

ACL Reconstruction Guideline

The outcome of this evidence-based ACL rehabilitation program following an arthroscopic ACL reconstruction is to return individuals to the desired activities with full participation safely and as quickly as possible. This protocol is criterion-based and the time frames in each phase will vary depending on many factors including patient demographics, goals, and individual progress.¹ Modifications to the protocol may be necessary dependent on type of graft used, primary reconstruction versus ACL revision, or concomitant injuries or procedures performed. The therapist must modify the program appropriately depending on the individual's goals for activity following reconstruction.

The ACL reconstruction protocol is intended to provide the treating clinician with a guideline for rehabilitation. It is not intended to substitute for making sound clinical decisions regarding the patient's post-operative care based on exam/treatment findings, individual progress, and/or the presence of post-operative complications. If the clinician should have questions regarding post-operative progression, they should contact the referring physician.

General Guidelines/Expectations

- Therapist will monitor pain and swelling and adjust program appropriately
- Weight bearing will begin immediately unless restricted by concomitant procedure
- Level 1 Return to Play testing (see appendix) between 12-16 weeks post-op
- No impact activities until full ROM, no swelling, adequate strength and biomechanics are demonstrated
- Progression to running program at 12-16 weeks based on physician preference, when able to demonstrate sufficient symmetry and shock absorption with running mechanics and level 1 testing activities
- Level 2 Return to Play testing (see appendix) at 6-8 months post-op
- Return to full sport activities when able to complete Level 2 Return to Play testing at game speed with sufficient biomechanics (45/50 score), confidence in limb, and/or release by physician.

Preoperative Rehabilitation (2-4 weeks prior to surgery)

Note: Achieving pre-operative goals enhance postsurgical outcomes²

- Pre-operative goals
 - Full knee range of motion (ROM)
 - Minimal to no swelling present
 - Minimal to no pain
 - Normalized gait mechanics

Postoperative Rehabilitation (6-9 months depending on patient goals and progress)

Phase I – Immediate-Early Postoperative Phase (Weeks 0-6)

Phase IA – Goals: Initiation of ROM and muscle activation (weeks 0-3)

Milestones and Advancement criteria

- Proper performance of Level 1 MPI protocol (see appendix)
- Active Quad contraction

Ambulate without assistive device
ROM – Symmetrical extension ROM to 120 degrees flexion
NO Extension lag
Bilateral symmetrical heel raises FWB (25 reps)

Recommended number of visits per week: 1-3; **Total: (4-12)**

Exercises

- Ankle pumps
- Quad sets (NMES to quads for re-education)
- SLR (flexion, progressing to abduction and extension)
- Passive knee extensions to zero by week 1, symmetrical extension by week 3
- Standing weight shifts
- Bike for progressive ROM
- MPI level 1 (reps, progressing to static holds of 1 minute holds)
 - Clamshells
 - SDLY hip abduction
 - Fire hydrants
- Standing exercise progression
 - Mini-squats
 - Mini-lunges
 - Step ups
 - Double leg proprioception exercises
- Gait training with brace opened to available ROM (90 degree max)
 - Hurdle step overs (lateral and forward)
- **Manual Therapy**
 - Patella mobilizations
 - Assisted stretching with emphasis on extension stretching with manual assistance

Phase IB – Goals: Restoration of ROM and progression of weight bearing activation (weeks 4-6)

- **Milestones and Advancement criteria**
 - Proper performance of Level 2-3 MPI Protocol (see appendix)
 - Full extension ROM (equal to contralateral side) and flexion ROM within 10 degrees
 - Normalized gait symmetry (step length and WB)
 - Proper Gluteal activation
 - Reciprocal stair climbing
- Recommended number of visits: **4 Visits; Total (8-16)**
- **Notice**
 - **If full passive extension (equal to the contralateral side) has not been fully restored by the end of this time frame, extension ROM should be the primary focus of therapy and the program should not be advanced until it has been achieved.**
- **Exercises**
 - Continue with previous exercises
 - Bike for ROM stimulus and endurance
 - Leg press (0-60)
 - Wall sits (0-70 degrees)
 - Calf Raises
 - Stair master
 - Elliptical
 - Progressive flexion ROM while maintaining full extension ROM
 - Proprioception training
 - Double leg training on progressively unstable surfaces with perturbation
 - Rocker and scooter board
 - Single leg balance training on stable surfaces with and without perturbation
 - MPI level 2
 - Static squat with holds
 - Surfer squats with holds

- MPI level 3
 - Single leg wall pushes with holds
 - Stand on involved leg, contralateral hip flexed to 90 degrees, push lateral knee out into ER with abduction
 - Standing clamshells
- Pool therapy
 - Gait training
 - ROM progression
 - Closed chain strengthening
- **Manual Therapy**
 - Patella mobilizations
 - Assisted flexion stretching

Phase II- Intermediate Post-operative Phase (weeks 7-16)

Goals: Exposure to proper hip and shock absorption strategies

Note: Level I Return to Play testing by week 16 (when adequate control and movement strategies are demonstrated)

- **Milestones and Advancement criteria**
 - Full AROM/PROM as compared to the contralateral limb
 - Able to sit on heels or prone lying heel to buttock touching
 - Progression of Phase 1 Strengthening
 - Proper performance of Level 4-5 MPI protocol (see appendix)
 - Joint effusion of trace or less
 - Demonstrate normal gait mechanics (full cycle)
 - Normal Step Down mechanics x 10 reps from 8" step
 - SLS less than 100 mm excursion or 30 seconds eyes closed
 - Goal: Quad strength 70-80% compared to contralateral limb
 - Goal: Gluteal strength within 10% contralateral limb
 - Initiate Running program when demonstrate normalized step-down, normalized hip strength, gait symmetry (16 weeks)
 - **Satisfactory performance on Return to Sport Test Level I including the above criteria and biomechanical readiness tests**
- Recommended number of visits: **10-12; Total (18-28)**
- **Exercises**
 - Continue above PRE
 - Light hamstring curls (may begin earlier if BTB or allograft)
 - Progression toward single leg based strengthening as strength and control allows
 - Single leg wall sits
 - Leg press
 - Table squats
 - Progressive single leg proprioception training on unstable surfaces with perturbation
 - MPI level 4
 - Barbell squats
 - Kettle bell / dumbbell squats
 - Crab (lateral walks with band at knees) walks
 - Forward lunges – full depth
 - MPI level 5
 - Bench lunges (Bulgarian split squats)
 - Single leg (superman) squats
 - Single leg RDL's
 - Kaiser (or TB) single leg squat pulls
 - Standing clamshells (reps)
 - Pelvic drops
 - Deep step forward step ups
 - Forward controlled step downs

- **Return to Sport Biomechanical Readiness Level 1 Test (approximately 4 months post-op)**
 - Begin training for Level 1 testing as cleared by MD (approximately 12-14 weeks)
 - See appendix

Referral to Return to Performance program upon satisfactory scoring on Level 1 testing (average 1-2 sessions per week)

- If patient elects to continue independently, they will be provided an individualized program to be completed at a facility with appropriate strengthening equipment

Phase III- Advanced Movement and Impact Phase (months 5-6)

Goals: Advancement of hip and shock absorption strategies

- **Milestones and Advancement criteria**
 - Continue to progress strength and endurance while adding advance loading activities
 - Demonstrate appropriate control of Level 6-7 MPI Protocol (see appendix)
 - Normalized Running mechanics
 - Adequate Drop jump mechanics
 - Adequate Lateral Shuffle mechanics
 - Adequate Triple Jump mechanics
 - Adequate deceleration mechanics
 - Adequate cutting mechanics
 - **Pass Return to Sport Test Level II (if the above criteria for are met)**
- Recommended number of visits: **8 Visits; Total (26-36)**
- **Exercises**
 - Continue previous exercises
 - MPI level 6
 - squat jumps with bands
 - forward jumps with bands
 - box jumps with bands
 - ladders with no bands
 - side to side over small hurdles
 - skater drills
 - lateral bounding
 - MPI level 7
 - lateral bounding single leg
 - lateral jump over object
 - forward deceleration/backpedal
 - single hops
 - single boxes 4"-6" up and landing
 - forward jumping
 - triple hops
 - side step cut
- **Return to Sport Biomechanical Readiness Level 2 Test (approximately 6-8 months)**

Phase IV – Speed, Power, and Agility Phase (month 7-8)

Goals: Advanced muscle performance with emphasis on return to play

- **Milestones and advancement criteria**
 - Demonstrate control of level 6-7 MPI protocol at game speed intensity
 - Normalized Running mechanics
 - Normalized Drop jump mechanics
 - Normalized Lateral Shuffle mechanics
 - Normalized Triple Jump mechanics
 - Normalized deceleration mechanics
 - Normalized cutting mechanics
 - **Score greater than 45 on Return to Sport Test full speed**
- Recommended number of visits: **6-8 Visits; Total (32-44)**

* Progression of functional activities and clearance for return to sport is based on both physical capacity testing (objective measurements) and overall confidence rating on subjective outcome measurement tool (IKDC 2000, etc).

References

1. Adams D, et al. Current concepts for anterior cruciate ligament reconstruction: a criterion-based rehabilitation progression. *JOSPT*. 2012 ;(42):601-614.
2. Lewek M, Rudolph K, Axe M, Snyder-Mackler L. The effect of insufficient quadriceps strength on gait after anterior cruciate ligament reconstruction. *Clin Biomech (Bristol Avon)*. 2002;17:56-63.
3. Paterno MV, et al. Biomechanical measures during landing and postural stability predict second anterior cruciate ligament injury after anterior cruciate ligament reconstruction and return to sport. *Am J Sports Med*. 2010;(38):1968-1978.

Appendix

Return to play testing – comprehensive testing performed at the Sanford POWER Center that evaluates an athlete's ROM, strength, proprioception, and functional movement patterns. There are 2 levels of testing performed based on stage of rehabilitation.

Level 1

- Completed 3-4 months postoperatively
- Determine an athlete's level of progress at the mid-point of their rehabilitation and identify impairments that may need further attention
- Used to determine athlete's readiness for the Return to Performance program
- Patient must meet all criteria prior to level 1 testing
 - Physician approval
 - Full ROM
 - No pain and swelling
 - Weight bearing symmetry
 - Restoration of balance and postural stability
 - Normal gait
 - Hip and pelvic stability
 - 0. >10 step downs on 8" step with good form

Level 2

- Completed 6-8 months postoperatively
 - Insurance provider may dictate timing of testing based on the individual's coverage
- Determine an athlete's level of readiness to return to full participation based on performance with functional tests, agility, strength, and proprioception. A heavy emphasis has been placed on biomechanical assessment with functional movement as impairments have been shown to increase risk for ACL injury.²
- Components of Level 2 testing includes
 - Biomechanical assessment of
 1. Forward step down
 2. Lateral shuffle
 3. Drop jump
 4. Deceleration
 5. Triple hop
 6. Side step cut (90 degree)
 - Assessment of running mechanics
 - Static and dynamic balance
 - Strength and endurance testing
 1. Goal: Less than 10% deficit in quads and gluteals (compared to contralateral limb or normative data) and 1:1 quad to gluteal ratio
- **A score of 45/50 total points on biomechanical assessment is recommended prior to return to sport**

Movement Performance Institute (MPI) Proximal Hip Stability Progression

- I. **Level One: Non-weight bearing activation-** Clam shell, Fire hydrant, side-lying hip abduction.
- II. **Level Two: Weight bearing double limb support-** static squat with holds, surfer squats
- III. **Level Three: Single Limb Support-** single leg wall pushes, standing clam
- IV. **Level Four: Double Limb Support, Dynamic-** squats with bar, kettle weight squats, crab walks, forward lunges
- V. **Level Five: Single Limb Support, Dynamic-** bench lunges, single limb squats, Russian dead lifts (RDL's), Kaiser pulls, standing clam, step-ups, pelvic drops, step downs
- VI. **Level Six: Double Limb Ballistic-** squat jumps with bands, forward jumps with bands, box jumps with bands, ladders with no bands, side to side over small hurdles, skater drills, lateral bounding
- VII. **Level Seven: Single Limb Ballistic-** lateral bounding single leg, lateral jump over object, forward deceleration/backpedal, single hops, single boxes 4"-6" up and landing, forward jumping, triple hops, side step cut
- VIII. **Return to Sport**