

NOTE: When feasible prior to surgery, it is recommended that patients have at least 0-120° ROM, no effusion and ≥ 80% of quad and hamstring strength as compared to the unaffected limb.

<h2>High Tibial Osteotomy</h2>	<p>Rehab Protocol Aaron Vandenbos, MD</p>	
<p>PHASE 1: Generally 0-6 Weeks Post-Op</p>		
<p>GOALS:</p>	<ol style="list-style-type: none"> 1) Protect surgical graft 2) ROM: full knee extension and 90° knee flexion 3) Good quadriceps control (achieve ≥ 20 SLRs with no lag) 4) Minimize pain and swelling 	
<p>PRECAUTIONS:</p>	<ul style="list-style-type: none"> - Wear brace AT ALL TIMES (even while sleeping); may unlock when sitting with knee bent - NO OPEN KINETIC CHAIN strengthening exercises - ROM: 0°-90° - Use CPM daily for at least 6-8hrs if prescribed 	
<p>CRUTCHES:</p>	<ul style="list-style-type: none"> - Weeks: 0-2: NWB - Weeks 2-6: TTWB (0-25%) - Weeks 6: PWB to WBAT 	
<p>BRACE:</p>	<ul style="list-style-type: none"> - Remains locked at 0° for WB activity for 6 weeks 	
<p>WOUND:</p>	<ul style="list-style-type: none"> - Post-op dressing remains intact until post-op day #2 (~48 hours after surgery) - Shower after post-op day #2 (no need to cover the incision site) - DO NOT SUBMERGE knee in water until 4 weeks post-op and incisions have fully healed - Suture/staple removal @ 10-14 days post-op per Ortho 	
<p>CRYOTHERAPY:</p>	<ul style="list-style-type: none"> - Cold with compression/elevation as needed (ice with compression wrap) 	
<p>REHABILITATION:</p>	<ul style="list-style-type: none"> - Begin scar massage after incision has healed and scar is formed - Perform the following rehabilitation exercises; progress as tolerated 	
<p>~ Weeks 1-2</p>	<ul style="list-style-type: none"> - AROM, AAROM 0° - 90° (heel slides, half revolutions on bike) - Calf pumps with theraband - Quad sets (use e-stim until patient is able to do 10 SLRs w/o extension lag) - Supine passive extension with towel under heel - Prone hangs as needed - Gentle HS, hip flexor and ITB stretching - SLR x4 on mat 	
<p>~ Weeks 2-4</p>	<ul style="list-style-type: none"> - Patellar mobilizations after suture/staple removal - NMES for restoration of quad function - hip/core strengthening - Standing HS curl - Ankle ROM and proprioceptive training - Progressive ankle strengthening - Isometric Quad at 90°, 64° and 45° 	
<p>~ Weeks 4-6</p>	<ul style="list-style-type: none"> - Week 6: Partial Weight-Bearing (25-75%) 	
<p>FOLLOW-UP:</p>	<ul style="list-style-type: none"> - Supervised rehab: 2-3x per week - PT re-eval: weekly - Ortho re-eval: ~2 to 4 weeks post-op 	

PHASE 2: Generally 6-12 Weeks Post-Op	
GOALS:	1) Full knee ROM 2) Minimal or no effusion 3) > 80% quadriceps and HS strength compared to the uninjured limb 4) Functional strength and control in daily activities
PRECAUTIONS:	- DO NOT SUBMERGE knee in water until 4 weeks post-op and incisions have fully healed - Unstable osteotomies may delay WB strengthening until 10 weeks - Let pain and swelling guide rehab progression. Decrease load if patient experiences an increase in osteotomy site pain - ROM to tolerance
CRUTCHES:	- Weight Bearing as Tolerated (75-100%) - Criteria to d/c crutches: Symmetric gait pattern, reciprocal stair negotiation, able to demonstrate single leg balance for 5-10 seconds
BRACE:	- Wear brace at Ortho's discretion - May be removed during rehab at therapist's discretion - D/C when sufficient quad control and normal gait are both achieved
REHABILITATION:	- Continue Phase 1 exercises as needed - Progress to the following exercises and increase intensity gradually when patient is ready (i.e. no increase in knee pain or effusion since the previous exercise session) - Recommend exercises begin with lighter intensity and higher reps with progression to higher intensity and lower reps
~ Weeks 6-8	- PROM, AAROM and AROM to regain full ROM - Stationary bike for ROM; progress to biking for conditioning - Beginner level pool exercises primarily in the sagittal plane (i.e. no breaststroke or whip kick motion) - General LE stretching (i.e. calf, HS, quads, hip flexors, and hip abductors/adductors) - Progressive strengthening <ul style="list-style-type: none"> • Leg Press: 0-45° • Multi-directional step downs 0-60° • HS Curls-6 weeks • SLRx4 on mat without brace and light resistance • Heel Raises: double leg to single leg progression • Core musculature • OKC for knee extension 90°-30° - if cleared by surgeon • Step Ups - <u>DO NOT</u> neglect the patient's overall fitness condition - Gait training as needed until normalized gait
~ Weeks 8-10	- Continue beginner level pool exercises primarily in the sagittal plane (i.e. no breaststroke or whip kick motion) - General LE stretching (i.e. calf, HS, quads, hip flexors, and hip abductors/adductors) - Mini Squats 0-45° degrees - Progress strengthening and neuromuscular retraining <ul style="list-style-type: none"> • Hurdle drills, cone drills, ladder drills, etc. - TM Walking progression
~ Weeks 10-12	- Mini Squats 60-90deg - Lunges with 90 degrees flexion - Progressive pool program as tolerated

	<ul style="list-style-type: none"> - Progressive functional training <ul style="list-style-type: none"> • 2-legged plyometrics (i.e. shuttle jumps and jump roping) • Progress DL to SL - Progressive LE and core strengthening - Heel Taps 2-4" - Step Ups 6-8" - Resisted OKC quad strengthening through full ROM begins at week 10 - Progressive neuromuscular training and balance exercises
NEUROMUSCULAR TRAINING:	- Proprioceptive training-SL BAPS, ball toss, body blade
FOLLOW-UP:	<ul style="list-style-type: none"> - Supervised rehab: 2-3x per week - PT re-eval: every 3-4 weeks - Ortho re-eval: ~12 weeks post-op

PHASE 4: Generally 3-6 Months Post-Op	
GOALS:	<ol style="list-style-type: none"> 1) Jog at own pace and distance without pain 2) Meet occupation requirements at 6-9 months
PRECAUTIONS:	- NO PARTICIPATION in sports or physically demanding military schools until cleared for return to sport by the rehabilitation team
REHABILITATION:	<ul style="list-style-type: none"> - Continue Phase 3 exercises as needed - Progress in duration and intensity of exercises (i.e. no increase in knee pain or effusion since the previous exercise session)
~ Months 3-4	<ul style="list-style-type: none"> - Knee extension & HS curl weight machine - Hip weight machine x4 - Progressive jogging program <ul style="list-style-type: none"> • Begin on Alter-G if available • Criteria for run progression: pain-free hopping and ability to perform $\geq 90\%$ of uninvolved limb max reps SL squats to $\geq 60^\circ$ knee flexion • Increase time and/or distance no more than 10 - 20% per week - Progressive functional, neuromuscular, plyometric, and agility training: <ul style="list-style-type: none"> • Jumping, hopping, directional jogging, cariocas, shuffles, etc. • SL anterior and lateral jumps • Shuttle jumps progressing to box jumps
~ Months 4-6	<ul style="list-style-type: none"> - Biodex isokinetic testing: until $> 90\%$ symmetry - Aggressive weight training - Hop test battery: until $> 90\%$ symmetry in hop for distance, triple hop for distance, crossover hop, and 6-meter timed hop - Y-balance test: until $> 90\%$ symmetry - Movement quality assessments: Landing Error Scoring System (LESS), Functional Movement Screen (FMS), etc.
FOLLOW-UP:	<ul style="list-style-type: none"> - Supervised rehab: 1-2x per week - PT re-eval: monthly - Ortho re-eval: ~6 months post-op
MISCELLANEOUS:	- After 6 months post-op, Phase 4 exercises are continued and gradually increased in intensity and duration as tolerated

These guidelines were created as a framework for the post-operative rehabilitation program. They DO NOT substitute for any specific restrictions or requirements that are determined through the necessary shared decision-making and collaboration between the operating surgeon and treating rehabilitation team.