

Accelerated Rehabilitation Following Contralateral PTG-ACL Reconstruction for Early Return to Competition

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)

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

Donor Knee

- *Strengthen what will be the donor knee
- *Recruit the right muscle fibers in preparation for postoperative rehabilitation
- *Educate patient on the concept of 2 separate surgeries and 2 different rehabilitation programs
- *Same as ACL leg plus a single-leg hop for distance
- *StairMaster (30 min)
- *Bike (20 min)
- *Weights (unilateral)
 - Leg press 5 x 3-6
 - Leg extensions 3 x 10
 - Leg curls 3 x 10
 - Heel lifts 5 x 20
- *Lower extremity flexibility
 - Quadriceps

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 on side

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

Donor Knee

- *Full knee ROM
- *Independent straight-leg raise
- *Weight bearing as tolerated
- *ROM
- *Ice to PTG placed on the patient's knee immediately after surgery to provide compression and cold to minimize pain and swelling.
- *Over pressure into extension
- *Knee flexion
 - Continue to increase bend beyond 110o flexion by pulling leg further to buttocks with hands
- *Leg control
 - Active quadriceps contraction with quad sets
 - Straight-leg raises

Postoperative Day 2 to 3

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 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
- *Patellar mobilization
- *Ankle pumps
- *Straight leg raises (3 directions)
- *Mini squats and weight shifts
- *Standing Hamstring curls
- *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., 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

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

Donor Knee

- *ROM exercises
- *Heel slides if needed
- *Step downs (1-4"): 2 x 20
- *Leg extensions with cuff weight (0-10 lb.): 3 x 12-15
- *Heel lifts: 3 x 12
- *Ice
- Patellar mobilization
- Soft tissue mobilization
- *Electrical stimulation of quad

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
- 7)

Goals: Maintain full passive knee extension
 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

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

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

Exercises

- *Muscle stimulation to quadriceps exercises
- *Isometric quadriceps sets
- *Straight Leg raises (4 planes)
- *Leg Press
- *Knee extension 90-40 degrees
- *Half squats (0-40)
- *Weight shifts
- *Front and side lunges
- *Hamstring Curls
- *Bicycle
- *Proprioception training
- *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

Swelling control – Ice, compression, elevation

Donor Knee

- *Active heel height with good quadriceps tone indicated by no extensor lag when performing a straight-leg raise
- *ROM
- *StairMaster
- *Bike
- *Quadriceps stretching (4 x 30 sec)
- *Weights (unilateral)
 - Leg press: 4 x 12-15
 - Leg extension: 3 x 12
 - Leg curls: 3 x 12
 - Heel lifts: 4 x 15
- *Continue quad strengthening exercises
 - 0-135/130°
 - 0-135°

Week Three

Brace – Discontinue

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

- Exercises**
- *Continue all exercises as in week two
 - *Passive Range of Motion 0-115 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
 - *Lateral Step Ups
 - *Front Step Ups
 - *Lateral Step-Overs (cones)
 - *Stair-Stepper machine
 - *Progress Proprioception drills, neuromuscular control drills

III. CONTROLLED AMBULATION 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

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

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)

Donor Knee *Full ROM

- *Quadriceps tone continues to improve with noticeable quadriceps definition returning
- *Return to full activity and 70% strength
- *Proprioceptive/agility specific program, including having the patient receive a passed basketball while standing on 1 foot.
- *Complete a sport-specific functional progression
- *Same as ACL-reconstructed leg
- *Decrease repetitions, increase weight
 - Leg press: 5 x 12: 10-8-6-4
 - Leg extension: 3 x 10
 - Leg curl: 3 x 10
 - Calf raises: 5 x 20
 - Functional rehab drills same as ACL reconstructed leg

Week 6

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

- Exercises**
- *Continue all exercises
 - *Poor running (forward) and agility drills
 - *Balance on tilt boards
 - *Progress to balance and board throws

Week 8

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

- Exercises**
- *Continue all exercises listed in Weeks 4-6
 - *Plyometric Leg Press
 - *Perturbation Training
 - *Isokinetic exercises (90 to 40 degrees) (120 to 240 degrees/second)
 - *Walking/jogging
 - *Bicycle for endurance
 - *Stair Stepper Machine for endurance

IV. ADVANCED ACTIVITY PHASE (Week 10-16)

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
 - *Running program/sprinting

Criteria to Enter Phase IV

- 1) AROM 0-125 degrees or greater
- 2) Quad strength 79% 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
 - 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 *Continue all exercises

V. RETURN TO ATHLETICS PHASE (Week 12-22)

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

6 MONTH FOLLOW-UP

Isokinetic test
 KT 2000 test
 Functional test

12 MONTH FOLLOW-UP

Isokinetic test
 KT 2000 test
 Functional test