



ANDREAS SAUERBREY, M.D.

Rehabilitation Following ACL Reconstruction
With Medial Collateral Ligament Repair

I. 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

A. 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

1) Postoperative Day 1

Brace:

- Brace/immobilizer applied to knee, locked in full extension

Weight Bearing: Two crutches, weight bearing as determined by physician

Exercises:

- Ankle pumps
- Overpressure into full, passive knee extension
- Active and Passive knee flexion (90 degree by day 14)
- Straight leg raises (Flexion, Abduction, Adduction)
- Quadriceps isometric setting
- Hamstring stretches

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

B. Postoperative Day 2 to 3:

Brace:

- Brace/immobilizer locked at zero degrees extension for ambulation

Weight Bearing:

- Two crutches, toe-touch weight bearing

Range of Motion:

- Remove brace perform range of motion exercises 6-8 times a day
- Perform frequent bouts of ROM to regain flexibility

Exercises:

- Overpressure into extension (knee extension should be at least 0 degrees to slight hyperextension)
- Emphasize restoring knee extension

- Patellar mobilization
- Ankle pumps
- Straight leg raises (No Adduction)
- Quadriceps isometric setting

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

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

C. Postoperative Day 4 to 7:

Brace:

- Brace /immobilizer locked at zero degrees extension for ambulation

Weight Bearing:

- Two crutches, toe-touch weight bearing

Range of Motion:

- Remove brace to perform range of motion exercises 6-8 times per day, knee flexion 90 degrees by day 14, approximately 100 degrees by day 21

Exercises:

- Overpressure into extension (full extension 0)
- Patellar mobilization (5-8 times daily)
- Ankle pumps
- Straight leg raises (3 directions)
- Quadriceps isometric setting

Muscle Stimulation:

- Electrical muscle stimulation (6 hours daily)

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

A. Week 2:Brace:

- Continue locked brace for ambulation

Weight Bearing:

- As tolerated (goal is to discontinue crutches 14-28 days post op per physician request)

Exercises:

- Muscle stimulation to quadriceps exercises
- Isometric quadriceps sets
- Straight leg raises (No adduction)
- Mini squats
- Weight shifts
- Hamstring curls standing (active ROM)
- Uni-cam bicycle (low intensity cycling)
- Proprioception training
- Overpressure into extension
- Passive range of motion from 0 to 105 degrees
- Patellar mobilization
- Well leg exercises
- Progressive resistance extension program - start with 1 lb., progress 1 lb. per week

Swelling Control:

- Ice, compression, elevation

B. Week 3: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 (emphasize ROM on bike)
- Lateral step-overs (cones)
- Frequent bouts of ROM exercises

III. Progressive Strengthening / Neuromuscular Control Phase (Week 4-10)Criteria to Progress to Phase III:

- 1) Active range of motion 0-115 degrees
- 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:

- Restore full knee range of motion (0-125 degrees)
- Improve lower extremity strength
- Enhance proprioception, balance, and neuromuscular control
- Improve muscular endurance
- Restore limb confidence and function

Brace:

- Unlock for ambulation

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

A. Week 4:Exercises:

- Progress isometric strengthening program
- Leg press (0-100 degrees)
- Knee extension 90-40 degrees

- Hamstring curls (isotonics)
- Hip abduction and adduction
- Hip flexion and extension
- Lateral step overs
- Lateral step ups
- Front step downs
- Wall squats
- Vertical squats
- Standing toe calf raises
- Biodex stability system (Balance, squats, etc.)
- Proprioception drills
- Bicycle
- Stair Stepper machine
- Pool program (Backward running, hip and leg exercises)

B. Week 6:

Exercises:

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

C. Week 8:

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
- Walking program
- Bicycle for endurance
- Stair stepper machine for endurance
- Biodex stability system

D. Week 10:

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 Progress to 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%

Goals:

- Normalize lower extremity strength
- Enhance muscular power and endurance
- Improve neuromuscular control
- Perform selected sport-specific drills

Exercises:

- 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

A. **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 Progress to Phase V:

- 1) Full range of motion
- 2) Unchanged KT 2000 Test (with 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) Functional test (85% or greater or contralateral side)
- 9) Satisfactory clinical exam

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