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 REHABILIATION 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^{o}
- 0-135^{o}

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
*Poor 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