

Nonoperative Rehabilitation Following ACL Injury (3-3-4-4 Program)

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
- *Biodex 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 & 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