

ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION REHABILITATION PROGRAM

Rehabilitation following ACL reconstruction has changed dramatically over the past two decades. Originally, many surgeons used cast or brace immobilization, restricted weight bearing and used a timetable of 9 to 12 months before allowing patients to return to athletic activity. As our experience with ACL reconstruction and postoperative rehabilitation has increased, we have found that patients can return to sports activities earlier without injuring the graft. The present protocol emphasizes: (1) early terminal knee extension equal to the contralateral side; (2) early weight bearing; and (3) closed and open kinetic chain strengthening exercises. Early knee extension establishes the foundation for the entire rehabilitation program. The incidence of flexion contracture with associated quadriceps weakness and extensor mechanism dysfunction following ACL reconstruction has significantly decreased with accelerated knee extension immediately after surgery. Quadriceps strength is enhanced with early extension and early weight bearing. Closed kinetic lower extremity strengthening facilitates improved patellar tracking and has been determined to be a functional mode of exercise. The combination of early knee extension, early weight bearing, and closed kinetic quadriceps strengthening allows the patient to progress through the post-operative rehabilitation period at a rapid pace without compromising ligamentous stability.

Rehabilitation following ACL reconstruction consists of four distinct phases. It is possible to overlap phases depending on the individual progress of the patient.

PHASE I: PRE-OPERATIVE

With this protocol, patients presenting with an ACL deficient knee may be seen in physical therapy prior to ACL reconstruction. The area of focus with the pre-operative visits includes preparing the knee for surgery and mental preparation of the patient to deal with surgery and the post-operative rehabilitation course. Patients with acute ACL tears will be placed on appropriate rehabilitation to decrease swelling and restore range of motion and strength to near normal levels. Both acute and chronic ACL patients may undergo isometric leg press testing.

PRE-OP GOALS

- ◆ Restore full ROM and strength and control swelling
- ◆ Ensure complete understanding of the basic principles of accelerated rehabilitation including:
 - Full terminal knee extension
 - Early weight bearing
 - Closed and open chain strengthening

TESTING

- ◆ Bilateral ROM including full terminal knee extension
- ◆ Single leg hop on non-involved leg

EXERCISES

- ◆ Prone hangs
- ◆ Extension board
- ◆ Heel slides
- ◆ Closed kinetic chain strengthening
 - Leg press
 - ¼ squats
 - Step downs
 - Bike
 - StairMaster

PHASE IIA: 1 TO 6 DAYS

CLINICAL GOALS

- ◆ Full passive knee extension and 110 degrees of flexion
- ◆ Independent straight leg raise
- ◆ Weight bearing as tolerated

TESTING

- ◆ Bilateral ROM

EXERCISES

- ◆ Ice is placed on the patient's knee immediately after surgery. This provides compression and cold to minimize pain and swelling. The ice also remains on the knee at all times, **except** when performing motion exercises.
- ◆ **Extension** range of motion exercises **hourly** during the day:
 - The knee is allowed to fully extend to terminal extension for ten minutes during each exercise bout.
 - Elevate the heel on pillows at the foot of the bed. A 2.5 lb. Ankle weight is placed across the proximal tibia to facilitate terminal extension. **Full extension allows the newly reconstructed ligament to fit perfectly into the intercondylar notch. Restricting full extension will allow the notch to fill with scar and become a block to extension.**
- ◆ **Knee flexion**
 - Flex knee to 110 degrees, and hold for 10 minutes 4X/day.
 - Continue to increase bend beyond 110 degrees by pulling leg further to buttocks with hands
- ◆ Leg control
 - Active quadriceps contraction with quad sets
 - Straight leg raises
 - Active heel height
- ◆ During the first week, the patient is to **remain lying down as much as possible**. However, when getting up to go to the bathroom, the patient is encouraged to be full weight bearing as tolerated with the **crutches or walker and knee immobilizer**.

CLINICAL FOLLOW-UP

- ◆ Patient will report to physical therapy one week after surgery and should have:
 - Full terminal extension and flexion to 110 degrees
 - Decreasing swelling
 - Full weight bearing w/ assist device

PHASE IIB: 1 to 4 weeks

CLINICAL GOALS

- ◆ Full terminal extension and flexion to 110 degrees
- ◆ Minimal swelling and soft tissue healing
- ◆ Normal gait without assistive devices
- ◆ Demonstrate ability to lock knee with weight shifted to ACL leg

TESTING

- ◆ Bilateral ROM

EXERCISES

- ◆ Regaining/maintaining full extension range of motion is **CRITICAL**
 - Towel extensions
 - Prone hangs
 - Wall slides
 - Heel slides
- ◆ Patient is encouraged to **lock out knee** by standing with weight shifted to ACL leg so that extension is full and knee is fully locked (single leg stance).
- ◆ Progress from partial to full weight bearing without crutches. It is very important to emphasize leg control early in the rehabilitation program. Through early extension and normal gait, the patient is able to regain good quadriceps tone and leg control.
- ◆ **Once** the patient has **regained full knee extension** and is ambulating normally, it will be possible to implement strengthening exercises. Closed and open kinetic strengthening will be used including:
 - Bilateral ¼ knee bends
 - Calf raises
 - It is felt that this type of exercises facilitates return of lower extremity strength with minimal stress to the joint.
 - StairMaster 4000 workouts on manual control will be started around the 2nd to 3rd week after surgery.
 - Bicycling workouts are started. Initially, the bike is used as a mechanical means of attaining flexion. Once the patient has gained 120 degrees of flexion, they can use the bike for moderate speed strengthening workouts.
 - Swimming and other hydrotherapy exercises can be started once the incisions have healed.

CLINICAL FOLLOW-UP

- ◆ The patient will return 2 weeks following surgery.
- ◆ The patient should have full terminal extension and full flexion to 130 degrees.

PHASE III: 4 TO 8 WEEKS

CLINICAL GOALS

- ◆ Full terminal extension and full flexion to 130 degrees
- ◆ Consistent weight room and moderate speed strengthening

- ◆ Early return to agility and sport specific drills

TESTING

- ◆ Bilateral ROM

EXERCISES

- ◆ If the patient does not have full passive terminal extension or full flexion:
 - An extension board will be used during routine clinic visits to restore full extension.
 - Heel slides are the most effective means of regaining terminal flexion.
- ◆ Weight room activities (**once the patient has sufficient leg control to perform a unilateral knee bend without difficulty**):
 - ¼ squats
 - **Unilateral** leg press, calf raises, step-downs, and leg extensions
 - Continue Stairmaster, bicycle and hydrotherapy

PHASE IV: 8 WEEKS ON

CLINICAL GOALS

- ◆ Full ROM including terminal extension
- ◆ Quadriceps tone continues to improve with noticeable quadriceps definition returning
- ◆ Return to full activity
- ◆ At least 80% strength
- ◆ Proprioceptive/agility specific program
- ◆ Complete a sport specific functional progression

TESTING

- ◆ An isometric leg press test is done at 12 weeks
- ◆ Bilateral ROM
- ◆ If strength is $\geq 80\%$ of normal leg then perform: Single leg hop – patient is instructed to perform a single leg hop for distance with take off and landing on the same leg. A side-to-side percentage is calculated for comparison.

EXERCISES

- ◆ Full squat (<90 degrees) as tolerated
- ◆ Unilateral leg press, leg extensions, step-downs, calf raises
- ◆ Lunges
- ◆ StairMaster and Bicycle
- ◆ Start jogging straight ahead on even surfaces/treadmill when 80% strength

AGILITY

- ◆ Begin at 12-16 weeks if strength and functional hop > 80%
- ◆ Factors influencing the patient's return to controlled agility training and sport specific activity include patient subjective rating as well as isokinetic and isometric test scores.
- ◆ Agility training and limited sports participation not only help the patient to regain fast speed strength but also help to restore confidence in getting back to aggressive athletic activities as tolerated in the program.
 - Jump rope
 - Lateral slides
 - Backward running
 - Shooting baskets, dribbling soccer ball and other sport specific drills

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