

## ACL Reconstruction Rehabilitation Protocol

### Prehab Phase

From time of injury to surgery	
Rehabilitation Goals	<ul style="list-style-type: none"> <li>• Control and management of pain and swelling</li> <li>• Establish pain free full passive range of motion (ROM) into both flexion and extension</li> <li>• Establish a strong volitional isometric quadriceps contraction while in full knee extension</li> <li>• Progress exercises to develop strength sufficient to increase functional status, normal gait, and ADLs</li> </ul>
Weight Bearing	<ul style="list-style-type: none"> <li>• Allow weight bearing to tolerance as joint stability with/without assistive device as needed</li> </ul>
Brace	<ul style="list-style-type: none"> <li>• Fit patient with post-operative knee brace to provide external stability if needed</li> <li>• Provide education on use of brace for after surgery</li> </ul>
Precautions	<ul style="list-style-type: none"> <li>• Avoid exercises that create pain or swelling</li> <li>• No impact or rotational activities</li> </ul>
Treatment Strategies	<ul style="list-style-type: none"> <li>• Extension: towel stretch</li> <li>• Flexion: heel slide variations as tolerated</li> <li>• Strength exercises as tolerated</li> <li>• Gait training</li> <li>• No impact or rotational activities</li> <li>• Discuss nutritional strategies for athletes during recovery and rehabilitation</li> <li>• Instruction and discussion on initial post op exercises</li> </ul>
Cardiovascular Exercise	<ul style="list-style-type: none"> <li>• Upper body ergometer (UBE) or similar exercise</li> </ul>
Advancement Criteria	<ul style="list-style-type: none"> <li><input type="checkbox"/> Minimal effusion</li> <li><input type="checkbox"/> Full passive extension equal to contralateral limb</li> <li><input type="checkbox"/> Equal pain free active and passive ROM equal to contralateral limb of at least 120 degrees</li> <li><input type="checkbox"/> Able to ambulate with normal gait pattern, using an assistive device and/or brace, as needed</li> <li><input type="checkbox"/> Able to establish a volitional quadriceps contraction</li> <li><input type="checkbox"/> Patient education on post-operative exercises and need for compliance</li> <li><input type="checkbox"/> Educate in ambulation with crutches</li> </ul>

## ACL Reconstruction Rehabilitation Protocol

### Phase 1: Immediate Post-Op Rehabilitation Phase

Surgery to completion of Phase 1 criteria, approximately 2-3 weeks	
Time frames for each phase may be extended if the repair is delayed or the surgery included other associated injuries (i.e., additional ligament repair or reconstruction, meniscal repair, etc.)	
Rehabilitation Goals	<ul style="list-style-type: none"> <li>• Protection of the healing graft</li> <li>• Control pain and joint effusion</li> <li>• Maintain good patellar mobility</li> <li>• Restore quadriceps function and leg control</li> <li>• Gait re-education</li> <li>• Adherence to home exercise program (HEP) and precautions</li> </ul>
Weight Bearing	<ul style="list-style-type: none"> <li>• Weight bearing as tolerated (WBAT) beginning with crutches</li> <li>• Progress to pain free and normalized gait without assistive device</li> </ul>
Brace	<ul style="list-style-type: none"> <li>• Post-operative brace for 6 weeks</li> <li>• Brace locked for first 2 weeks, then progressing to unlocked as patient establishes leg control, pain control and normal gait mechanics in a safe environment</li> <li>• <b>Dr. Looby and Dr. Watson brace unlocked at all times</b></li> </ul>
Precautions	<ul style="list-style-type: none"> <li>• Avoid unsafe surfaces and environments</li> </ul>
Treatment Strategies	<ul style="list-style-type: none"> <li>• Brace off for exercises</li> <li>• Patellar mobilizations</li> <li>• Ankle pumps</li> <li>• Flexion: heel slide variations</li> <li>• Extension: towel stretch with heel elevated and other variations</li> <li>• Quad sets</li> <li>• Straight leg raises in multiple directions</li> <li>• Weight shifts</li> <li>• Mini squats</li> <li>• Ground based proprioceptive training (No Airex pad, BOSU, etc.)</li> <li>• Gait training</li> <li>• NMES: VL and VMO, max tolerable intensity isometric at ~60 degrees flexion</li> <li>• BFR allowed when appropriate</li> </ul>

## ACL Reconstruction Rehabilitation Protocol

### Phase 1: Immediate Post-Op Rehabilitation Phase (Cont.)

Cardiovascular Exercise	<ul style="list-style-type: none"> <li>• UBE or similar exercise</li> </ul>
Criteria for advancement to Phase 2	<ul style="list-style-type: none"> <li><input type="checkbox"/> Prone passive knee flexion to at least 90 degrees</li> <li><input type="checkbox"/> Knee extension equal with contralateral side up to 5 degrees hyperextension</li> <li><input type="checkbox"/> Near normal gait without crutches</li> <li><input type="checkbox"/> Full quadriceps activation quantified by no lag on SLR for 10 repetitions</li> <li><input type="checkbox"/> Minimal, controlled joint effusion</li> </ul>

## ACL Reconstruction Rehabilitation Protocol

### Phase 2: Early Post-Op Rehabilitation Phase

Begin after meeting Phase 1 criteria, at approximately 2-6 weeks

Time frames for each phase may be extended if the repair is delayed or the surgery included other associated injuries (i.e., additional ligament repair or reconstruction, meniscal repair, etc.)

Rehabilitation Goals	<ul style="list-style-type: none"> <li>• Maintain full passive knee extension</li> <li>• Increase active and passive flexion to tolerance, progressing to full in hip extended positions</li> <li>• Normalize gait</li> <li>• Avoid oversteering the graft and harvest site</li> <li>• Closed chain leg control for non-impact movement control</li> <li>• Maintain understanding and adherence to HEP</li> </ul>
Precautions	<ul style="list-style-type: none"> <li>• No active inflammation or reactive swelling</li> <li>• Brace unlocked in safe situations if able to ambulate without compensation</li> <li>• Avoid reciprocal descent of stairs until adequate quad control and proper lower extremity alignment are present</li> <li>• Avoid pain with therapeutic exercise and functional activities</li> </ul>
Treatment Strategies	<ul style="list-style-type: none"> <li>• Brace off for exercises</li> <li>• Scar massage</li> <li>• Flexion ROM</li> <li>• Extension: towel stretch with heel elevated and other variations</li> <li>• Straight leg raises in multiple directions</li> <li>• Bridging</li> <li>• Closed chain strengthening for quads and glutes</li> <li>• Step up exercises</li> <li>• Initiate hip hinge movement</li> <li>• Hip and core strengthening</li> <li>• Proprioceptive training</li> <li>• Gait training</li> <li>• NMES: VL and VMO, until full active extension achieved</li> <li>• BFR allowed when appropriate</li> </ul>
Cardiovascular Exercise	<ul style="list-style-type: none"> <li>• Stationary bike with low resistance as ROM permits</li> <li>• Elliptical, with no compensations; begin with decreased incline</li> <li>• UBE or similar exercise</li> </ul>

## ACL Reconstruction Rehabilitation Protocol

### Phase 2: Early Post-Op Rehabilitation Phase (Cont.)

Criteria for advancement to Phase 3	<ul style="list-style-type: none"> <li><input type="checkbox"/> Full active extension</li> <li><input type="checkbox"/> Prone passive flexion to 120 degrees</li> <li><input type="checkbox"/> Normal symmetrical gait</li> <li><input type="checkbox"/> Able to squat to greater than or equal to 90 degrees of knee flexion with appropriate weight bearing symmetry</li> <li><input type="checkbox"/> No reactive swelling</li> </ul>
-------------------------------------	--

## ACL Reconstruction Rehabilitation Protocol

### Phase 3: Strengthening and Control Rehabilitation Phase

Begin <u>after</u> meeting Phase 2 criteria, Not before 6 weeks until approximately 12-18 weeks	
Rehabilitation Goals	<ul style="list-style-type: none"> <li>• Maintain full ROM</li> <li>• Improvement in strength, endurance and efficient movement patterns</li> <li>• Adherence to HEP</li> </ul>
Precautions	<ul style="list-style-type: none"> <li>• Avoid stressing the graft and harvest site</li> <li>• No active inflammation or reactive swelling</li> <li>• Avoid pain with therapeutic exercise and functional activities</li> <li>• Avoid running, pivoting, and sports</li> </ul>
Treatment Strategies	<ul style="list-style-type: none"> <li>• Advancement of lower body strength exercises               <ul style="list-style-type: none"> <li>◦ Double leg, split stance, single leg</li> </ul> </li> <li>• Squat movement variations (No back squats)</li> <li>• Hip hinge movement variations</li> <li>• Knee dominant hamstring and quad strengthening</li> <li>• Step-up/step down exercises</li> <li>• Shuttle press</li> <li>• Isotonic knee extensions (ROM 90-40 degrees); <b>MUST</b> be pain free</li> <li>• Advanced proprioception exercises (perturbations)</li> <li>• Hip and core strengthening</li> <li>• Progress into snap-down exercises as nearing the end of this phase</li> <li>• BFR allowed when appropriate but emphasis should be for progressing to normally loaded exercises</li> </ul>
Cardiovascular Exercise	<ul style="list-style-type: none"> <li>• Stationary bike, progress into interval workouts</li> <li>• Elliptical</li> </ul>
Progression Criteria	<ul style="list-style-type: none"> <li><input type="checkbox"/> ROM within normal limits</li> <li><input type="checkbox"/> Swelling &lt;1cm different and stable</li> <li><input type="checkbox"/> Able to perform double leg squat with proper lower chain mechanics, trunk and pelvis stability and without pain</li> <li><input type="checkbox"/> Able to forward descend 8 inch step pain free with good control</li> <li><input type="checkbox"/> Able to perform single leg squat to 90 degrees without pain or to the degree symmetrical to the contralateral limb</li> </ul>

## ACL Reconstruction Rehabilitation Protocol

### Phase 4: Functional Rehabilitation Phase

Begin after meeting Phase 3 criteria, at approximately 12-18 weeks

Begin <u>after</u> meeting Phase 3 criteria, at approximately 12-18 weeks	
Rehabilitation Goals	<ul style="list-style-type: none"> <li>• Maximization of strength and mobility to meet demands of ADLs</li> <li>• No joint effusion</li> </ul>
Precautions	<ul style="list-style-type: none"> <li>• Protection of the graft</li> <li>• No active inflammation or reactive swelling</li> <li>• Avoid pain with therapeutic exercise and functional activities</li> <li>• Avoid cutting/pivoting, and sports</li> </ul>
Treatment Strategies	<ul style="list-style-type: none"> <li>• Advancement of lower body strength exercises <ul style="list-style-type: none"> <li>○ Double leg, split stance, single leg</li> <li>○ Multiple planes of motion</li> <li>○ Progress exercises by increasing loads, set/rep schemes</li> </ul> </li> <li>• Squat movement variations</li> <li>• Hip hinge movement variations</li> <li>• Knee dominant hamstring and quad strengthening</li> <li>• Shuttle press</li> <li>• Hip and core strengthening</li> <li>• Isotonic knee extensions (ROM 90-40 degrees); MUST be pain free</li> <li>• Progression of plyometric exercises <ul style="list-style-type: none"> <li>○ Emphasis on proper landing technique</li> <li>○ Double leg snap down, double leg quick response plyometrics</li> <li>○ Single leg snap down, single leg quick response plyometrics</li> <li>○ Progress to double leg max power jumps progressed to single leg</li> </ul> </li> <li>• Not before 4 months and once good control on single leg quick response plyometrics: Progression to running (short duration intervals)</li> <li>• BFR allowed when appropriate but emphasis should be put on progressing to normally loaded exercises</li> </ul>
Cardiovascular Exercise	<ul style="list-style-type: none"> <li>• Stationary bike</li> <li>• Elliptical</li> </ul>
Progression Criteria	<ul style="list-style-type: none"> <li><input type="checkbox"/> Pain free with all treatment strategies listed above</li> <li><input type="checkbox"/> Full and equal ROM on both lower extremities</li> <li><input type="checkbox"/> Achievement of &gt;75% quad index</li> <li><input type="checkbox"/> Normal running gait</li> <li><input type="checkbox"/> Jumping without difficulty</li> <li><input type="checkbox"/> No reactive swelling</li> </ul>

## ACL Reconstruction Rehabilitation Protocol

### Phase 5: Return to Sport Training Phase

Begin <u>after</u> meeting Phase 4 criteria, at approximately 20 weeks until full clearance	
Rehabilitation Goals	<ul style="list-style-type: none"> <li>• Sports specific training without pain, swelling or difficulty</li> <li>• 90% limb symmetry on quad index and functional hop testing</li> <li>• Enhance overall muscular power and endurance</li> <li>• Improve neuromuscular control</li> <li>• Confidence with high velocity multi-planar movements without side-to-side differences or compensations</li> </ul>
Precautions	<ul style="list-style-type: none"> <li>• Avoid pain with therapeutic exercise and functional activities</li> <li>• Avoid sports until criteria met along with physician clearance</li> </ul>
Treatment Strategies	<ul style="list-style-type: none"> <li>• Advancement of lower body strength exercises               <ul style="list-style-type: none"> <li>○ Double leg, split stance, single leg</li> <li>○ Multiple planes of motion</li> <li>○ Progress exercises by increasing loads, set/rep schemes</li> </ul> </li> <li>• Progression to total body performance strength programming</li> <li>• Addition strength exercises to focus on deficits</li> <li>• Plyometric exercises               <ul style="list-style-type: none"> <li>○ Quick response plyometrics</li> <li>○ Max power jumps</li> </ul> </li> <li>• Running, cutting, agility and deceleration drills</li> <li>• Gradual progression into return to sport drills</li> </ul>
Cardiovascular Exercise	<ul style="list-style-type: none"> <li>• Progressive running program, designed to use sport specific energy systems</li> </ul>
Progression Criteria	<ul style="list-style-type: none"> <li><input type="checkbox"/> Achievement of &gt;90% quad index</li> <li><input type="checkbox"/> Lack of apprehension with sport-specific movement</li> <li><input type="checkbox"/> Independence in maintenance HEP</li> <li><input type="checkbox"/> No residual soreness or swelling</li> <li><input type="checkbox"/> Advancement through practice continuum</li> <li><input type="checkbox"/> At least 7 months post op <u>AND</u> all other criteria met</li> </ul>