



**POSTOPERATIVE REHABILITATION PROTOCOL FOLLOWING
ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION
USING IPSILATERAL AUTOGRAFT OR ALLOGRAFT**

PREOPERATIVE PHASE

Goals: Diminish inflammation, swelling, and pain
Restore normal range of motion (especially knee extension)
Restore voluntary muscle activation
Provide patient education to prepare patient for surgery

Brace – Elastic wrap or knee sleeve to reduce swelling

Weight Bearing – As tolerated with or without crutches

Exercises: *Ankle Pumps
 *Passive knee extension to zero
 *Passive knee flexion to tolerance
 *Straight Leg Raises (3 Way, Flexion, Abduction, Adduction)
 *Quadriceps Setting
 *Closed kinetic chain exercises: mini squats, lunges, step-ups

Muscle Stimulation – Electrical muscle stimulation to quadriceps during voluntary quadriceps exercises (4 to 6) hours per day)

Neuromuscular/Proprioception Training -
- Eliminate quad avoidance gait
- Retro stepping drills
- Joint repositioning on Sports RAC
- Passive/active reposition at 90, 60, 30 degrees
- CKC squat/lunge repositioning on screen

Cryotherapy/Elevation – Apply ice 20 minutes of every hour, elevate leg with knee in full extension (knee must be above heart)

Patient Education – Review postoperative rehabilitation program
Review instructional video (optional)
Select appropriate surgical date

I. IMMEDIATE POST-OPERATIVE 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

Postoperative Day 1

Brace – EZ Wrap brace/Immobilizer applied to knee, locked in full extension during ambulation of Protonics

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
- *Closed kinetic chain exercises: mini squats, weight shifts

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

Continuous Passive Motion – As needed, 0 to 45/50 degrees (as tolerated and as directed by physician)

Ice and Evaluation – Ice 20 minutes out of every our and elevate with knee in full extension

Postoperative Day 2 to 3

Brace – EZ Wrap brace/Immobilizer, locked at zero degrees extension for ambulation and unlocked for sitting, etc.

Weight Bearing – Two crutches, weight bearing as tolerated

Range of Motion – Remove brace perform range of motion exercises 4 to 6 times a day

Exercises:

- *Multi-angle isometrics at 90 and 60 degrees (knee extension)
- *Knee Extension 90-40 degrees
- *Overpressure into extension (knee extension should be at least 0 degrees to slight hyperextension)
- *Patellar mobilization
- *Ankle pumps
- *Straight leg raises (3 directions)
- *Mini squats and weight shifts
- *Quadriceps isometric setting

Muscle Stimulation – Electrical muscle stimulation to quads (6 hours per day)

Continuous Passive Motion – 0 to 90 degrees, as needed

Ice and Evaluation – Ice 20 minutes out of every hour and elevate leg with knee in full extension

Postoperative Day 4 to 7

Brace – EZ Wrap brace/Immobilizer, locked at zero degrees extension for ambulation and unlocked for sitting, etc.

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 (full extension 0 degrees to 5-7 hyperextension)
- *Patellar mobilization (5-8 times daily)

- *Ankle pumps
- *Straight leg raises (3 directions)
- *Mini squats and weight shifts
- *Standing Hamstring curls
- *Quadriceps isometric setting
- *Proprioception and balance activities

Neuromuscular training/proprioception – OKC passive/active joint repositioning at 90, 60 degrees
CKC squats/weight shifts with repositioning on sports RAC

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

Continue Passive Motion – 0 to 90 degrees, as needed

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

II. EARLY 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 control and activation
Restore proprioception/neuromuscular control
Normalize patellar mobility

Week Two

Brace – Continue locked brace for ambulation

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

Passive Range of Motion – Self-ROM stretching (4-5 times daily), emphasis on maintaining full motion

KT 2000 Test – (15 lb. Anterior-posterior test only)

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
- *Front and side lunges
- *Hamstring Curls standing (active ROM)
- *Bicycle (if ROM allows)
- *Proprioception training
- *Overpressure into extension
- *Passive range of motion from 0 to 100 degrees
- *Patellar mobilization
- *Well leg exercises
- *Progressive resistance extension program – start with 1 lb., progress 1 lb. per week

Proprioception/Neuromuscular Training

- *OKC passive/active joint repositioning 90, 60, 30 degrees
- *CKC joint repositioning during squats/lunges
- *Initiate squats on tilt board use sports RAC with repositioning

Swelling control – Ice, compression, elevation

Week Three

Brace – Discontinue locked brace (some patients use ROM brace for ambulation)

Passive Range of Motion – Continue range of motion stretching and overpressure into extension (ROM should be 0-100/105 degrees)

- Exercises:
- *Continue all exercises as in week two
 - *Passive Range of Motion 0-105 degrees
 - *Bicycle for range of motion stimulus and endurance
 - *Pool walking program (if incision is closed)
 - *Eccentric quadriceps program 40-100 (isotonic only)
 - *Lateral lunges (straight plane)
 - *Front Step Downs
 - *Lateral Step-Overs (cones)
 - *Stair-Stepper machine
 - *Progress Proprioception drills, neuromuscular control drills
 - *Continue passive/active reposition drills on sports RAC (CKC, OKC)

III. PROGRESSIVE STRENGTHENING/NEUROMUSCULAR CONTROL PHASE (Week 4-10)

Criteria to Enter Phase III

- 1) Active Range of Motion 0-115 degrees
- 2) Quadriceps strength 60 % > contralateral side (isometric test at 60 degree knee flexion)
- 3) Unchanged KT Test bilateral values (+1 or less)
- 4) Minimal to no full joint effusion
- 5) No joint line or patellofemoral pain

Goals: Restore 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 to control swelling/support

Range of Motion - Self-ROM (4-5 times daily using the other leg to provide ROM), emphasis on maintaining zero degrees passive extension
 - PROM 0-125 degrees at 4 weeks

KT 2000 Test – (Week 4, 20 lb. anterior and posterior test)

Week 4

- Exercises:
- *Progress isometric strengthening program
 - *Leg Press (0-100 degrees)
 - *Knee extension 90 to 40 degrees
 - *Hamstring Curls (isotonics)
 - *Hip Abduction and Adduction
 - *Hip Flexion and Extension
 - *Lateral Step-Overs
 - *Lateral Lunges (straight plane and multi-plane drills)
 - *Lateral Step Ups
 - *Front Step Downs
 - *Wall Squats
 - *Vertical Squats
 - *Standing Toe Calf Raises
 - *Seated Toe Calf Raises
 - *Biodex Stability System (Balance, Squats, etc)
 - *Proprioception Drills
 - *Bicycle
 - *Stair Stepper Machine
 - *Pool Program (Backward Running, Hip and Leg Exercises)

- Proprioception/Neuromuscular Drills
- Tilt board squats (perturbation)
 - Passive/active reposition OKC
 - CKC repositioning on tilt board with sports RAC
 - CKC lunges with sports RAC

Week 6

KT 2000 Test – 20 and 30 lb. anterior and posterior test

- Exercises:
- *Continue all exercises
 - *Pool running (forward) and agility drills
 - *Balance on tilt boards
 - *Progress to balance and ball throws
 - *Wall slides/squats

Week 8

KT 2000 Test – 20 and 30 lb. anterior and posterior test

- Exercises:
- *Continue all exercises listed in Weeks 4-6
 - *Leg Press Sets (single leg) 0-100 degrees and 40-100 degrees
 - *Plyometric Leg Press
 - *Perturbation Training
 - *Isokinetic exercises (90 to 40 degrees) (120 to 240 degrees/second)
 - *Walking Program
 - *Bicycle for endurance
 - *Stair Stepper Machine for endurance
 - *Biodex stability system
 - *Sports RAC Neuromuscular training on tilt board and Biodex stability

Week 10

KT 2000 Test – 20 and 30 lb. and Manual Maximum Test

Isokinetic Test – Concentric Knee Extension/Flexion at 180 and 300 degrees/second

- Exercises:
- *Continue all exercises listed in Weeks 6, 8 and 10
 - *Plyometric Training Drills
 - *Continue Stretching Drills
 - *Progress strengthening exercises and neuromuscular training

IV. ADVANCED ACTIVITY PHASE (Week 10-16)

Criteria to Enter Phase IV

- 1) AROM 0-125 degrees or greater
- 2) Quad strength 75% of contralateral side, knee extension flexor:extensor ratio 70% to 75%
- 3) No change in KT values (Comparable with contralateral side, within 2 mm)
- 4) No pain or effusion
- 5) Satisfactory clinical exam
- 6) 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%
- 7) Hop Test (80% of contralateral leg)
- 8) 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: *May initiate running program (weeks 10-12)
 *May initiate light sport program (golf)
 *Continue all strengthening drills

- Leg press
- Wall squats
- Hip Abd/Adduction
- Hip Flex/Ext
- Knee Extension 90-40
- Hamstring curls
- Standing toe calf
- Seated toe calf
- Step down
- Lateral step ups
- Lateral lunges

 *Neuromuscular training

- Lateral step-overs cones
- Lateral lunges
- Tilt board drills
- Sports RAC repositioning on tilt board

Week 14-16

- *Progress program
- *Continue all drills above
- *May initiate lateral agility drills
- *Backward running

V. RETURN TO ACTIVITY PHASE (Month 16-22)

Criteria to Enter Phase V

- 1) Full Range of Motion
- 2) Unchanged KT 2000 Test (within 2.5 mm of opposite side)
- 3) Isokinetic Test that fulfills criteria
- 4) Quadriceps bilateral comparison (80% or greater)
- 5) Hamstring bilateral comparison (110% or greater)
- 6) Quadriceps torque/body weight ratio (55% or greater)
- 7) Hamstrings/Quadriceps ratio (70% or greater)
- 8) Proprioceptive Test (100% of contralateral leg)
- 9) Functional Test (85% or greater of contralateral side)
- 10) Satisfactory clinical exam
- 11) Subjective knee scoring (modified Noyes System) (90 points or better)

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

Tests – KT 2000, Isokinetic, and Functional Tests before return

Exercises *Continue strengthening exercises
 *Continue neuromuscular control drills
 *Continue plyometrics drills
 *Progress running and agility program
 *Progress sport specific training
 - Running/cutting/agility drills
 - Gradual return to sport drills

6 MONTH FOLLOW-UP

Isokinetic test
KT 2000 test
Functional test

12 MONTH FOLLOW-UP

Isokinetic test
KT 2000 test
Functional test