Rehabilitation Guidelines
Anterior Cruciate Ligament (ACL) Reconstruction

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Assumptions with the long term health and recovery of the knee.

- Isolated ACL injury
- See precautions section for modifications if secondary surgery involved (Revision, meniscus repair, etc.)

Preoperative goals

- Full knee extension range of motion (ROM)
- Absent or minimal effusion
- No knee extension lag with straight leg raise

Immediate Postoperative Phase (Week 1) visits 1-3

Milestones	Treatment
1. Knee active/passive ROM, 0 to 90- unlock brace 0-90 2. Active quadriceps contraction with superior patellar glide	○ Wall slides, patellar mobilization, gait training, NMES (see guidelines below) ○ Isometrics: Co-contraction quads/hamstring sets 30 reps 4x/day, holding each contraction for 3-5 sec.; SLR directions (forward flex, abduction, and prone extension) 30-50 reps. Add weight above knee joint level; Ball or pillow squeeze in long sitting position. Place patient in a sitting position w/ feet on floor to perform ball squeezes. When 90° of flexion has knee achieved, hold each squeeze for 3-5 seconds. ○ Home exercise program: supine wall slides, self-patellar mobilizations 30 to 50 times per day, quadriceps set, long-arc quadriceps (90-45), and straight leg raise 3~ 10 repetitions (3 times per day) ○ Exercise bike, no resistance – rocking the pedals back and forth to facilitate ROM

Early Postoperative Phase (Week 2) Visits 4-6

Milestones	Treatment
1. Knee flexion greater than 110 2. Walking without crutches 3. Use of cycle/stair climber without difficulty 4. Walking with full knee extension 5. Reciprocal stair climbing 6. Straight leg raise without a knee extension lag	○ Closed Kinetic Chain: 3 Wall squats 15- 20 reps; 3 knee bends 15-20 reps; 2” step ups NOT step downs 15-20 reps; 2 footed leg press (up to patient’s body weight) 2 sets of 20 ○ Portal/incision mobilization as needed (if skin is healed) ○ StairMaster, wall squats/sits ○ Progress to functional brace as swelling permits- brace unlocked for full ROM ○ Prone hangs if lacking full extension ○ Patellar mobilization in flexion (if flexion is limited)

TWIN CITIES ORTHOPEDICS

Intermediate Postoperative Phase (Weeks 3-5) Visits 7-15

Milestones	Treatment
1. Knee flexion ROM to within 10degrees of uninvolved side 2. Quadriceps strength greater than 60% of uninvolved side	○ Tibiofemoral mobilizations with rotation for ROM if joint mobility is limited ○ Progress bike and StairMaster duration (10-minute minimum, mild resistance) ○ Begin balance and proprioceptive activities

Late Postoperative Phase (Weeks 6-8) Visits 16 - 25

Milestones	Treatment
1. Quadriceps strength greater than 80% of uninvolved side 2. Normal gait pattern 3. Full knee ROM (compared to uninvolved side) 4. Knee effusion of trace or less	○ Progress exercises in intensity and duration ○ Leg press single leg. Patient should feel fatigue in the quads, hams, and glutes; Hamstring curls, patient lifting w/ 2 legs and lowering with involved leg; Wall squats single leg using the involved leg; Doorway squats single leg using involved leg; Step downs and retro step ups. Do not let the patient touch anything for balance. Increase height of step downs as the patellar tendon allows; Retro treadmill to build quad strength. Raise the incline; 3 squats with proper form; 3 lunges with proper form; Proprioception BAPS board workout and mini-tramp with ball toss; Pelvic/Core strengthening ○ Ice after workouts for 15-30 min. Patellar mobs and massage of scars as instructed. ○ Begin running progression (see running progression below); on treadmill or track with functional brace (if all milestones are met). If swelling of the knee occurs, discontinue running, return to strengthening ○ Transfer to fitness facility or ongoing work with ATC (if all milestones are met)

Transitional Phase (Weeks 9-12) Visits 25 - 38

Milestones	Treatment
1. Maintaining or gaining quadriceps strength (greater than 80% of uninvolved side) 2. Hop tests greater than 85% of uninvolved side (see below) at 12 weeks 3. KOS-sports questionnaire greater than 70%	○ If 70% of strength has been obtained, the PT will instruct patient in phase 1 plyometric drills. If 70% has not been obtained, patient will be instructed to keep up with strengthening program and retest in one month ○ Any exercise that causes patellar tendinitis or overuse symptoms will be stopped until sufficient quad strength is obtained. Plyo leg presses starting with 2 legs progressing to involved leg only; Hamstring curls single leg; Full squats and lunges ○ Progression of sports-specific activities ○ Agility exercises

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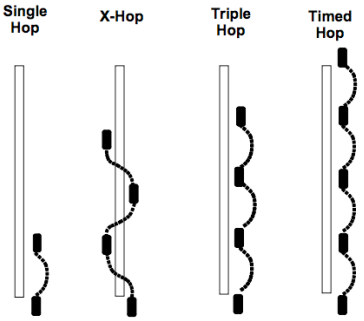
Follow-up Functional Testing (4 Months, 6 Months, 1 Year Postoperative)

Milestones	Testing
1. Maintaining gains in strength (greater than or equal to 90% to 100%) 2. Hop test 90% or greater 3. KOS-sports 90% or greater 4. Return-to-sport criteria--- ○ Achieve 90% of full strength ○ Have CV endurance, muscle strength, balance/agility to return to sport activities ○ Functional deficits in limb strength and body position have been corrected	○ Patient performs 2 practice trials on each leg for each hop sequence ○ Patient performs 2 timed or measured trials on each leg for each hop sequence ○ Measured trials are averaged and compared (involved to uninvolved) for single, triple, and crossover hop ○ Measured trials are averaged and compared (uninvolved to involved) for timed hop



Precautions

Meniscal repair

- No weight-bearing flexion beyond 45deg for 4 weeks
- Weight bearing in full extension is allowed
- Seated Kinetron and multi-angle quadriceps isometric can substitute for weight-bearing exercises

Concomitant microfracture
(consider location and size of lesion for exercise specific alterations)

- Non–weight bearing 2 to 4 weeks with axillary crutches
- No weight-bearing activities in treatment for 4 weeks

Medial collateral ligament injury

- Restrict motion to sagittal plane until weeks 4 to 6 to allow healing of medial collateral ligament
- Perform progressive resistive exercises with tibia in internal rotation during early postoperative period to decrease medial collateral ligament stress
- Consider brace for exercise and periods of activity if severe sprain and/ or patient has pain
- Nonrepaired ROM restrictions: grade I, no ROM restrictions; grade II, 0 to 90 in week 1, 0 to 110 in week 2; grade III, 0 to 30 in week 1, 0 to 90 in week 2, 0 to 110 in week 3

ACL revision

- Delay progression of running, hop testing, agility drills, and return to sport by 4-8 weeks
- Crutches and immobilizer are used for 2 weeks following surgery. Otherwise, follow same milestones

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Running Progression

(requires trace or less effusion, 80% or greater strength, understand soreness rules)

Level Treadmill Track
Level 1 0.1-mi walk/0.1-mi jog, repeat 10 times Jog straights/walk curves (2 mi)
Level 2 Alternate 0.1-mi walk/0.2-mi jog (2 mi) Jog straights/jog 1 curve every other lap (2 mi)
Level 3 Alternate 0.1-mi walk/0.3-mi jog (2 mi) Jog straights/jog 1 curve every lap (2 mi)
Level 4 Alternate 0.1-mi walk/0.4-mi jog (2 mi) Jog 1.75 laps/walk curve (2 mi)
Level 5 Jog full 2 mi Jog all laps (2 mi)
Level 6 Increase workout to 2.5 mi Increase workout to 2.5 mi
Level 7 Increase workout to 3 mi Increase workout to 3 mi
Level 8 Alternate between running/jogging every 0.25 mi Increase speed on straights/jog curves

Progress to next level when patient is able to perform activity for 2 mi without increased effusion or pain. Perform no more than 4 times in 1 week and no more frequently than every other day. Do not progress more than 2 levels in a 7-day period.

Neuromuscular electrical stimulation (NMES) guidelines

1. Electrodes placed over proximal lateral quadriceps and distal medial quadriceps (modify distal electrode placement as needed to avoid covering superior medial arthroscopy portal until the stitches have been removed and skin is healed).
2. Stimulation parameters: 2500 Hz; 75 bursts; 2-second ramp; 12 seconds on, 50 seconds rest; intensity to maximum tolerable (at least 50% maximal volitional isometric contraction [MVIC]); 10 contractions per session. Three sessions per week until quadriceps strength MVIC is 80% of uninvolved side. 3. Stimulation performed isometrically at 60deg (dependent on graft site).