

**Orthopedic Surgery • Sports Medicine**  
*Neil Kumar, MD*

## **Anterior Cruciate Ligament (ACL) Reconstruction Protocol**

### **Hamstring Autograft, Allograft, or Revision**

“As tolerated” should be understood to “perform with safety” for the reconstruction/repair. Pain, limp, swelling, or other undesirable factors are indicators that you are doing too much too soon. If any of these should occur, decrease your activity level, elevate the leg, and ice your knee.

Ice should be applied to the knee for 15 to 20 minutes following each exercise, therapy, or training session. While your knee remains swollen, icing should also be done separate from exercise sessions at least three times per day.

All times and exercises are to serve as guidelines only. Progression through the protocol should be based upon criteria as opposed to dates listed and will vary depending on each individual patient. Progress should be agreed upon by the patient and his/her team of providers.

#### **Pre-Operative**

- Brace – As directed by your doctor
- Weight Bearing – Full, use crutches as necessary
- ROM (range of motion) – Full, no restrictions
- Therapeutic Exercise - Learn exercises for post op regimen
  - Calf stretching
  - Quad sets
  - Four-way straight leg raises (SLR)
  - Heel slides
  - ‘Propped’ knee extension
- Modalities - Cryotherapy (Ice) six to eight times per for 15 to 20 minutes each time
  
- **Goals for Surgery**
  - Minimal to no swelling
  - Full ROM
  - Normal strength

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### **Post-Operative Phase I: Weeks 0 to 2**

- Brace - Locked at 0<sup>0</sup> for ambulation, 90<sup>0</sup> when non-ambulatory
- Weight Bearing - Weight bear as tolerated with bilateral (2) crutches
- ROM - 0° to 90° active and passive
- Therapeutic Exercise - *All exercises without weight*
  - 'Preoperative' exercises
  - Hamstring curls
  - Glute sets
  - Ankle pumps
  - Isometric knee extension at 60<sup>0</sup> and 90<sup>0</sup> knee flexion
  - Quad sets at 0<sup>0</sup>
  - Open kinetic chain (OKC) knee extension 90<sup>0</sup> to 40<sup>0</sup>
  - No closed kinetic chain (CKC) terminal knee extension
  - No short arc quads
- Modalities
  - Scar and soft tissue massage, patella mobilizations
  - NMES (neuromuscular electrical stimulation) for quadriceps atrophy
  - HVPC (high volt pulsed current) for effusion (swelling) reduction
  - Cryotherapy six to eight times per day for 15 to 20 minutes each
- Proprioception
  - Seated BAPS board
  - Standing weight shifts
- Cardio - UBE (arm bike)
  
- **Goals for Phase II:**
  - Hip flexion SLR without knee extension lag
  - Full knee extension
  - Knee flexion to 90°
  - Minimal joint effusion

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### **Post-Operative Phase II: Weeks 2 – 6**

**\*\*\*Include single-leg exercises on non-involved side\*\*\***

- Brace
  - Unlock when non-ambulatory
  - Locked at 0<sup>0</sup> for ambulation
  - At Week 4 – unlock for ambulation and transition out of brace
- Weight Bearing - Weight bear as tolerated without crutches
- ROM - 0° to 130° active and passive
- Therapeutic Exercises – Continue Phase I exercises
  - Standing hamstring curls
  - OKC knee extension 90<sup>0</sup> to 40<sup>0</sup> with 1# weight increase per week
  - Eccentric quad strengthening 40<sup>0</sup> to 100<sup>0</sup> isotonic
  - At Week 5 – initiate CKC anterior/lateral lunges to 60<sup>0</sup> knee flexion and mini squats to 60<sup>0</sup>
- Modalities
  - Scar and soft tissue massage, patella mobilizations
  - NMES (neuromuscular electrical stimulation) for quadriceps atrophy
  - HVPC (high volt pulsed current) for effusion (swelling) reduction
  - Cryotherapy six to eight times per day for 15 to 20 minutes each
- Proprioception
  - Seated BAPS board
  - Standing weight shifts
  - Unstable surfaces
  - Joint repositioning
- Cardio
  - UBE
  - Stationary bike without resistance
  - At Week 4 – initiate elliptical and pool walking
- **Goals for Phase III:**
  - Normal gait
  - No effusion
  - No pain
  - Knee ROM 0°- 120°
  - Good eccentric control of involved knee without brace
  - Isometric quad strength 75% of non-involved side at 60° knee flexion
  - Hamstring to quad ratio at least 66%
  - Isokinetic hamstring strength 100% of non-involved side

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### **Post-Operative Phase III: Weeks 6 – 12**

**\*\*\*Do not initiate new activities during Week 8 due to graft vulnerability\*\*\***

- Weight Bearing - weight bear as tolerated without brace
- ROM - Full active and passive
- Therapeutic Exercises – Continue Phase II exercises
  - Hip and Core strengthening
  - OKC knee extension 90<sup>0</sup> to 40<sup>0</sup> with 1# weight increase per week
  - CKC multi-plane activities within pain-free ROM
  - Anterior step downs and lateral step overs
  - Stair stepper
  - Leg press 0<sup>0</sup>- 60<sup>0</sup>
- Modalities
  - Scar and soft tissue massage, patella mobilizations
  - NMES (neuromuscular electrical stimulation) for quadriceps atrophy
  - HVPC (high volt pulsed current) for effusion (swelling) reduction
  - Cryotherapy six to eight times per day for 15 to 20 minutes each
- Proprioception
  - Perturbation training (balance against resistance)
  - Unstable surfaces
  - Joint repositioning
- Cardio
  - UBE
  - Stationary bike with light resistance
  - Treadmill ambulation
  - After Week 8 – initiate pool running and swimming
- Plyometrics - Frontal (forward) and sagittal (side) plane double-leg plyometrics
  
- **Goals for Phase IV:**
  - Full ROM
  - No effusion
  - No pain
  - Isometric quad strength 80% of non-involved side
  - Proprioception 80-100% of non-involved side
  - Hamstring to quad ratio 70%
  - *Minimum of 10 weeks post-op*



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### **Post-Operative Phase IV: Weeks 12 – 16**

- Therapeutic Exercises – Progress Phase III exercise strength and endurance
- Proprioception – Progress Phase III tolerance
- Cardio
  - UBE
  - Stationary bike with increasing resistance
  - Pool running
  - Swimming
  - Treadmill running with brace
- Plyometrics - Progress from double to single limb plyometrics
- Testing - Isometric and isokinetic tests at 12 weeks
  
- **Goals for Phase V:**
  - Isokinetic hamstring strength 110% of non-involved side
  - Proprioception 100%

### **Post-Operative Phase V: Weeks 16 – 24**

Transitional Therapy for return to sport activities during this phase with progression based upon patient progress through earlier protocol.

- Initiate treadmill running without brace at 4 months
- Initiate cutting/pivoting/jump training at 5 months
- Isometric and isokinetic tests and KT 2000 anterior tibial translation test at 6 months

In addition to ongoing strength, balance, agility, and cardio conditioning, initiate sport specific plyometric activities as tolerated such as:

Soccer/Football: Two foot ankle hop, double-leg hop, front barrier hop, lateral barrier hop, single-leg hop, power skip, backward skip, double arm alternate leg bound, and cycled split squat jump

Basketball/Volleyball: Two foot ankle hop, double-leg hop, squat jump, double-leg vertical jump, single-leg hop, single-leg vertical jump, power skip, backwards skip, double-arm alternate-leg bound, alternate leg push off box drill, and side-to-side push off box drill

Baseball/Softball/Overhead throwing sports: Two foot ankle hops, double-leg hop, front barrier hop, lateral barrier hop, single-leg hop, power skip, backward skip, double arm alternate leg bound, cycled split squat jump, and return to throwing program

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### **Return to Sports**

Return to sports is based on provider team (physician, physician assistant, athletic trainer, therapist) input. At 6 month follow-up with provider, clinical exam, isometric and isokinetic testing, and KT 2000 anterior tibial translation test will be used to determine optimal timing for jump/hop functional test. Transitional Therapy should continue during this time as the patient prepares to return to sports and athletic activities.

Clearance for return to full sports activities will be determined with input from the entire health team. When cleared by the provider, patients should return to their sports with a *4-week progression plan* as determined by the health team and coaches. This allows the athlete to acclimate to the mental and physical demands of sports and athletics in safe manner.

Follow-up testing at 12 months will include

- KT 2000 anterior tibial translation test
- Isometric and Isokinetic hamstring/quadriceps test
- Jump and hop functional test