

## Surgical Rehabilitation Protocol

### ACL with Posterolateral Corner (PLC) Reconstruction

The following information is to help make your recovery from surgery as smooth and rapid as possible. If you have any questions or concerns, contact Dr. Mayo's team at the number above. You will have appointments with Dr. Mayo at ~1-2 weeks and ~6 weeks postop.

#### Phase 1: Recovery from Surgery – 0-6 Weeks After Surgery

<b>Goals</b>	<ul style="list-style-type: none"> <li>• Protection of repaired structures, graft fixation (4-6 weeks) and graft primary revascularization (8 weeks)</li> <li>• Educate patient on rehab progression</li> <li>• Diminish joint swelling and pain</li> <li>• Restore patellar mobility</li> <li>• Restore full passive knee extension to 0 degrees (no hyperextension)</li> <li>• Gradually improve knee flexion to 90 degrees</li> <li>• Re-establish quadriceps control and activation</li> <li>• Restore independent ambulation within precautions</li> </ul>
<b>Precautions</b>	<ul style="list-style-type: none"> <li>• <b>Avoid hyperextension and varus force</b></li> <li>• <b>Brace:</b> Bledsoe brace locked in extension when ambulating and sleeping. May be unlocked to 0-90 degrees when non-weight bearing.</li> <li>• <b>Weight Bearing:</b> Toe touch weight bearing in brace locked in extension with crutches for 4 weeks, then 50% weight bearing.</li> <li>• <b>Range of Motion:</b> 0-90 degrees</li> <li>• <b>Wound Care:</b> No swimming or submerging in water until wounds healed</li> <li>• If performed in conjunction with meniscal repair or other surgery, defer to most restrictive guidelines</li> <li>• <b>Call Dr. Mayo if:</b> Significant wound drainage or dehiscence, purulence, erythema.</li> </ul>
<b>Therapeutic Exercises</b>  <i>See last page for example exercises</i>	<ul style="list-style-type: none"> <li>• <b>Strengthening:</b> Quad sets, four-way SLR, ankle pumps, core stabilization</li> <li>• <b>Proprioception:</b> None</li> <li>• <b>Conditioning:</b> Upper body only</li> <li>• <b>Modalities:</b> BFR, NMES</li> <li>• <b>Manual Therapy:</b> Patella and soft tissue mobilization, active and passive knee flexion to 90 degrees</li> </ul>
<b>Home Instructions</b>	<ul style="list-style-type: none"> <li>• <b>Wound Care:</b> Remove large bulky dressing on postoperative day 3. Leave white band-aids (Steri-strips) in place. Sutures will be removed at ~2 weeks in clinic.</li> <li>• <b>Bathing:</b> Showering permitted once after bulky dressing removed. No submerging in water (bath/pool/lake/etc.) for minimum 4 weeks.</li> <li>• <b>Driving:</b> Must be off all narcotic pain meds when operating vehicle             <ul style="list-style-type: none"> <li>○ 1 week for automatic cars, left leg surgery</li> <li>○ 2-4 weeks for standard/manual cars or right leg surgery</li> </ul> </li> <li>• <b>Sleeping:</b> Brace locked in extension for 2 week, OK to sleep without at 4 weeks</li> <li>• <b>Ice and Elevation:</b> Ice for 20 minutes every hour for the first week, elevate leg with knee in full extension as much as possible. Ice as needed after 1 week.</li> <li>• <b>Home Exercise:</b> As instructed by physical therapy. Quad sets and straight leg raises in brace up to 300-500 per day). Range of motion.</li> </ul>
<b>Criteria to Progress</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Knee ROM: 0-90 degrees</li> <li><input type="checkbox"/> Perform SLR without quad lag and good quad activation</li> <li><input type="checkbox"/> Normalized gait per precautions</li> <li><input type="checkbox"/> Normal patellar mobility</li> <li><input type="checkbox"/> Minimal swelling/inflammation</li> </ul>



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#### Phase 2: Early Strengthening/Neuromuscular Control – 6-12 Weeks After Surgery

<b>Goals</b>	<ul style="list-style-type: none"> <li>• Protection of graft primary revascularization (8 weeks)</li> <li>• Eliminate inflammation and swelling</li> <li>• Full knee ROM (0-135 degrees) or hyperextension if normal</li> <li>• Normal gait on all surfaces without brace or assistive device</li> <li>• Improve lower extremity strength, proprioception, balance, neuromuscular control, and confidence</li> <li>• Demonstrate stability with dynamic knee activities (no varus/valgus deviations)</li> </ul>
<b>Precautions</b>	<ul style="list-style-type: none"> <li>• <b>Brace:</b> Transition brace to completely unlocked, may remove when non-ambulating and during sleep. Must wear until 8 weeks minimum.</li> <li>• <b>Weight Bearing:</b> Full weight bearing in hinged knee brace unlocked</li> <li>• <b>Range of Motion:</b> Avoid weight bearing deep squatting past 90.</li> <li>• <b>Call Dr. Mayo if:</b> Not achieving full range of motion, large effusion.</li> </ul>
<b>Therapeutic Exercises</b>  <i>See last page for example exercises</i>	<ul style="list-style-type: none"> <li>• <b>Strengthening:</b> Advancement of multi-plane closed chain activities, open chain, core strengthening and functional standing activities</li> <li>• <b>Proprioception:</b> One leg balance, wobble boards, BAPS</li> <li>• <b>Conditioning:</b> Stationary bike, elliptical, swimming</li> <li>• <b>Modalities:</b> BFR, NMES</li> <li>• <b>Manual Therapy:</b> Patella and soft tissue mobilization, passive knee flexion to 135 degrees, prone quadriceps stretching, joint mobilization as needed</li> </ul>
<b>Home Instructions</b>	<ul style="list-style-type: none"> <li>• <b>Driving:</b> OK to drive assuming off narcotic pain medication</li> <li>• <b>Sleeping:</b> OK to remove brace</li> <li>• <b>Ice and Elevation:</b> Ice as needed for pain and swelling after activity</li> <li>• <b>Home Exercises:</b> As instructed by physical therapy</li> </ul>
<b>Criteria to Progress</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> AROM 0-125 degrees or greater</li> <li><input type="checkbox"/> Minimal swelling/inflammation</li> <li><input type="checkbox"/> No pain with exercises</li> <li><input type="checkbox"/> Normal gait on all surfaces at community level distances</li> <li><input type="checkbox"/> Satisfactory clinical exam by surgeon</li> <li><input type="checkbox"/> Quadriceps strength 75% of contralateral side</li> <li><input type="checkbox"/> Hamstrings equal bilateral</li> <li><input type="checkbox"/> Hamstrings/quadriceps ratio 66% to 75%</li> <li><input type="checkbox"/> Subjective knee scoring (modified Noyes System) 80 points or better</li> </ul>



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### Phase 3: Advanced Activity Phase – 13-24 Weeks After Surgery

<b>Goals</b>	<ul style="list-style-type: none"> <li>• Normalize lower extremity strength to &gt;85% non-involved extremity</li> <li>• Enhance muscular power and endurance</li> <li>• Improve neuromuscular control and proprioception exercises</li> <li>• Perform selected sport-specific drills</li> <li>• Initiate plyometric exercises</li> <li>• Improve aerobic endurance</li> <li>• Physician clearance to initiate return to running and functional progression</li> </ul>
<b>Precautions</b>	<ul style="list-style-type: none"> <li>• <b>Brace:</b> Short hinged knee brace for sport specific activity</li> <li>• <b>Call Dr. Mayo if:</b> Increased effusion, knee feels unstable, not full range of motion</li> </ul>
<b>Therapeutic Exercises</b>	<ul style="list-style-type: none"> <li>• Phase 2 exercises plus plyometric training added</li> <li>• Sport specific activities and skill work</li> <li>• Agility drills and cutting</li> <li>• Sport specific conditioning</li> </ul> <p><i>See last page for example exercises</i></p>
<b>Home Instructions</b>	<ul style="list-style-type: none"> <li>• <b>Home exercises:</b> Workouts in gym, focus per physical therapist</li> </ul>
<b>Criteria to Progress</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Full Range of Motion</li> <li><input type="checkbox"/> No pain with forward running, agilities, jump training, or strengthening</li> <li><input type="checkbox"/> Good knee control with single leg dynamic proprioceptive activities</li> <li><input type="checkbox"/> Lower extremity strength greater than or equal to 85% of non-involved by Cybex</li> <li><input type="checkbox"/> Single leg hop test greater or equal to 85% of non-involved</li> <li><input type="checkbox"/> Subjective knee scoring (modified Noyes System) (90 points or better)</li> <li><input type="checkbox"/> Satisfactory clinical exam</li> </ul>



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#### Phase 4: Return to Activity – 24+ Weeks after Surgery to Return

<b>Goals</b>	<ul style="list-style-type: none"> <li>• Protect graft through ligamentization process</li> <li>• Equal bilateral lower extremity strength</li> <li>• Equal bilateral balance, proprioception, power in lower extremity</li> <li>• 100% global function rating</li> <li>• Achieve maximal strength and endurance</li> <li>• Progress skill training</li> <li>• Gradual return to full-unrestricted sports</li> </ul>
<b>Precautions</b>	<ul style="list-style-type: none"> <li>• <b>Brace:</b> No brace recommended</li> <li>• <b>No return to full participation in cutting, pivoting, or contact sports until cleared by Dr. Mayo</b></li> </ul>
<b>Therapeutic Exercises</b>	<ul style="list-style-type: none"> <li>• Continue all exercises</li> <li>• Non-contact sport specific drills</li> <li>• Improve conditioning</li> </ul> <p><i>See last page for example exercises</i></p>
<b>Home Instructions</b>	<ul style="list-style-type: none"> <li>• <b>Home Exercises:</b> Workouts in gym, focus per physical therapist</li> </ul>
<b>Criteria for Full Return to Sport</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Minimum 8 months post surgery for cutting/pivoting/contact sports</li> <li><input type="checkbox"/> Limb symmetry greater than 90% on dynamometer for quad and hamstring</li> <li><input type="checkbox"/> 6 meter single leg hop for time (seconds) &gt;90% contralateral</li> <li><input type="checkbox"/> Single leg hop for distance &gt;90% contralateral leg</li> <li><input type="checkbox"/> Functional Lower Extremity Evaluation (FLEE) Test – Composite score <math>\geq</math> 90% LSI</li> <li><input type="checkbox"/> ACL-RSI &gt;75</li> <li><input type="checkbox"/> Final return to play determined by Dr. Mayo</li> </ul>



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### Sample Rehabilitation Exercises by Phase

Phase I	Phase II
Week 0-6	Week 6-12
<p style="text-align: center;"><u>Week 0-6:</u></p> <p><b><u>Range of Motion</u></b></p> <ul style="list-style-type: none"> <li>• Ankle pumps</li> <li>• When doing passive, apply slight valgus force</li> <li>• Pressure into full, passive knee extension (no hyperextension)</li> <li>• Active and passive gradual knee flexion 0-90 degree</li> <li>• Hamstring and gastrocnemius stretch</li> <li>• Heel slides, AAROM prone knee flexion, seated flexion stretch</li> </ul> <p><b><u>Strengthening</u></b></p> <ul style="list-style-type: none"> <li>• Straight leg raises (Flexion, Abduction, Adduction)</li> <li>• Quadriceps activation sets and stimulation</li> <li>• Calf strengthening</li> <li>• Multi-angle isometric at 90-60 degree extension</li> <li>• Knee extension 90-40 degrees</li> <li>• OKC passive/active joint repositioning 90,60, 30 degrees</li> </ul> <p><b><u>Manual Therapy/Modalities</u></b></p> <ul style="list-style-type: none"> <li>• NMES is strongly recommended</li> <li>• Patellar mobilization</li> <li>• Blood flow restriction</li> </ul>	<p style="text-align: center;"><u>Week 6-8:</u></p> <p><b><u>Range of Motion</u></b></p> <ul style="list-style-type: none"> <li>• Advance ROM</li> </ul> <p><b><u>Strengthening</u></b></p> <ul style="list-style-type: none"> <li>• Progress isometric strengthening program</li> <li>• Leg press (0-100 degrees)</li> <li>• Knee extension 90 to 40 degrees - Avoid open chain quad strengthening 30-0 degrees</li> <li>• Passive/active reposition OKC</li> <li>• Hamstring Curls (isotonics)</li> <li>• Hip Abduction and Adduction</li> <li>• Hip Flexion and Extension</li> <li>• Lateral Step-Overs, Lunges (straight plane and multi-plane drills)</li> <li>• Lateral Step Ups, Front Step Downs</li> <li>• Wall slides/squats</li> <li>• Vertical Squats</li> <li>• Standing or Seated Toe Calf Raises</li> </ul> <p><b><u>Endurance</u></b></p> <ul style="list-style-type: none"> <li>• Bicycle and Stair Stepper Machine</li> <li>• Pool Program (Running, agility, Backward Running, Hip and Leg Exercises)</li> <li>• Unloading treadmill walking</li> </ul> <p><b><u>Proprioception/Plyometric</u></b></p> <ul style="list-style-type: none"> <li>• Proprioception Drills</li> <li>• Biodex Stability System (Balance, Squats, etc)</li> <li>• Progress to balance and ball throws</li> <li>• Tilt board repositioning, balance, and squats (perturbation)</li> </ul> <p style="text-align: center;"><b><u>Week 8-12</u></b></p> <ul style="list-style-type: none"> <li>• Continue all exercises listed in Weeks 4-6</li> </ul> <p><b><u>Strengthening</u></b></p> <ul style="list-style-type: none"> <li>• Leg Press Sets (single leg) 0-100 degrees and 40-100 degrees</li> <li>• Isokinetic exercises (90 to 40 degrees) (120 to 240 degrees/second)</li> </ul> <p><b><u>Proprioception/Plyometric</u></b></p> <ul style="list-style-type: none"> <li>• Plyometric Leg Press</li> <li>• Biodex stability system</li> <li>• Training on tilt board</li> <li>• Perturbation Training</li> </ul> <p><b><u>Endurance</u></b></p> <ul style="list-style-type: none"> <li>• Walking Program</li> <li>• Bicycle/Stair Stepper/Elliptical Machine for endurance</li> <li>• May initiate running program (weeks 10-12) (Physician Decision) with brace</li> </ul>



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Phase III	Phase IV
Weeks 12-24	Weeks 24+
<p><b><u>Strengthening</u></b></p> <ul style="list-style-type: none"> <li>• Continue strengthening - advance resistance and repetitions (ball hamstring curls, single leg press, core stabilization)</li> <li>• Continue all strengthening drills</li> <li>• Leg press</li> <li>• Wall squats</li> <li>• Hip Abd/Adduction</li> <li>• Hip Flex/Ext</li> <li>• Knee Extension 90-40</li> <li>• Hamstring curls</li> <li>• Standing toe calf raises</li> <li>• Step down</li> <li>• Lateral step ups</li> <li>• Lateral lunges</li> <li>• Plyometric leg press</li> <li>• Neuromuscular training</li> <li>• Lateral step-overs cones</li> <li>• Tilt board drills</li> <li>• May initiate lateral agility drills</li> <li>• Backward running</li> <li>• Spin bike</li> <li>• Cybex training</li> </ul> <p><b><u>Proprioception/Plyometric</u></b></p> <ul style="list-style-type: none"> <li>• Pre-running exercises (low skips, punch steps, double punch steps, hurdle walks, high skips, kickbacks, step-overs)</li> <li>• Advance proprioceptive exercises (BOSU, single leg dynamic balance, dual task balance)</li> <li>• Agility drills (ladder, side shuffles, crossovers, backwards run, quick start/stops, zig-zags, cutting)</li> <li>• Jump training (shuttle training, trampoline, landing technique, box jumps, single leg hops, tuck jumps)</li> <li>• Return to running – treadmill, with transition to level outdoor surfaces</li> </ul> <p><b><u>Endurance/Sport Specific</u></b></p> <ul style="list-style-type: none"> <li>• Initiate running program (weeks 10-12) (Physician Decision) with brace</li> <li>• May initiate light sport program (golf) (Surgeon Decision) with brace</li> </ul>	<ul style="list-style-type: none"> <li>• Continue strengthening exercises</li> <li>• Continue neuromuscular control drills</li> <li>• Continue plyometrics drills</li> <li>• Progress running and agility program</li> <li>• Gradually progress level of participation in sport specific training</li> <li>• Running/cutting/agility drills</li> <li>• Gradual return to sport drills</li> <li>• Running on all surfaces</li> </ul>

