

## Sports Rehabilitation & Performance Center Tibial Tubercle Transfer Guidelines© \*

The following TTT guidelines were developed by the Sports Rehabilitation and Performance Center team at Hospital for Special Surgery. Progression is both criteria-based and patient specific. Phases and time frames are designed to give the clinician a general sense of progression. Concomitant procedures such as cartilage repair (DeNovo), lateral release, medial patellofemoral ligament repair/reconstruction, as well as chronicity of condition will alter the guideline.

### Follow physician's modifications as prescribed

#### POST – OPERATIVE PHASE I (WEEKS 0-4-6)

##### GOALS:

- Independence in home therapeutic exercise (HEP) program
- Promote healing
- Control post-operative pain / swelling
- Prevent quadriceps inhibition
- ROM: 0° KE to 90° KF
- Independent ambulation NWB with crutches and brace locked in extension, on level surfaces and stairs

##### Emphasize

- Non weight bearing status
- Improving quadriceps contraction
- Controlling pain/effusion
- PROM KE
- Compliance with home instructions: cold therapy unit, CPM, bone stimulator, quad re-ed with estim unit

##### PRECAUTIONS:

- Weight bearing status
- AA-AROM KE
- Symptom provocation: quadriceps shut down, joint effusion, active inflammation
- Knee flexion range of motion as per surgeon's guidelines

##### TREATMENT RECOMMENDATIONS:

- Emphasize patient compliance to HEP and weight bearing precautions/progression
  - ✓ NWB with brace locked in extension with crutches on level surfaces and stairs
  - ✓ Cryotherapy: home cold therapy unit
  - ✓ Continuous Passive Motion: 3-4 hours/ day; with DeNovo = 5-6 hours/ day
  - ✓ Bone stimulator: 20 minutes/ day
  - ✓ Electrical stimulation for quadriceps re-education: towel roll under knee
- @ 4 weeks: sitting knee ROM exercise: A/AAROM for knee flexion, PROM for knee extension
- Patella mobilization as per instructed
- Hip progressive resisted exercises
- Distal strengthening (elastic band for triceps surae)
- Flexibility exercises (hamstrings, gastrocnemius)

##### MINIMUM CRITERIA FOR ADVANCEMENT TO NEXT PHASE:

- Radiographic evidence of adequate healing, and clearance from surgeon
- Good quadriceps contraction
- Good patellar mobility
- ROM: 0° knee extension to 90° knee flexion
- 0/10 pain at rest
- Able to SLR pain-free without quadriceps lag

## Sports Rehabilitation & Performance Center Tibial Tubercle Transfer Guidelines© \*

### POST – OPERATIVE PHASE II (WEEKS 7-12)

#### GOALS:

- Independence in HEP, as instructed
- Control pain, inflammation, effusion
- Promote healing
- ROM 0° KE - 120° KF (8 weeks), progressing to full ROM
- Good patella mobility
- Normalize gait without an assistive device
- 0/10 pain with ADLs, therapeutic exercise: Establish pain-free arc of motion
- Weight bearing progression as per surgeon's guidelines based on radiographic evidence of healing

#### Emphasize

- Symptom control with ADLs, therex
- Minimizing knee effusion
- Normal gait pattern
- Postural stability, alignment, neuro-muscular control in single limb stance

#### PRECAUTIONS:

- Sign and symptom provocation: pain, inflammation, quadriceps shut down, joint effusion
- Articular cartilage procedure (DeNovo)
- Knee flexion range of motion as per surgeon's guidelines
- Progression of weight bearing as per surgeon's prescription
- Pathological gait pattern (quadriceps avoidance; bent knee)
- Pain-free arc of motion during exercise

#### TREATMENT RECOMMENDATIONS:

- HEP: advance as tolerated.
- Continue phase I exercises, as appropriate
- Patient education: Activity modification, progression of gait training
- Cryotherapy is continued throughout rehabilitation as activity level continues to increase
- Patellar mobilization, as instructed
- ROM exercises:
  - Sitting PROM - AAROM KE to AROM - AAROM KF in a pain free arc of motion
  - Sitting progressing to supine wall ROM ( when ROM ~125°KF in sitting, control, pain-free), as tolerated
- Gait training: weeks 6-8 =weight bearing progression 20 lbs/ 2 days with brace locked in extension. Then progression to normal gait pattern with brace open or functional brace and assistive device to ensure knee flexion during loading response (beginning at 8-10 weeks); hydro-treadmill (adequate wound healing) or anti-gravity treadmill. Retro-walking to encourage n-m control with KF during loading response
- Quadriceps strengthening progression: in pain-free arc of motion (esp. w/ known articular cartilage defect)
  - Continue with Estim, biofeedback, submaximal multi angle isometrics
  - Bilateral leg press: monitor arc of motion
  - Leg press eccentric
  - Initiate forward step up (FSU) progression, 6" step
- Bicycle: progressing from short crank to standard crank as ROM allows (115° KF in sitting), 80 RPMs
- Flexibility exercises - evaluation-based: AROM knee flexion with hip extension in standing
- Advance proximal strengthening: hip extension with knee flexion, side planks, bridge progression
- Core training.
- Hydrotherapy for single limb alignment and stability, proximal strengthening
- Initiate balance and proprioceptive training: double limb support on progressively challenging surfaces to single limb support on level surface only with demonstration of good alignment, stability and n-m control

#### MINIMUM CRITERIA FOR ADVANCEMENT:

- ROM 0° KE → 130° KF
- Normal gait pattern without assistive device
- Good patella mobility
- Postural stability, alignment and neuromuscular control in single limb stance
- 0/10 pain with ADLs and therapeutic exercise
- Independent HEP

## Sports Rehabilitation & Performance Center Tibial Tubercle Transfer Guidelines© \*

### POST – OPERATIVE PHASE III (WEEKS 13-22)

#### GOALS:

- Patient education
- Control pain, effusion and inflammation
- 0/10 pain with ADLs, therapeutic exercise
- ROM: WNLs
- Normalize gait
- Good single limb dynamic balance
- Good eccentric quadriceps control
- Pelvic control during step down
- Independent HEP

#### Emphasize

- Normal gait
- Improving quadriceps strength
- Proximal stability
- Neuromuscular control
- Functional progression

#### PRECAUTIONS:

- Sign and symptom provocation: pain, and active inflammation/ effusion, quadriceps shutdown
- Gait deviations
- Overloading the joint
- Disregarding quality of movement

#### TREATMENT RECOMMENDATIONS:

- Home exercise program, as instructed
- Educate patient
- Activity modification, individualized
- Cryotherapy continues as patient activity level continues to increase
- Quadriceps strengthening: monitor arc of motion, closed chain preferred
  - FSU progression: 6" step with 0# progressing to 5# progressing to 10# on ≥ weekly basis, then 8" step with 0# progressing to 5# progressing to 10# on ≥ weekly basis
  - Eccentric leg press progressing to
  - Forward step down (FSD) progression: 6" step with 0# to 5# progressing to 10# then 8" step progression
  - Squat progression: ball squats (with buttocks moving under ball), then chair squats to free squats
- ROM exercises:
  - AAROM KE to AAROM KF in sitting and supine wall slides
- Gait training to emphasize heel-toe gait pattern with emphasis on loading response
  - Treadmill: utilize small grade elevation (%) to encourage loading response
  - Retro-walking for neuromuscular control during loading response
- Advance proximal strengthening through functional activities: bridging progression, hip extension with KF
- Hydrotherapy
- Balance activities: single limb static balance in sagittal plane then coronal plane to dynamic activities
- Address muscle imbalances – evaluation-based: 2 joint hip flexor length
- Cross training: elliptical trainer initiated with good strength during 6" FSU, bicycle (80 RPMs), swimming (crawl, back stroke)

#### CRITERIA FOR ADVANCEMENT:

- ROM WNLs
- Normalize gait
- Ability to demonstrate alignment, control, stability in single limb stance during dynamic activities
- Able to ascend an 8" step with good control
- Able to descend a 8" step with good control, and alignment
- Good postural alignment during dynamic single limb stance

## Sports Rehabilitation & Performance Center Tibial Tubercle Transfer Guidelines© \*

### POST – OPERATIVE PHASE V RETURN TO SPORT (WEEKS 23 - ?)

#### GOALS:

- Lack of pain, apprehension with sport specific movements
- Maximize strength and flexibility as to meet demands of individual's sport activity
- Symmetrical, quality of movement, alignment
- Ability to decelerate with good control, and alignment
- Isokinetic test: 85% limb symmetry index (LSI)
- Cardiovascular fitness to meet demands of sport
- Hop Test  $\geq$  85% limb symmetry

#### TREATMENT RECOMMENDATIONS:

- Continue to advance LE strengthening, flexibility & agility programs
- Advance plyometric program: with MD clearance
  - ✓ Vertical jumping progression: Jump up to Jump in place to Jump down
  - ✓ Horizontal jumping progression: Broad jump to Hop to opposite to Single leg hop
- Core stability: plank hold, side plank hold
- Single limb stability: the clock, lawnmower, single leg RDLs, tri-planar reach
- Initiate running program: with evidence of eccentric quadriceps control during 8" FSD

#### PRECAUTIONS:

- Pain with therapeutic exercise & functional activities
- Inadequate strength, functional strength, ROM, flexibility, fitness when returning to sport

#### CRITERIA FOR DISCHARGE:

- Isokinetic test: 85% limb symmetry index (LSI)
- Demonstrate symmetrical, quality movement strategies
- Medical clearance by surgeon following Return to Play program
- Hop Test  $\geq$  85% limb symmetry
- Lack of apprehension with sport specific movements
- Flexibility to meet demands of sport
- Independence with gym program for maintenance and progression of therapeutic exercise program at discharge