Neil Kumar, MD
Sports Medicine

FLORIDA ORTHOPAEDIC INSTITUTE®

Tibial Tubercle Osteotomy (TTO), Medial Patellofemoral Ligament (MPFL) Reconstruction, and MACI Cartilage Grafting 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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Post-Operative Phase I: Weeks 0 to 8

- Brace
  - Locked at 0^0 during ambulation
  - ROM (active and passive)
    - Week 0-2 - 0^0 - 45^0
    - Week 2-4 - 0^0 - 90^0
    - Week 4 - Remove brace when nonambulatory
- Weight Bearing –
    - Week 1-4 – Toe-Touch weightbearing with bilateral (2) crutches
    - Week 4-8 – 50% weightbearing with bilateral (2) crutches
- Therapeutic Exercise - *All exercises without weight*
  - 'Preoperative' exercises
  - Hamstring curls
  - Glute sets
  - Ankle pumps
  - Quad sets at 0^0
  - 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
  - Stationary bike without resistance

- **Goals for Phase II:**
  - Hip flexion SLR without knee extension lag
  - Full ROM
  - Minimal joint effusion

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Post-Operative Phase II: Weeks 8 – 12 – DEPENDENT ON BONE HEALING

- Brace – Transition to patellar stabilizing brace for ambulation
- Weight Bearing - Full weight bearing without crutches
- ROM - Full active and passive
- Therapeutic Exercises – Continue Phase I exercises
  - *All weighted knee flexion exercises should be weight-supported*
    - Leg press up to 45^0 with <20% of body weight
    - Wall squats up to 45^0 with <20% of body weight
  - Standing hamstring curls
  - Hip and Core strengthening
  - Front step downs
- 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
  - Stationary bike without resistance
  - Pool walking progressing to pool running

- **Goals for Phase III:**
  - Full knee ROM
  - Good eccentric control of involved knee without brace
  - Isometric quad strength 75% of non-involved side
  - Hamstring to quad ratio at least 66%
  - Isokinetic hamstring strength 100% of non-involved side

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Post-Operative Phase III: Months 3 – 6

- Weight Bearing - patellar stabilizing brace for physical therapy/workouts only
- ROM - Full active and passive
- Therapeutic Exercises – Continue Phase II exercises
  - *All weighted knee flexion exercises should be weight-supported*
    - Leg press up to 90^0 with 50% of body weight
    - Wall squats up to 90^0 with 50% of body weight
  - OKC knee extension within pain-free ROM with 1# weight increase per week
  - CKC multi-plane activities within pain-free ROM
  - Plyometrics - Frontal (forward) and sagittal (side) plane double-leg plyometrics
  - Stair stepper
- 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)
  - Standing weight shifts
  - Unstable surfaces
  - Joint repositioning
- Cardio
  - Elliptical
  - Stationary bike with increasing resistance
  - Pool running
  - Treadmill ambulation

- **Goals for Phase IV:**
  - Full ROM
  - Normal gait
  - Isometric quad strength 80% of non-involved side
  - Proprioception 80-100% of non-involved side
  - Hamstring to quad ratio 70%

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Post-Operative Phase IV: Months 6 – 12

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

- Patellar stabilizing brace for sport
- Leg press and Wall Squats with full ROM and full weight-bearing
- Pool running and Swimming

    - Months 6 - 9: Straight-line jogging with progression to running, begin cutting/pivoting/jumping training
    - Months 9 - 12: Evaluate for noncontact sport participation
    - After 12 months: Progression of return to contact sports

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

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*. This allows the athlete to acclimate to the mental and physical demands of sports and athletics in safe manner.