

I. **IMMEDIATE INJURY PHASE (Day 1 to Day 7)**

Goals: Restore full passive knee extension  
Diminish joint swelling and pain  
Restore patellar mobility  
Gradually improve knee flexion  
Re-establish quadriceps control  
Restore independent ambulation

**Post-Injury Day 1- 3**

**Brace** – brace/Immobilizer applied to knee, locked in full extension during ambulation as directed by physician

**Weight Bearing** – Two crutches, weight bearing as tolerated

**Exercises:**

- Ankle pumps
- Overpressure into full, passive knee extension
- Active and Passive knee flexion (90 degree by day 5)
- Straight leg raises (Flexion, Abduction, Adduction)
- Quadriceps isometric setting
- Hamstring stretches/ calf stretches
- Closed kinetic chain exercises: mini squats, weight shifts

**Muscle Stimulation** – Use muscle stimulation during active muscle exercises (4-6 hours per day)

**Ice and Elevation** – Ice 20 minutes out of every hour and elevate with knee in full extension, may use e-stim for edema control

**Post-Injury Day 3 to 7**

**Brace** – EZ Wrap brace/Immobilizer, locked at zero degrees extension for ambulation and unlocked for sitting, Etc., or Protonics Rehab System (PRS) as directed by physician

**Weight Bearing** – Two Crutches weight bearing as tolerated

**Range of Motion** – Remove brace to perform range of motion exercises 4-6 times per day, knee flexion 90 degrees by day 5, approximately 100 degrees by day 7

**Exercises:**

- Multi-angle isometrics at 90 and 60 degrees (knee extension)
- Knee Extension 90-40 degrees
- Overpressure into extension
- Patellar mobilization
- Ankle pumps
- Straight leg raises (3 directions)
- Mini squats and weight shifts

- Standing Hamstring curls
- Quadriceps isometric setting
- Proprioception and balance activities
- Continue Hamstring and calf stretching

**Muscle Stimulation** – Electrical muscle stimulation (continue 6 hours daily)

**Ice and Elevation** – Ice 20 minutes of every hour and elevate leg with knee full extension

## II. INTERMEDIATE REHABILITATION PHASE (Week 2-4)

### ***Criteria to Progress to Phase II***

- 1) Quad Control (ability to perform good quad set and SLR)
- 2) Full passive knee extension
- 3) PROM 0-90 degrees
- 4) Good patellar mobility
- 5) Minimal joint effusion
- 6) Independent ambulation

**Goals:** Maintain full passive knee extension (at least 0 to 5-7 hyperextension)

Gradually increase knee flexion

Diminish swelling and pain

Muscle training

Restore proprioception

Patellar mobility

### **Week Two**

**Brace** – Discontinue brace or immobilizer at 2 to 3 weeks per physician

**Weight Bearing** – As tolerated (goal is to discontinue crutches 10-14 days post injury)

**Range of Motion** – Self-ROM stretching (4-5 times daily), emphasis on maintaining full, passive range of motion progress flexion as tolerated

### **Exercises:**

- Muscle stimulation to quadriceps exercises
- Isometric quadriceps sets
- Straight Leg raises (4 planes)
- Leg Press (0-60 degrees)
- Knee extension 90-40 degrees
- Half squats (0-40)
- Weight shifts
- Gait training with cones
- Front and side lunges
- Hamstring Curls
- Bicycle
- Proprioception training
- Tilt board squats
- Dip walking
- Overpressure into extension

- Passive range of motion from 0 to 50 degrees
- Patellar mobilization
- Well leg exercises
- Progressive resistance extension program – start with 1 lb., progress 1 lb. per week
- Continue stretching program

**Swelling control** – Ice, compression, elevation, e-stim

### **Week Three**

**Brace** – Discontinue

**Range of Motion** – PROM should be full or near full ROM

**Passive Range of Motion** – Continue range of motion stretching and overpressure into extension

**Exercises:**

- Continue all exercises as in week two
- Passive Range of Motion as tolerated
- Bicycle for range of motion stimulus and endurance
- Pool walking program (if incision is closed)
- Eccentric quadriceps program 40-100 (isotonic only)
- Lateral lunges
- Lateral step ups
- Lateral cone step overs
- Stair-Stepper machine
- Progress Proprioception drills, neuromuscular control drills

### **III. ADVANCED STRENGTHENING/NEUROMUSCULAR CONTROL PHASE (Week 4-8)**

***Criteria to Enter Phase III***

- 1) Full ROM
- 2) Quadriceps strength 60% > contralateral side (isometric test at 60 degree knee flexion)
- 3) Minimal to no full joint effusion
- 4) No joint line or patellofemoral pain

**Goals:** Maintain full knee range of motion (0 to 125 degrees)

Improve lower extremity strength

Enhance proprioception, balance, and neuromuscular control

Improve muscular endurance

Restore limb confidence and function

**Brace** – No immobilizer or brace, may use knee sleeve or fit for function all brace

**Range of Motion** – Self-ROM (4-5 times daily using the other leg to provide ROM), emphasis on maintaining full ROM

**Week 4****Exercises**

- Progress isometric strengthening program
- Leg Press
- Knee extension 90 to 40 degrees
- Hamstring curls
- Hip Abduction and Adduction
- Hip Flexion and Extension
- Lateral Step-Overs
- Lateral Lunges
- Lateral step ups
- Front step downs
- Wall Squats
- Vertical squats
- Toe Calf Raises
- Bidex Stability System (balance, squats, etc.)
- Proprioception drills
- Bicycle
- Stair Stepper machine
- Pool program (backward running, hip and leg exercises)

**Week 6****Exercises:**

- Continue all exercises
- Pool running (forward) and agility drills, jumping
- Progress to balance and tilt board throws, perturbation training
- Advanced Neuromuscular control drills:
  - CKC on unstable surfaces
  - Lunges onto foam
  - Step ups on foam
  - Perturbation training
- Wall slides/squats
- Muscular training for fast reaction times
  - High speed hamstring curls
- Progress dynamic stabilization drills
  - Tilt board perturbations

**IV. ADVANCED ACTIVITY PHASE (Week 8-12)*****Criteria to Enter Phase IV***

- 1) Full ROM
- 2) Quad strength 75% of contralateral side, knee extension flexor:extensor ratio 70% to 75%
- 3) No pain or effusion
- 4) Satisfactory clinical exam
- 5) Satisfactory isokinetic test (values at 180 degrees)
  - Quadriceps bilateral comparison 75%
  - Hamstrings equal bilateral
  - Quadriceps peak torque/body weight 65% at 180°/s (males) 55% at 180°/s (females)
  - Hamstrings/quadriceps ratio 66% to 75%
- 6) Subjective knee scoring (modified Noyes System) 80 points or better

**Goals:** Normalize lower extremity strength  
 Enhance muscular power and endurance  
 Improve neuromuscular control  
 Perform selected sport-specific drills

**Exercises:**

- Continue all exercises
- Advanced Neuromuscular control drills:
- Plyometric program
  - Leg press plyometrics
  - Box jumps

**V. RETURN TO ACTIVITY PHASE (Month 12-22)**

***Criteria to Enter Phase V***

- 1) Full Range of Motion
- 2) Isokinetic Test that fulfills criteria
- 3) Quadriceps bilateral comparison (80% or greater)
- 4) Hamstring bilateral comparison (110% or greater)
- 5) Quadriceps torque/body weight ratio (55% or greater)
- 6) Hamstrings/Quadriceps ratio (70% or greater)
- 7) Proprioceptive Test (100% of contralateral leg)
- 8) Functional Test (85% or greater of contralateral side)
- 9) Satisfactory clinical exam
- 10) Subjective knee scoring (modified Noyes System) (90 points or better)

**Goals:** Gradual return to full-unrestricted sports 8 activities  
 Achieve maximal strength and endurance  
 Normalize neuromuscular control  
 Progress skill training

**Exercises:**

- Continue strengthening exercises
- Continue neuromuscular control drills
- Continue plyometrics drills
- Progress running and agility program
- Progress sport specific training