

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

Phase 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

Phase II – Intermediate 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 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

Phase III – Advanced strengthening/Neuromuscular Control (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 function for all braces

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
 o High speed hamstring curls
- Progress dynamic stabilization drills
 o Tilt board perturbations

Phase 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 degrees (males) 55% at 180 degrees (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

Phase V – Return to Activity Phase (Month 12-22)

Criteria to progress to phase V

1. Full ROM
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 ration (55% or greater)
6. Hamstrings/quadriceps ration (70% or greater)
7. Proprioceptive test (100% of contralateral leg)
8. Fuctional 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