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Rehabilitation Protocol for Anterior Cruciate Ligament (ACL) Reconstruction

This protocol is intended to guide clinicians through the post-operative course for ACL Reconstruction. This protocol is time based (dependent on tissue healing) as well as criterion based. Specific intervention should be based on the needs of the individual and should consider exam findings and clinical decision making. The timeframes for expected outcomes contained within this guideline may vary based on surgeon's preference, additional procedures performed, and/or complications. If a clinician requires assistance in the progression of a post-operative patient, they should consult with the referring surgeon.

The interventions included within this protocol are not intended to be an inclusive list of exercises. Therapeutic interventions should be included and modified based on the progress of the patient and under the discretion of the clinician.

Considerations for allograft and hamstring autograft

Early weight bearing and early rehabilitation intervention vary for allograft and hamstring autograft. Please reference specific instructions below. Expectations are the early return to sport phase will be delayed.

Considerations with concomitant injuries

Be sure to follow the more conservative protocol with regards to range of motion, weight bearing, and rehab progression when there are concomitant injuries (i.e. meniscus repair)

Post-operative considerations

If you develop a fever, intense calf pain, excessive drainage from the incision, uncontrolled pain or any other symptoms you have concerns about you should call your doctor

PHASE I: IMMEDIATE POST-OP (0-2 WEEKS AFTER SURGERY)

Rehabilitation Goals:

Protect graft
- Reduce swelling, minimize pain
- Restore patellar mobility
- Restore full extension, gradually improve flexion
- Minimize arthrogenic muscle inhibition, re-establish quad control, regain full active extension

• Patient education o Keep your knee straight and elevated when sitting or laying down.
Do not rest with a towel placed under the knee
Do not actively kick your knee out straight; support your surgical side when performing transfers (i.e. sitting to laying down)
Do not pivot on your surgical side

Weight Bearing

Walking

• Initially brace locked, crutches (per MD recommendation)
• May start walking without crutches as long as there is no increased pain, effusion, and proper gait o Allograft and hamstring autograft continue partial weight bearing with crutches for 6 weeks unless otherwise instructed by MD
• May unlock brace once able to perform straight leg raise without lag
• May discontinue use of brace after 6 wks per MD and once adequate quad control is achieved
• When climbing stairs, lead with the non-surgical side when going up the stairs, and lead with the crutches and surgical side when going down the stair

Interventions

Swelling Management
• Ice, compression, elevation (check with MD re: cold therapy)
• Retrograde massage
• Ankle pumps
Range of motion/Mobility
• Patellar mobilizations: superior/inferior and medial/lateral
Patellar mobilizations are heavily emphasized in the early post-operative phase following patella tendon autograft
• Seated assisted knee flexion extension and heel slides with towel
• Low intensity, long duration extension stretches: prone hang, heel prop
• Standing gastroc stretch and soleus stretch
• Supine active hamstring stretch and supine passive hamstring stretch

Strengthening
• Calf raises
• Quad sets
• NMES high intensity (2500 Hz, 75 bursts) supine knee extended 10 sec/50 sec, 10 contractions, 2x/wk during sessions—use of clinical stimulator during session, consider home units distributed immediate post op
• Straight leg raise
o **Do not perform straight leg raise if you have a knee extension lag
• Hip abduction
• Multi-angle isometrics 90 and 60 deg knee extension

Criteria to Progress

• Knee extension ROM 0 deg
• Quad contraction with superior patella glide and full active extension
• Able to perform straight leg raise without lag

PHASE II: INTERMEDIATE POST-OP (3-5 WEEKS AFTER SURGERY)

Rehabilitation Goals
• Continue to protect graft
• Maintain full extension, restore full flexion (contra lateral side)
• Normalize gait

Additional Interventions (Continue with Phase 1 interventions)

Range of motion/Mobility
• Stationary bicycle
• Gentle stretching all muscle groups: prone quad stretch, standing quad stretch, kneeling hip flexor stretch

Strengthening
• Standing hamstring curls
• Step ups and step ups with march
• Partial squat exercise
• Ball squats, wall slides, mini squats from 0-60 deg
• Lumbopelvic strengthening: bridge & unilateral bridge, sidelying hip external rotationclamshell, bridges on physioball, bridge on physioball with roll-in, bridge on physioball alternating, hip hike

Balance/proprioception
• Single leg standing balance (knee slightly flexed) static progressed to dynamic and level progressed to unsteady surface
• Lateral step-overs
• Joint position re-training

Criteria to Progress

• No swelling (Modified Stroke Test)
• Flexion ROM within 10 deg contra lateral side
• Extension ROM equal to contra lateral side

PHASE III: LATE POST-OP (6-8 WEEKS AFTER SURGERY)

Rehabilitation Goals

• Continue to protect graft site
• Maintain full ROM
• Safely progress strengthening
• Promote proper movement patterns
• Avoid post exercise pain/swelling
• Avoid activities that produce pain at graft donor site

Additional Interventions *Continue with Phase I-II Interventions

Range of motion/Mobility
• Rotational tibial mobilizations if limited ROM Cardio
• 8 weeks: Elliptical, stair climber, flutter kick swimming, pool jogging

Strengthening
• Gym equipment: leg press machine, seated hamstring curl machine and hamstring curl machine, hip abductor and adductor machine, hip extension machine, roman chair, seated calf machine o Hamstring autograft can begin resisted hamstring strengthening at 12 weeks
• Progress intensity (strength) and duration (endurance) of exercises
**The following exercises to focus on proper control with emphasis on good proximal stability
• Squat to chair
• Lateral lunges
• Romanian deadlift
• Single leg progression: partial weight bearing single leg press, slide board lunges: retro and lateral, step ups and step ups with march, lateral step-ups, step downs, single leg squats, single leg wall slides
• Knee Exercises for additional exercises and descriptions
• Seated Leg Extension (avoid anterior knee pain): 90-45 degrees with resistance Balance/proprioception
• Progress single limb balance including perturbation training

Criteria to Progress

• No effusion/swelling/pain after exercise
• Normal gait
• ROM equal to contra lateral side
• Symmetrical Joint position sense (<5-degree margin of error)

PHASE IV: TRANSITIONAL (9-12 WEEKS AFTER SURGERY)
Rehabilitation Goals
• Maintain full ROM
• Safely progress strengthening
• Promote proper movement patterns
• Avoid post exercise pain/swelling
• Avoid activities that produce pain at graft donor site

Additional Interventions *Continue with Phase II-III interventions

• Begin sub-max sport specific training in the sagittal plane
• Bilateral PWB plyometrics progressed to FWB plyometrics Criteria to Progress
• No episodes of instability
• Maintain quad strength
• 10 repetitions single leg squat proper form through at least 60 deg knee flexion
• Drop vertical jump with good control
• KOOS-sports questionnaire >70%

• Functional Assessment o Quadriceps index >80%; HHD or isokinetic testing 60d/s o Hamstrings ≥80%; HHD or isokinetic testing 60 d/s o Glut med, glut max index ≥80% HHD

PHASE V: EARLY RETURN TO SPORT (3-5 MONTHS AFTER SURGERY)

Rehabilitation Goals
• Safely progress strengthening
• Safely initiate sport specific training program
• Promote proper movement patterns
• Avoid post exercise pain/swelling
• Avoid activities that produce pain at graft donor site Additional Interventions

*Continue with Phase II-IV interventions
• Interval running program
o Return to Running Program
• Progress to plyometric and agility program (with functional brace if prescribed)
o Agility and Plyometric Program

Criteria to Progress
• Clearance from MD and ALL milestone criteria below have been met
• Completion jog/run program without pain/effusion / swelling
• Functional Assessment o Quad/HS/glut index ≥90%; HHD mean or isokinetic testing @ 60d/s
o Hamstring/Quad ratio ≥66%
o Hop Testing ≥90% compared to contra lateral side, demonstrating good landing mechanics

PHASE VI: UNRESTRICTED RETURN TO SPORT (6+ MONTHS AFTER SURGERY)

Rehabilitation Goals
• Continue strengthening and proprioceptive exercises
• Symmetrical performance with sport specific drills
• Safely progress to full sport Additional Interventions

*Continue with Phase II-V interventions
• Multi-plane sport specific plyometrics program
• Multi-plane sport specific agility program
• Include hard cutting and pivoting depending on the individuals' goals (~7 mo)
• Non-contact practice→ Full practice→ Full play (~9 mo) Criteria to Progress
• Functional Assessment o Quad/HS/glut index ≥95%; HHD mean or isokinetic testing @ 60d/s
o Hamstring/Quad ratio ≥66% o Hop Testing ≥95% compared to contra lateral side, demonstrating good landing mechanics
• KOOS-sports questionnaire >90%
• International Knee Committee Subjective Knee Evaluation >93
• ACL-RSI

Return to Running Program

This program is designed as a guide for clinicians and patients through a progressive return-to-run program. Patients should demonstrate > 80% on the Functional Assessment prior to initiating this

program (after a knee ligament or meniscus repair). Specific recommendations should be based on the needs of the individual and should consider clinical decision making. If you have questions, contact the referring physician.

PHASE I: WARM UP WALK 15 MINUTES, COOL DOWN WALK 10 MINUTES

Day 1 2 3 4 5 6 7

Week 1 W5/J1x5 W5/J1x5 W4/J2x5 W4/J2x5

Week 2 W3/J3x5 W3/J3x5 W2/J4x5

Week 3 W2/J4x5 W1/J5x5 W1/J5x5 Return to Run

Key: W=walk, J=jog **Only progress if there is no pain or swelling during or after the run

Recommendations
- Runs should occur on softer surfaces during Phase I
- Non-impact activity on off days
- Goal is to increase mileage and then increase pace; avoid increasing two variables at once
- 10% rule: no more than 10% increase in mileage per week