


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

PHASE 2: Generally 6-12 Weeks Post-Op	
<b>GOALS:</b>	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
<b>PRECAUTIONS:</b>	- <b>DO NOT SUBMERGE</b> 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
<b>CRUTCHES:</b>	- 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
<b>BRACE:</b>	- 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
<b>REHABILITATION:</b>	- 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"> <li>• Leg Press: 0-45°</li> <li>• Multi-directional step downs 0-60°</li> <li>• HS Curls-6 weeks</li> <li>• SLRx4 on mat without brace and light resistance</li> <li>• Heel Raises: double leg to single leg progression</li> <li>• Core musculature</li> <li>• OKC for knee extension 90°-30° - if cleared by surgeon</li> <li>• Step Ups</li> </ul> - <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"> <li>• Hurdle drills, cone drills, ladder drills, etc.</li> </ul> - 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"> <li>- Progressive functional training <ul style="list-style-type: none"> <li>• 2-legged plyometrics (i.e. shuttle jumps and jump roping)</li> <li>• Progress DL to SL</li> </ul> </li> <li>- Progressive LE and core strengthening</li> <li>- Heel Taps 2-4"</li> <li>- Step Ups 6-8"</li> <li>- Resisted OKC quad strengthening through full ROM begins at week 10</li> <li>- Progressive neuromuscular training and balance exercises</li> </ul>
<b>NEUROMUSCULAR TRAINING:</b>	- Proprioceptive training-SL BAPS, ball toss, body blade
<b>FOLLOW-UP:</b>	<ul style="list-style-type: none"> <li>- Supervised rehab: 2-3x per week</li> <li>- PT re-eval: every 3-4 weeks</li> <li>- Ortho re-eval: ~12 weeks post-op</li> </ul>

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