**Physical Therapy Post-Operative Guidelines**

**Dr. Elizabeth Arendt**

**Tibial Tubercle Osteotomy (Distal/Medial)**

**Phase I: 0-4 Weeks**

**Precautions:** Flexion ROM limited to 90° KF x 4 weeks; No OKC quad strengthening (to avoid pull at osteotomy site through patellar tendon); Observe for wound healing

<table>
<thead>
<tr>
<th>Weight Bearing</th>
<th>Brace</th>
<th>ROM</th>
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<tbody>
<tr>
<td>• PWB (≤50% BW)</td>
<td>• On &amp; locked at 10-15° KF at all times except w/CPM or P/AAROM exercises</td>
<td>• Emphasize full extension</td>
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<tr>
<td>• May stand in tandem for brief periods</td>
<td>• Discontinue brace for sleep at 4 weeks per comfort level (unless otherwise instructed by MD)</td>
<td>• Progress flexion to ≤90°KF multiple times per day</td>
</tr>
<tr>
<td>• Use bilateral axillary crutches or other appropriate assistive device for proper weight bearing</td>
<td>• Open when seated</td>
<td>• CPM per MD instruction</td>
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<td>• Patellar and peripatellar joint and soft tissue mobilizations permitted</td>
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<td>• Seated heel slide into TKE permitted maintaining contact with foot on floor</td>
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**Therapeutic Exercise and Activity**

- Establish high quality quad set
  - *Superior translation of the patella*
  - *Avoid co-contraction with hamstrings and proximal gluteal musculature*
  - *Utilize NMES as needed*
- SLR x 4
  - *Flexion: begin in standing → reclined standing → supine*
  - Progress per quad control, no extensor lag, NO pain at osteotomy site
  - *Abduction, Adduction, Extension*
- Beginner mat exercises for abdominal/lumbopelvic control and proximal hip strength
- Gentle double legged partial squats to 30° KF max, with support or light leg press with double limb
- Standing TKE with resistance band

**Goals:** Control effusion and pain; ROM 0-90°; Attain a strong quad set; SLR w/NO lag; Able to perform ≥30 reps prior to fatigue w/leg lifting
**PROGRESSION TO PHASE II DICTATED BY MD CLEARANCE**

**Phase II: 4-8 Weeks**

**Precautions:** RETURN TO FULL WEIGHT BEARING DICTATED BY MD CLEARANCE AND RADIOGRAPHIC HEALING; No OKC quad through large arc of motion – observe for pain and/or increased pain or swelling at osteotomy site – contact MD if present; No isolated pushing through flexed knee until MD radiographic clearance (i.e. stair climbing or step drills); Avoid end range quad stretching x 8 weeks

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| • 4-6 weeks – up to 75% weight bearing  
• 6-8 weeks – transition to full weight bearing (see precaution) | • On with gait – gradually open per quad control  
• Lock outdoors if not confident with surroundings or w/fatigue | • Full extension  
• Progress flexion toward full ROM – may initiate stationary bike for ROM |

**Therapeutic Exercise and Activity (Phase II continued)**

• Initiate bridging with legs over exercise ball/bolster (no plank poses yet)  
• Increase repetitions w/proximal hip strength and abdominals  
• Initiate basic 2 legged CKC strength drills  
  *Shallow (0-45°) KF angles for ↓PFJ stress  
• Initiate 2 legged L/E proprio/balance  
• Emphasize terminal knee extension control in CKC

**Goals:** Effusion resolving; No pain at osteotomy site; Full extension ROM; Flexion ROM ≥120°; Multi-planar L/E hip strength = MMT grade 5/5

**NOTE:** Distal transfer of tubercle may need extended time to heal. Pain with weight bearing at osteotomy site dictates slower progression.

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**Phase III: 8-12 Weeks**

**Precautions:** Caution w/extended periods of walking in FWB (per MD ok & symptoms); Maintain effusion/pain control with WB and HEP progression; Avoid pivoting on a planted foot; Instruct proper knee/hip alignment with CKC drills; Observe for quadriceps control of terminal knee extension with CKC drills and ADL mobility

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<th>Weight Bearing</th>
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| • FWB, unless instructed differently by MD  
  *Normalize gait pattern, avoiding knee hyperextension in early stance  
• Return to normal stair climbing (if healing confirmed) | • Open per quad control  
• Protective use when out of home: environmental hazards, crowds | • Full, symmetrical ROM |

**Therapeutic Exercise and Activity**

• Progress core activities – side plank from knees, bridging w/ or w/o ball, basic 2 legged prone plank and hip strength  
• Initiate basic low impact cardio with bike, elliptical, walking (15-20 minutes, minimal intensity, steady pace)  
• Progress CKC drills – step, lunge, leg press

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Liz Niemuth, DPT, OCS  

**Return to Sport/Occupation**  
Dr. Elizabeth Arendt
*Deeper KF angles (>45°) with 2 legged support
*Early KF angles (0-45°) with 1 legged support per control/tolerance
• Progress L/E proprio/balance drills: single limb per control/tolerance

**Goals:** Effusion resolved; No pain at osteotomy site; ROM WNL; Progressing toward normal gait pattern in FWB; Able to perform ≥30 reps prior to fatigue with leg lifting; Normal LE kinematics w/2 legged CKC activities

<table>
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<th>Phase IV: 12-16 Weeks*</th>
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<tbody>
<tr>
<td><strong>Precautions:</strong> Increased pain at osteotomy site indicates need to reduce level of physical activity (fitness, ADL activity, rehab progression); Observe/instruct proper L/E alignment w/CKC drills (avoid functional valgus); Avoid pivoting on a planted foot</td>
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<tr>
<th>Cardiovascular Fitness</th>
<th>Proprioception/Balance</th>
<th>Core Stability</th>
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<tbody>
<tr>
<td>• Progress low impact cardio per symptoms – increase one variable at a time (intensity level, intervals, duration)</td>
<td>• Progress drills: Add surface challenge/perturbation on DL</td>
<td>• Advance progression of core stabilization and bridging as tolerated</td>
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<tr>
<td>*15-20 min minimal intensity, steady pace to begin</td>
<td>• Single limb activities on level surface</td>
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<td>• Directional reaching and stepping drills</td>
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**Strengthening**

• Increase workload with CKC drills:
  *Add resistance with 2 legged squatting*
  *Progress depth with single limb (step, lunge, leg press)*
  *Initiate large muscle group weight training (HS curls, leg press, calf raises, dead lift, etc.)*

**Goals:** Restore normal mechanics with single leg CKC activities; Gait speed and distance normalizing; Able to perform 2 legged squat ≥60° x 20 reps w/kinematic & symptom control; Able to maintain single leg balance ≥60 seconds; Restore normal stair climbing

*Timeframes in later phases of rehabilitation are estimates only. Patients may be progressed faster/slower based on their ability to attain goals for each phase.

*Patient to return to University of Minnesota Health Clinics and Surgery Center for physical performance testing at approximately 16 weeks post-surgery*

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Return to Sport/Occupation
**Phase V: 16-24 Weeks**

**Precautions:** Observe for return of effusion and/or pain with increased activity levels; Observe kinematic control w/CKC activities

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<tr>
<td>• Progress cardio with bike, elliptical, walking (20-25 minutes, moderate intensity, steady pace)</td>
<td>• Add Surface Challenge or Perturbation</td>
<td>• Intermediate (\rightarrow) Advanced Core poses per control</td>
<td>• Reps to fatigue w/CKC strength drills (squat, lunge) per symptoms for muscular endurance</td>
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<tr>
<td>• Initiate running program if scores ≥ 85% w/Level II Testing</td>
<td>• BOSU, Dynadisc, trunk and/or extremity movement, perturbation</td>
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<td>• Progress CKC drills with directional challenge (lunging, resisted side stepping)</td>
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<td></td>
<td>• 2 (\rightarrow) 1 limb support</td>
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<td>• Progress weight training to single leg (First eccentric phase only, then both eccen/conc)</td>
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**Phase V Goals:** Quad girth returning; Normalized walking speed and distance; Restore normal stair climbing; Able to perform 2 leg squats to ≥60° KF x 20 reps w/proper alignment (per symptoms); Able to perform a single leg squat ≥45° knee flexion with normal mechanics; Improving low-impact cardio base

*Timeframes in later phases of rehabilitation are estimates only. Patients may be progressed faster/slower based on their ability to attain goals for each phase.*

*RETURN TO RUN program initiation must be cleared by MD, likely around 6 months post op*

**Attention:**

Progression to Phases VI and VII only pertinent to patients with an athletic history who desire to return to pounding/pivoting activities. Progression based on PF joint chondral health, symptom tolerance, and patient’s return of strength, fitness and coordination.

**NOTE:** Distal transfer of tubercle osteotomy may need extended time to heal. Pain with weight-bearing at osteotomy site dictates slower progression. NO pounding activities until cleared by MD.

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**Return to Sport/Occupation**
### Phase VI: 24-28 weeks*

**Precautions:** Closely observe/instruct alignment with plyometric, agility, cutting and sport drills; Modify intensity of exercises per symptoms and L/E alignment control; Advise return to running per criteria below

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<td>• 25-40 minute workout (moderate intensity) w/3-5 brief near-maximal intensity bursts w/recovery periods&lt;br&gt; • Once able to run x 20 minutes symptom-free, initiate sprint drills&lt;br&gt; *Linear&lt;br&gt; *Focus on acceleration phase&lt;br&gt; *Progress % intensity per fatigue, symptoms</td>
<td>• 1 leg stance w/surface challenge/perturbation&lt;br&gt; • 1 leg stance w/sport simulation activity&lt;br&gt; • Dynamic movement elements:&lt;br&gt; * Dot drills&lt;br&gt; * Reaching drills&lt;br&gt; • Add resistance band at U/E or L/E for challenge</td>
<td>• Advanced Core Stability Poses&lt;br&gt; • Add challenge w/Exercise/BOSU ball under legs/trunk&lt;br&gt; • Add dynamic mvmt, plyometric elements</td>
<td>• Initiate basic 2 leg plyometric drills (emphasize controlled landing into deep squat with good alignment)&lt;br&gt; • Initiate basic agility/footwork drills (initiate quick foot chopping, feet and hips move together, no pivoting on a planted foot)</td>
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**Goals:** Normal quad girth; Able to perform 2 leg squat to 90° x 20 reps & 1 leg squat ≥60° KF x 20 reps w/kinematic & symptom control; Good self-awareness of proper kinematics w/CKC drills

### Phase VII: 28+ Weeks*

**Precautions:** Observe for return of effusion and/or pain with increased activity level and modify HEP; Closely observe alignment with plyometric, agility, cutting and sport drills

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<tr>
<td>• Continue regular cardio workouts 4-6x/wk&lt;br&gt; • Progress sprint drills:&lt;br&gt; * Increase % intensity&lt;br&gt; * Add direction change in acceleration&lt;br&gt; • Add deceleration drills&lt;br&gt; * Add direction change in deceleration</td>
<td>• Blend strength elements (CKC L/E, OKC U/E) into balance drills per control&lt;br&gt; • Continue to progress dynamic challenge elements</td>
<td>• Blend upper body/lower body strengthening elements into core stability poses</td>
<td>• Progress plyometrics:&lt;br&gt; * Increase intensity&lt;br&gt; - 2 -&gt; 1 leg take-off/land&lt;br&gt; - Traveling&lt;br&gt; - Direction change&lt;br&gt; - Surface challenge on landings (BOSU)</td>
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**Goals:** Patient to become independent with exercise program and demonstrate good self-awareness of proper L/E alignment with high level drills

*Patient will return to University of Minnesota Health Clinics and Surgery Center for physical performance testing to dictate final clearance by MD for return to sport and occupation*