



# ACL Reconstruction Protocol Phase 1

Purpose		Precautions
Maximum Protection	<ul style="list-style-type: none"><li>• Avoid active knee extension 40°-0°</li><li>• Avoid ambulation without knee brace locked at 0° (until patient able to do SLR w/o lag)</li><li>• Avoid standing and walking for a prolonged period</li><li>• Hamstring Graft: Avoid isolated resisted hamstring exercises</li></ul>	
Typical Time Frame		
0-3 Weeks		
Criteria to Pass		
<ul style="list-style-type: none"><li>• 0°-100° of knee AROM in supine</li><li>• Able to perform 1 SLR without lag</li><li>• Comfortable with unilateral weight bearing</li></ul>		
Priority List & Suggested Exercises		
<ol style="list-style-type: none"><li><b>1. Knee Extension ROM</b><ol style="list-style-type: none"><li>a. Low Load Long Duration: Extension prop, Prone hangs, Foot on Ottoman (add weight or ice to all)</li><li>b. Manual Techniques: AP glide of femur on tibia, Patella mobs (superior glides), Passive extension overpressure (add quad set)</li><li>c. Quad sets with NMES</li><li>d. Stretches: Hamstring &amp; Slantboard</li></ol></li><li><b>2. Knee Flexion ROM</b><ol style="list-style-type: none"><li>a. PROM: Seated knee bend off table, Physioball knee flexion (supine), Heel slides, Wall slides, Shuttle press, Standing knee flexion on step</li><li>b. Nu-step and bike (½ revolutions into full)</li><li>c. Manual Techniques: Patella mobs (inferior glides)</li></ol></li><li><b>3. Quad Activation</b><ol style="list-style-type: none"><li>a. Quad sets with NMES (pushing into towel roll, 10sec hold)</li><li>b. SLR with NMES (quad set &gt; into SLR &gt; reset)</li></ol></li><li><b>4. Gait Training</b><ol style="list-style-type: none"><li>a. Weight shifting with UE assistance</li><li>b. Gait training with crutches</li><li>c. Low hurdle gait training</li><li>d. Calf raises</li></ol></li></ol>		
Special Considerations		
<ul style="list-style-type: none"><li>• Meniscus Repair: Typical time frame will be pushed back about 6 weeks as patient may be NWB and have knee flexion restrictions</li><li>• Swelling: compression, elevation, ice, retrograde massage</li><li>• NMES: Use with all quad exercises in phase 1</li><li>• BFR: use as soon as patient able to get a good quad contraction</li><li>• Incision: inspect frequently to ensure healing and closing</li></ul>		

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# ACL Reconstruction Protocol Phase 2

Purpose		Precautions
Protection	• Hamstring Graft: Avoid isolated resisted hamstring exercises • Patella Graft: Avoid deep squatting • No resisted knee extension past 60°	
Typical Time Frame		
3-6 Weeks		
Criteria to Pass		
<ul style="list-style-type: none"><li>• 0°-125° of knee AROM in supine</li><li>• SLS x 30sec without LOB</li><li>• 30 consecutive SLR without lag</li><li>• Normal gait pattern without AD and with full terminal knee extension</li></ul>		
Priority List & Suggested Exercises		
<ol style="list-style-type: none"><li><b>1. Knee Extension ROM</b><ol style="list-style-type: none"><li>a. Continue Phase 1 exercises (add sets and reps per discretion)</li></ol></li><li><b>2. Knee Flexion ROM</b><ol style="list-style-type: none"><li>a. Continue Phase 1 exercises (add sets and reps per discretion); More aggressive PROM &amp; AAROM</li><li>b. Bike (full revolutions)</li><li>c. Manual prone quad stretch</li></ol></li><li><b>3. Quad Activation</b><ol style="list-style-type: none"><li>a. 4-way SLR with (NMES only for forward)</li><li>b. TKEs with NMES (banded, ball behind knee, big ball behind knee, prone)</li><li>c. Kicking into physio ball isometric holds (begin at 90° and progress to 60°)</li><li>d. Leg press into physioball with NMES</li><li>e. SAQ with NMES &gt; LAQ with NMES (no resistance)</li></ol></li><li><b>4. Gait Training</b><ol style="list-style-type: none"><li>a. SLS no UE support &gt; SL balance reaches</li><li>b. Gait training without crutches (forward and retro) &gt; progress to sled (pulling and pushing)</li><li>c. Low hurdle (reciprocal pattern) &gt; high hurdle (step to) &gt; high hurdle (reciprocal pattern)</li><li>d. Calf Raises</li></ol></li></ol>		
Special Considerations		
<ul style="list-style-type: none"><li>• Swelling: compression, elevation, ice, retrograde massage</li><li>• NMES: Use for at least 10 minutes until patient can perform unweighted SAQ and LAQ = ROM to uninvolved LE</li><li>• BFR: use as soon as patient able to get a good quad contraction (start at 50% and progress to 80% per patient tolerance and use most of session)</li><li>• Incision: Should be closed by 6 weeks</li><li>• Programming: High volume for exercises 2-3 sets of 12-15 reps</li><li>• Consider aerobic conditioning for HEP throughout all phases to maintain aerobic capacity</li></ul>		

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# ACL Reconstruction Phase 3

Purpose	Precautions
<b>Functional Restoration</b>	<ul style="list-style-type: none"> <li>• Avoid exercises that are painful and cause swelling</li> <li>• Don't initiate running</li> <li>• No resisted knee extension past 60°</li> </ul>
<b>Typical Time Frame</b>	
<b>6-12 Weeks</b>	

## Criteria to Pass

- Knee ROM is restored to 95% of the uninvolved knee in supine
- Ascend/descend stairs reciprocal pattern without pain or UE assist
- 5 steps ups (10" step)
- 5 lateral step downs (8" step)
- Squat symmetrically to 90°
- Y balance reach 80% of uninvolved side without hip strategy

## Priority List & Suggested Exercises

### 1. Knee Flexion ROM

- Continue Phase 2 exercises (add sets and reps per discretion)
- Manual: More aggressive PROM, cupping to distal quad/scar, Knee flexion with manual tibial internal rotation, IASTM to scar tissue
- Mobility: Prone quad stretch, Couch stretch, Flossing with knee ROM, Knee circles
- AAROM: Shuttle press, TRX squat

### 2. Anterior Chain Strength

- Continue SAQ and/or LAQ with NMES and isometric knee extension at 60°
- Isotonic leg extension 90°-60° (unweighted > ankle weight > cable resistance)
- Wall sit progression
- Heavy banded TKEs/Shuttle Press TKEs
- SL Shuttle press

### 3. Functional Strength

- Squat progression
- Step ups progression
- LSD progression

### 4. Posterior Chain Strength

- Bridge progression
- Hamstring curls progression
- Quadruped hip extension over bench holds
- Double leg hip thruster holds
- SL RDL reaches
- Calf raise variations

### 5. Lateral Chain Strength

- Clamshells > Side lying abduction
- Stork stance holds
- Sidelying shuttle press
- Hip hike holds > hip hike reps

## Special Considerations

- BFR: Continue to use in the earlier part of PT session
- NMES: Use for at least 10 minutes until patient can perform unweighted SAQ and LAQ = ROM to uninvolved LE
- Motor Control: If there is still a difference between AROM/PROM focus on end range strengthening and isometrics
- Programming:
  - High Volume Exercises 2-3 sets of 12-15 reps
  - 3:1:1 anterior chain to posterior chain to lateral chain strengthening ratio
  - Complete 1x25 reps on uninvolved leg for anterior chain exercises and same sets/reps for posterior and lateral chain
- Collaborate with surgeon if patient continues to have difficulty w/ ROM at 12 weeks for possible manipulation or cortisone injection
- Ligamentization: Typically occurs during phase 3 between 4-12 weeks



# ACL Reconstruction Phase 4

Purpose		Precautions
Progressive Overload		<ul style="list-style-type: none"><li>• Avoid exercises that are painful and cause swelling</li><li>• Don't initiate running</li></ul>
Typical Time Frame		
8-16 Weeks		
Criteria to Pass		
<ul style="list-style-type: none"><li>• Y balance reach 95% of uninvolved side without hip strategy in supine</li><li>• 30 lateral step downs (8" step, back flat against wall) with no hip compensation</li><li>• 15 forward step downs (8" step)</li></ul>	<ul style="list-style-type: none"><li>• 25 SL bridges on bench (knee bent at 20°)</li><li>• 25 SL calf raises (10° incline to 60bpm metronome)</li><li>• 25 SL squats to box (20") with minimal trunk flexion</li></ul>	
Priority List & Suggested Exercises		
<b>1. Anterior Chain Mobility</b> <ul style="list-style-type: none"><li>a. Dip bar assisted slantboard squat &gt; slantboard squat &gt; dip bar assisted exaggerated split squat on step &gt; no step</li><li>b. Couch Stretch, Prone quad stretch</li></ul>	<b>3. Functional Strength</b> <ul style="list-style-type: none"><li>a. LSD progression</li><li>b. Forward step down progression</li><li>c. SL squat progression</li></ul>	
<b>2. Anterior Chain Strength</b> <ul style="list-style-type: none"><li>a. Full ROM LAQ &gt; Ankle Weight &gt; Cable resistance</li><li>b. Double leg extension on machine 90°-60° progressing to 90°-45°</li><li>c. Sled Pulls/Sled Pushes</li><li>d. Kickstand squat on wall &gt; Goblet squat</li><li>e. Eccentric Shuttle press (up w/ 2, down w/ 1)</li></ul>	<b>4. Posterior Chain Strength</b> <ul style="list-style-type: none"><li>a. Hip thruster progression</li><li>b. RDL progression</li><li>c. Hamstring curl progression</li><li>d. Calf raise variations</li></ul>	
	<b>5. Lateral Chain Strength</b> <ul style="list-style-type: none"><li>a. Lateral squat progression</li><li>b. Stork stance banded reps</li><li>c. Lateral band walks/skaters</li><li>d. Side plank progression</li></ul>	
Special Considerations		
<ul style="list-style-type: none"><li>• BFR: Continue to use in the earlier part of PT session</li><li>• NMES: Use for at least 10 minutes until patient can perform unweighted SAQ and LAQ = ROM to uninvolved LE</li><li>• Motor Control: If there is still a difference between AROM/PROM focus on end range strengthening and isometrics</li><li>• Programming:<ul style="list-style-type: none"><li>◦ 3 sets of 6-12 reps with anterior and functional exercises focusing on strength</li><li>◦ 3:1:1 anterior chain to posterior chain to lateral chain strengthening ratio</li><li>◦ Tempo: 4-1-2 w/ emphasis on eccentric control</li><li>◦ Complete 1x25 reps on uninvolved leg for anterior chain exercises and same sets/reps for posterior and lateral chain</li></ul></li><li>• Ligamentization: Typically occurs during phase 3 between 4-12 weeks - make sure to manage front knee pain</li></ul>		

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# ACL Reconstruction Phase 5

Purpose	Precautions
Intro to Impact	<ul style="list-style-type: none"> <li>• Avoid exercises that are painful and cause swelling</li> <li>• Don't initiate running until patient has passed the criteria below for return to jogging</li> </ul>
Typical Time Frame	
12-24 Weeks	

## Criteria to Pass

<b>To Begin Jogging: (Use Strengthlevel.com)</b> <ul style="list-style-type: none"> <li>• 12 reps at 70% of Novice Goblet Squats</li> <li>• 12 reps at 70% of Novice Forward Lunges</li> <li>• 12 reps at 70% of Novice DB RDLs</li> <li>• &lt;30% quad strength deficit for average force with Isometric testing at 60° knee flexion</li> <li>• 15 SL hops in place w/ good load acceptance &amp; landing in same spot</li> </ul>	<b>To Move Onto Phase 6:</b> <ul style="list-style-type: none"> <li>• ATHLETES: Run 1mi w/o limping</li> <li>• GENERAL POP: Jog 5min w/o limping</li> <li>• Sprint w/o compensation</li> <li>• Land symmetrical &lt;10% difference w/ 5 squat jumps on Force Plates</li> <li>• Decel efficiently in the sagittal plane</li> </ul>
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## Priority List & Suggested Exercises

<b>1. Anterior Chain Strength</b> <ol style="list-style-type: none"> <li>Split squat isometric holds</li> <li>Slantboard step downs</li> <li>Single leg extension on machine 90°-60°</li> <li>Double leg extension holds on machine at 0° &gt; Single leg</li> <li>Full ROM double leg extension on machine &gt; Single leg</li> <li>Shuttle press variations</li> </ol>	<b>3. Agility/Impact</b> <ol style="list-style-type: none"> <li>Agility ladder (basic coordination)</li> <li>Mini hops &gt; Jogging progression &gt; hop &amp; stop &gt; UE assisted treadmill intervals</li> <li>Deceleration: snap down progression &gt; cable decels &gt; multiplanar hops &gt; ladder decels &gt; change of pace &gt; stop &amp; goes</li> <li>Jump progression</li> </ol>
<b>2. Functional Strength</b> <ol style="list-style-type: none"> <li>Lunge progression</li> <li>Loaded step up variations</li> <li>Loaded goblet squat progression</li> <li>Loaded LSD &amp; Forward step downs</li> </ol>	<b>4. Posterior Chain Strength</b> <ol style="list-style-type: none"> <li>Hamstring curl progression</li> <li>Hip thruster progression</li> <li>Deadlift/RDL variations</li> <li>Nordic progression</li> <li>Calf raise variations</li> </ol>
	<b>5. Lateral Chain Strength</b> <ol style="list-style-type: none"> <li>Lateral squat variations</li> <li>Copenhagens</li> <li>Anti-rotation and balance training</li> </ol>

## Special Considerations

<ul style="list-style-type: none"> <li>• Stretching: Continue quad stretching (prone quad and couch stretch)</li> <li>• Quad Strength: Constant focus to improve quad strength and decrease quad deficit</li> <li>• Isometric Testing: Quad strength testing at 60° to reduce stress on ACL graft</li> <li>• Programming: <ul style="list-style-type: none"> <li>◦ 2:1:1 anterior chain to posterior chain to impact exercises</li> <li>◦ Increase sets to 4 with reps 6-12 specifically for anterior and functional exercises</li> <li>◦ No &gt; 2-3 sets of 3-5 reps for agility/impact exercises</li> <li>◦ Once patient has started to jog begin same sets/reps for all exercises on uninvolved LE</li> </ul> </li> </ul>
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# ACL Reconstruction Protocol Phase 6

Purpose	Precautions
Deceleration	<ul style="list-style-type: none"> <li>Don't initiate cutting until patient has passed the criteria below for return to cutting</li> </ul>
Typical Time Frame	
5-8 Months	

## Criteria to Pass

### To Begin Cutting: (Use Strengthlevel.com)

- 8 reps at 80% of Intermediate Goblet Squats
- 8 reps at 80% of Intermediate Forward Lunges
- 8 reps at 80% of Intermediate DB RDLs
- <20% quad strength deficit for average force with isometric testing at 60° knee flexion

### To Move Onto Phase 7:

- SL hop test >80% LSI with average of 3 trials
- <20% deficit for Deceleration RFD and Peak Force with landing w/ 3 SL Countermovement Jump on Force Plates

## Priority List & Suggested Exercises

### 1. Agility/Impact

- Medicine ball drops
- Weighted hops > 3-way hurdle hop
- Hop over hurdle in sagittal plane > hurdle hop into lateral plane
- Hop over hurdle (lateral plane) > transition hops
- Lateral shuffles, reactive cutting, pro agility drill, T-test drill
- Cutting footwork drill > cone cutting > reactive cone cutting

### 2. Anterior Chain Strength

- Heavy SL machine extension
- Advanced Shuttle Press variations
- Leg Extensions on Excentric
- Squat Variations

### 3. Functional Strength

- Continue with Phase 5 exercises
- Add more load to functional movements
- Excentric: squat, split squat

### 4. Posterior Chain Strength

- Hamstring curl progression
- Hip thruster progression
- Deadlift/RDL variations
- Nordic progression
- KB swings
- Calf raise variations

### 5. Lateral Chain Strength

- Lateral step ups
- Lateral squat variations
- Excentric: lateral lunges
- Rotational deadlifts

## Special Considerations

- Icing & Stretching: At the end of session or at home; Continue prone quad & couch stretch)
- Programming:
  - No > 3-4 sets of 3-5 reps agility
  - 2:1 Power to Strength ratio
  - Undulated Loading Model: Example: Mon - Mod intensity; Wed - High intensity; Fri - High volume
  - Rest Days: At least 3 days off
  - Tempo: 0-0-0 Decelerate the load and transition to acceleration as fast as possible
  - Plyometrics should be done prior to strengthening in order to avoid fatigue
  - Once patient can tolerate advanced plyometrics for multiple sets/reps without pain and with good form you can begin supersetting strength with power
- Conditioning: Begin through cross training on elliptical, bike, rower, jogging



# ACL Reconstruction Protocol Phase 7

Purpose		Precautions
Return to Sport	<ul style="list-style-type: none"><li>• Patient should remain non-contact until at least 9 months post op or until they get through the criteria to pass (whichever comes last)</li></ul>	
Typical Time Frame		
6-12 Months		
Criteria to Pass		
<ul style="list-style-type: none"><li>• SL hop test &gt;95% LSI with average of 3 trials</li><li>• Triple hop test &gt;95% LSI with average of 3 trials</li><li>• &lt;10% quad strength deficit for average force with isometric testing at 60° knee flexion</li></ul>	<ul style="list-style-type: none"><li>• Girth measurements of the quad within 1 cm of non-surgical limb</li><li>• Hamstring/Quadriceps ratio at 60% using seated isometric testing at 60° of knee flexion</li><li>• ACL RSI 80% or greater score</li></ul>	
Priority List & Suggested Exercises		
<p><b>1. Agility/Impact</b></p> <ul style="list-style-type: none"><li>a. Continue with phase 6 agility/impact exercises until performing proficiently</li><li>b. Depth jump progression</li></ul> <p><b>2. Complex Training: Compound Exercise at 80% 1RM (4 reps) followed by a plyometric jump exercise that mimic the same motor pattern (3 reps); 3-6 sets</b></p> <ul style="list-style-type: none"><li>a. <b>Anterior Chain Complex Example:</b> Front Squats followed by Squat Jumps</li><li>b. <b>Posterior Chain Complex Example:</b> Barbell RDLs followed by KB Swings</li><li>c. <b>Lateral Chain Complex Example:</b> Lateral Lunges &gt; Skaters</li></ul>	<p><b>3. Contrast Training</b></p> <ul style="list-style-type: none"><li>a. Perform a maximal or near maximal lift (90-97% 1RM) followed by a drop set performed at 50-70% 1RM. Perform at maximal velocity.</li></ul> <p><b>4. French Contrast Training</b></p> <ul style="list-style-type: none"><li>a. 4 exercises performed in succession</li><li>b. Heavy compound exercise (80-90% 1RM) 1-4 reps</li><li>c. Plyometric jump 3 reps</li><li>d. Drop set or weighted jump (30% 1RM) 3 reps</li><li>e. Accelerated jump (usually band assisted) 2-3 reps</li></ul>	
Special Considerations		
<ul style="list-style-type: none"><li>• Icing: At the end of session or at home</li><li>• Prioritize Recovery: 2-3 days off/wk</li><li>• Training Scheme: Master complex training &gt; contrast training &gt; french contrast training</li><li>• Patients should have about 1 month of sport specific movements before beginning contact. Build confidence with stopping, cutting, training, game like movements/plays, etc.</li><li>• Contact should be progressed per therapist discretion during practice. Basketball Example: Contact Drills &gt; 3v3 &gt; 2v2 &gt; 1v1 &gt; 5v5</li><li>• Continue building isolated quad strength and explosive movements</li><li>• Ramp up conditioning specific to sport</li></ul>		

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