safe. Literature supports that repairing meniscus during ACL doesn't significantly delay strength return at 6 months, though there may be some early deficits, especially concerning hamstrings if both menisci are involved. 1

Functional outcomes ; hop tests, limb symmetry; tend to be similar in the long term after 8 months between patients with ACL + meniscus repair vs ACL only, provided a good rehabilitation protocol is followed. 2

Return to sport time may be delayed somewhat when meniscal repair is involved, particularly for sports involving twisting, cutting. Safety criteria for strength, ROM, neuromuscular control are more critical than simply time elapsed.

Complications ; restricted extension which can lead to altered gait and long term issues, swelling or effusion, graft failure, repair failure; these often relate to over aggressive early motion or weight bearing in cases where repair site is vulnerable.

## Learning Points & Recommendations

- Individualize rehab protocol depending on the surgical findings, graft type, meniscal repair vs meniscectomy, patient age, sport demands.
- Prioritize full extension early, as lack of extension is strongly associated with poor outcomes as quadriceps inhibition, altered mechanics.
- Gradual progression of weight bearing and activities when meniscus repair is present; avoid twisting/pivoting until repair has had time to heal.
- Use objective measures; as strength testing, limb symmetry, hop tests, range of motion, patient reported outcomes to guide progression and return to sport, rather than strictly time based protocols.
- Neuromuscular control and proprioceptive training are essential — often differentiators in reducing re injury risk.

## Conclusion

Rehabilitation after ACL reconstruction must be tailored to the specifics of the injury, particularly whether a meniscal repair is involved. With proper phased rehab, patients with combined ACL + medial meniscus repair can achieve outcomes comparable to those with isolated ACL reconstruction, though often with more cautious early phases. Objective criteria should drive decision making for functional progression and return to sport. These two cases exemplify this difference: the 28 year old with medial meniscus repair needed a

more conservative early strategy, while the 24 year old with pure ACL could progress somewhat more aggressively.

### Ethics Statement

This study is based on our work and aggregated statistics that do not involve the collection of personal or identifiable information from human participants. As such, ethical approval was not required. All data were analyzed in compliance with relevant ethical guidelines and standards for research involving public health and transportation data. The authors affirm that the research was conducted with integrity and respect for the subjects and context involved.

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### Conflicts of interest

The authors declare that there are no conflicts of interest.

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