

Orthopedic Surgery • Sports Medicine
Neil Kumar, MD

Multi-ligament Knee Reconstruction Protocol

“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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*****Prevention of posterior tibial subluxation is critical during rehabilitation*****
*****Brace must be worn at all times, including during rehabilitation exercises*****

Post-Operative Phase I: Weeks 0 to 4

- Brace – Locked at 0⁰ at all times
- Weight Bearing – Toe-touch weight bear with bilateral (2) crutches
- ROM – prone passive ROM with anterior tibial force 0° to 90°
- Therapeutic Exercise - *All exercises without weight, no active knee flexion*
 - ‘Preoperative’ exercises
 - Glute sets
 - Ankle pumps
 - Isometric knee extension at 60⁰ and 90⁰ knee flexion
 - Quad sets at 0⁰
 - Straight leg raises
 - Open kinetic chain (OKC) knee extension 90⁰ to 40⁰
 - 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
- 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 4 – 8

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

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

- Brace
 - Week 5: 0⁰ - 30⁰
 - Week 7: 0⁰ - 60⁰
- Weight Bearing
 - Toe-touch weight bear with bilateral (2) crutches
 - Week 6: Initiate weight bear as tolerated with bilateral (2) crutches
- ROM - prone passive ROM with anterior tibial force 0° to 120°
- Therapeutic Exercises – Continue Phase I exercises
 - Mini-squats
 - Week 4: 0⁰ - 45⁰
 - Week 6: 0⁰ - 60⁰
 - Core strengthening (not standing)
 - OKC knee extension 90⁰ to 40⁰ with 1# weight increase per week
 - No CKC hamstring strengthening with >30⁰ knee flexion
 - No OKC hamstring strengthening
- 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
 - Joint repositioning
- Cardio
 - UBE
 - Stationary bike without resistance
- **Goals for Phase III:**
 - Normal gait with brace
 - Knee ROM 0° - 120°
 - Good eccentric control of involved knee without brace
 - Isometric quad strength 60% of non-involved side at 60° knee flexion

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Post-Operative Phase III: Weeks 8 – 16

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

- Brace
 - When ambulatory: 0⁰ - 70⁰
 - When non-ambulatory: unlocked
- Weight Bearing - weight bear as tolerated without crutches with brace
- ROM - Full active and passive with anterior tibial force
- Therapeutic Exercises
 - *Limit knee flexion to 70⁰ during weight bearing exercises until Week 12*
 - Hip and Core strengthening
 - Hamstring curls up to 70⁰
 - No OKC hamstring strengthening
 - OKC knee extension 90⁰ to 40⁰ with 1# weight increase per week
 - Eccentric quad strengthening 40⁰ to 90⁰ isotonic
 - Leg press 0⁰- 70⁰
- Modalities
 - Scar and soft tissue massage, patella mobilizations
 - NMES (neuromuscular electrical stimulation) for quadriceps atrophy
 - 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 increasing resistance
 - Pool walking
 - Treadmill ambulation
- **Goals for Phase IV:**
 - Full ROM
 - No effusion, No pain
 - Isometric quad strength 70% of non-involved side
 - Isometric hamstring strength 70% of non-involved side
 - Proprioception 80-100% of non-involved side

Post-Operative Phase IV: Weeks 16 – 24

- Brace – unlocked brace
- Therapeutic Exercises – Progress Phase III exercise strength and endurance
 - ROM during weight bearing exercises is full
 - CKC multi-plane strengthening extension and flexion within pain-free ROM
 - CKC anterior/lateral lunges to 60⁰ knee flexion
 - Stair stepper (start with 2” and gradually increase)
 - Anterior step downs and lateral step overs
 - Eccentric quad strengthening within pain-free ROM
- Proprioception – Progress Phase III tolerance
- Cardio
 - UBE
 - Elliptical
 - Stationary bike with increasing resistance
 - Pool running
 - Swimming
- Plyometrics – Progress from double to single limb plyometrics
- Testing - Isometric and isokinetic tests at 16 weeks

- **Goals for Phase V:**
 - Isometric quad strength 90% of non-involved side
 - Isokinetic hamstring strength 110% of non-involved side
 - Proprioception 100%

Post-Operative Phase V: After Week 24

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

- Initiate treadmill running with brace at 6 months
- Initiate cutting/pivoting/jump training at 8 months
- Initiate transition out of brace at 10 months



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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

Return to Sports

Return to sports is based on provider team (physician, physician assistant, athletic trainer, therapist) input. At 9 month follow-up with provider, clinical exam, and isometric and isokinetic testing 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

- Isometric and Isokinetic hamstring/quadriceps test
- Jump and hop functional test

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