PHASE I
Time frame: estimated surgery through weeks 2-4.

Objectives:
• Protect graft fixation through early phase of healing.
• Comfort.
• Neuromuscular activation.
• Range of motion with full extension and flexion to minimum 90°-100°. Hamstring graft do not work passive flexion beyond 100° in first 4 weeks.
• Educate patient about rehabilitation progression.

Restrictions:
• Foot-Flat, Touchdown Weight-Bearing (reciprocal gait, only touch weight) advance to WBAT only when quadriceps control adequate.

*If MENISCAL REPAIR performed:
• Hinged brace locked 0°-30° for weight bearing first 6 weeks.
• No flexion beyond 90° first six weeks.

Modalities:
• Ice.
• If quad activation is progressing slowly: NMES-in clinic. Consider home unit.

Therapeutic Exercises
• Heel slides, standing leg curls, ankle PRE including standing heel raises.
• Quad sets, hamstring sets.
• Patellar mobilization.
• PROM to tolerance (within above limits)/(wallslides, bike for motion, rowing machine).
• Gastroc/soleus, hip flexor stretches. Avoid hamstring stretch x 4 weeks for hamstring graft.
• BAPS (seated or on total gym) PWB.
• SLR, all planes, until quad strength is sufficient to prevent extension lag (hip PREs).
• Quadriceps isometrics at 60° and 90°.
• Open chain knee extension 0°-90°OK with no resistance (begin at 4 weeks for hamstrings graft).
• Total gym leg press.
• Aerobic exercise-airdyne or stationary bike with surgical leg supported/braced until flexion sufficient for crank cycle.
• Aquatic therapy when wounds are well-healed (minimum 2 weeks). OK to swim freestyle/crawl with flutter kicks or buoy between legs. No fins. No breaststroke kick. No butterfly kick (dolphin kick).

Functional Milestones During Phase I:
• Normal walking pattern without crutches on level surfaces.
PHASE II
Time frame: estimated weeks 2-4 through weeks 6-8.

Criteria for Advancement to Phase II:
• Good quad set, SLR without extension lag.
• At least 90-100° of flexion.
• Full extension.
• 3 weeks post-op for hamstring auto graft.

Objectives:
• Restore normal gait.
• Maintain full extension, progress flexion range of motion.
• Protect graft fixation.
• Control swelling.

Weight Bearing:
• Discontinue use of crutches when the patient has full extension, can SLR without extension leg and has normal gait.

Modalities:
• NMES if necessary.
• Ice.

Therapeutic Exercises:
• Mini squats.
• Stationary bike with minimum to moderate resistance. Begin with high seat/low tension to promote ROM. Progress resistance and/or RPM to increase quadriceps challenge.
• Closed chain terminal extension (0°-90°) with resistive tubing or weight machine.
• FWB balance exercises (e.g. single leg balance, BAPS).
• Resisted hamstring exercise for patella tendon grafts. (May begin with hamstring grafts of allografts at 6-8 weeks).
• Aquatic therapy when wounds are well-healed (minimum 2 weeks). OK to swim freestyle/crawl with flutter kick. No fins. No breaststroke. No butterfly kick (dolphin kick).
• Continue hamstring stretches, progress to weight-bearing gastroc/soleus stretches.
• Stairmaster.
• Sport cord home program instruction.

Functional Milestones During Phase II:
• Normal walking pattern without crutches.
• Spin on a bike. Consider progression to outside (on level roads) when patient has adequate ROM and no balance or safety issues. Flat pedals only. No trail biking.

PHASE III
Time frame: estimated weeks 10-12

Criteria for Advancement to Phase III:
• Normal gait level surfaces. Reciprocal stairs.
• Active ROM: 0°-120° flexion.
Objectives
• Full ROM.
• Improve strength, endurance and proprioception on the lower extremity to prepare for functional activities.
• Avoid overstressing graft during ligamentization.
• Protect the patellofemoral joint.

Therapeutic Exercises:
• Continue flexibility exercises as appropriate for patient.
• Stationary cycle-intervals.
• Advance closed kinetic chain strengthening (one-leg squats, leg press 0°-45°, step-ups and step-downs begin at 2 inches and progress to 8 inches, etc.).
• Progress proprioception activities (slide board, fitter, use of ball, racquet with balance activities, etc.).
• Progress aquatic program to include pool running in vest. Swimming: all strokes and kicks are OK after 8 weeks.
• Walk/jog progression. Straight ahead, beginning after 8 weeks post-op if no evidence of patellofemoral irritation, at therapist’s discretion.

Functional Milestones During Phase III:
• Running after 8-12 weeks.
• Golf (for TRAIL leg) chipping and putting after 8 weeks. Swinging at 50% power at 10-12 weeks. Add 4 weeks if involving LEAD leg.
• Road biking, with hills.

PHASE IV
Time frame: estimated weeks 10-12 through 4-6 months.

Criteria for Advancement to Phase IV:
• Full, pain free ROM.
• Normal gait on stairs (ascending and descending).
• No evidence of patellofemoral joint irritation.
• Sufficient strength (75% RM leg press/hamstring curl) and control to initiate functional activities.

Objectives:
• Strengthen, strengthen, strengthen!
• Neuromuscular control in functional situations.
• Patient education of gradual return to activities.

Therapeutic Exercises:
• Continue progression of flexibility and strengthening program.
• Initiate plyometric program as appropriate for patient’s functional goals.
• Functional progression including, but not limited to: forward running, backward running, at 1/2 speed, 3/4 speed and full speed. Also cutting, cross-over, carioca, agility drills, etc.
• Initiate sport-specific drills as appropriate for patient.
• Advance proprioceptive balance exercises.

Functional Milestones During Phase IV:
• Swimming.
• Golfing. Progress to full swing (more cautiously if operative leg is pivot/lead leg).
• Hiking without pack (hydration pack is OK).
• Racquet and field sport drills when approved by physician and therapist at end of phase, if strength appropriate.
• Road biking and non-technical mountain biking.

**PHASE V**

*Time frame: estimated beyond 4-6 months.*

**Criteria for Advancement in Phase V:**
• No patellofemoral or soft tissue complaints.
• Adequate performance on strength and performance test.
• Physician clearance to resume partial or full activity.

**Objectives:**
• Safe return to athletics.
• Transition from anticipatory drills (athlete knows what is coming) to reactive competitive situations.
• Maintenance of strength, endurance and proprioception.
• Patient education in regard to any possible limitations.

**Therapeutic Exercises:**
• Gradual return to sports participation.
• Maintenance program for strength, endurance and proprioception.

**Functional Milestones During Phase V:**
• Sport activities/return to play.
• Skiing or other strenuous recreational activities.

**Bracing:**
• Functional brace is occasionally recommended by the physician for use during sports for the first one to two years after surgery.
• Not standard protocol to brace for return to sport.