

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

### **Anteromedialization/Tibial Tubercle Osteotomy (AMZ/TTO) 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 6**

- Brace - Locked at 0° for ambulation, 90° when non-ambulatory
- Weight Bearing – Weight bearing 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
  - Quad sets at 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 (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 6 – 12**

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

**\*\*\*Progression of weight bearing determined from radiographic healing\*\*\***

- Brace - Unlocked
- Weight Bearing
  - Initiate full weight bearing without crutches
  - Week 8 - Transition out of brace
- ROM - Full active and passive
- Therapeutic Exercises – Continue Phase I exercises
  - Standing hamstring curls
  - Hip and Core strengthening
  - OKC knee extension 90<sup>0</sup> to 40<sup>0</sup> with 1# weight increase per week
  - Leg press 0-90<sup>0</sup>
  - Front step downs
  - Stair stepper (start at 2")
  - Wall squats up to 90<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
- Cardio
  - UBE
  - Stationary bike without resistance
  - Pool walking progressing to pool running
- **Goals for Phase III:**
  - Full knee ROM
  - Normal gait
  - Good eccentric control of involved knee without brace
  - Isometric quad strength 80% of non-involved side
  - Proprioception 80-100% of non-involved side
  - Hamstring to quad ratio 70%

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

- Weight Bearing - weight bear as tolerated without crutches without brace
- ROM - Full active and passive
- Therapeutic Exercises – Continue Phase II exercises
  - Single-leg press 0<sup>0</sup>-100<sup>0</sup>
  - OKC knee extension within pain-free ROM with 1# weight increase per week
  - CKC multi-plane activities within pain-free ROM
  - Isokinetic knee extension within pain-free ROM
  - Plyometrics - Frontal (forward) and sagittal (side) plane double-leg plyometrics progressing to single-leg exercises
- 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
  - UBE
  - Stationary bike with increasing resistance
  - Pool running
  - Treadmill ambulation progressing to treadmill running
- **Goals for Phase IV:**
  - Full ROM
  - Normal gait
  - Isokinetic hamstring strength 110% of non-involved side
  - Proprioception 100%

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### **Post-Operative Phase IV: After Week 16**

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

- Initiate cutting/pivoting/jump training at 4 months
- Isometric and isokinetic tests 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

### **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 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.



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Follow-up testing at 12 months will include

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

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