KNEE POSTERIOR CRUCIATE LIGAMENT (PCL) RECONSTRUCTION
POST-OPERATIVE GUIDELINES

The following posterior cruciate ligament (PCL) reconstruction guidelines were developed by the HSS Rehabilitation. Progression is both criteria-based and patient specific. Phases and time frames are designed to give the clinician a general sense of progression. Progression through the phases may vary in individuals with concomitant injuries/procedures such as graft choice, donor site, chondral injury, meniscal repair, and concomitant ligament injury/surgery.

FOLLOW SURGEON MODIFICATIONS AS PRESCRIBED
KNEE PCL RECONSTRUCTION POST-OPERATIVE GUIDELINES
Post-Operative Phase 1: Weeks 0-2

PRECAUTIONS
- Avoid active knee flexion
- Avoid heat application
- Avoid ambulation without brace locked at 0°
- Avoid exceeding range of motion (ROM and weight bearing limitations)
- Avoid pain with therapeutic exercise and functional activities

ASSESSMENT
- Lower Extremity Functional Scale (LEFS)
- NPRS
- Past medical history: understand medical issues that may impact tissue healing
- Wound status
- Swelling
- Distal and proximal lower extremity (LE) active range of motion (AROM)
- LE passive range of motion (PROM)
- Patella mobility
- LE flexibility
- Quality of quadriceps contraction
- LE strength
- Gait
- Current activity level/demands on LE

TREATMENT RECOMMENDATIONS
- Patient education for compliance with home exercise program (HEP) and weight bearing precautions
- Gait: toe-touch weight bearing (TTWB) with brace locked at 0° with crutches
- Patellar mobilizations
- Hamstring and calf stretching
- Passive extension (pillow under calf)
- Quadriceps re-education (quadriceps sets with EMS or EMG)
- Active-assisted knee extension / passive flexion exercise (ROM 0° → 70°)
- SLR (all planes) with brace locked at 0°, with progressive resistance as tolerated
- Proximal (hip) strengthening progressive resistance exercise (PRE)
- Cryotherapy
- Cardiovascular exercises (e.g., upper body ergometer (UBE), etc.), as tolerated
CRITERIA FOR ADVANCEMENT

- Knee ROM $0^\circ \rightarrow 70^\circ$
- Ability to SLR without quadriceps lag
- Demonstrate progressive improvement of patellar mobility and proximal strength

EMPHASIZE

- Compliance with HEP
- Adhere to weight bearing precautions
- Patellar mobility
- Full PROM knee extension
- Improving quadriceps contraction
- Controlling pain and swelling

MODIFICATIONS TO PHASE 1

- Follow surgeon specific modifications
KNEE PCL RECONSTRUCTION POST-OPERATIVE GUIDELINES
Post-Operative Phase 2: Weeks 3-6

PRECAUTIONS
- Avoid active knee flexion
- Avoid heat application
- Avoid ambulation without brace locked @ 0°
- Avoid exceeding ROM and weight bearing limitations
- Avoid pain with therapeutic exercise and functional activities

ASSESSMENT
- LEFS
- NPRS
- Swelling
- Patella mobility
- LE flexibility
- Quality of quadriceps contraction
- Lower extremity (LE) AROM and PROM
- LE strength
- Gait
- Current activity level/demands on LE

TREATMENT RECOMMENDATIONS
- Patient education for compliance with home exercise program (HEP) and weight bearing precautions
- Gait: progress from TTWB to 75% partial WB by 6 weeks with brace locked at 0° with crutches
- Patellar mobilizations
- Hamstring and calf stretching
- Passive extension (pillow under calf)
- Quadriceps re-education (i.e., quadriceps sets with EMS or EMG)
- Active-assisted knee extension / passive flexion exercise (ROM 0° → 70°)
  - Progress to 90° as tolerated, week 4-6
- Multiple angle quadriceps isometrics (ROM 60° → 20°)
- SLR (all planes) with brace locked at 0°, with progressive resistance as tolerated
- Proximal (hip) strengthening PRE
- Leg press (ROM 60°-0° arc) (bilaterally)
- Proprioception training (bilateral weight bearing)
- Cryotherapy
• Short crank ergometry (when 85° flexion achieved)
• Cardiovascular exercises (e.g., UBE, etc.), as tolerated

CRITERIA FOR ADVANCEMENT
• Knee ROM 0° → 90°
• Ability to bear 75% of weight on involved extremity
• Ability to SLR without quadriceps lag
• Continued improvement in patella mobility and proximal strength

EMPHASIZE
• Knee ROM
• Patella mobility
• Quadriceps contraction
• Activity level to match response and ability

MODIFICATIONS TO PHASE 2
• Follow surgeon specific modifications
KNEE PCL RECONSTRUCTION POST-OPERATIVE GUIDELINES
Post-Operative Phase 3: Weeks 7-12

PRECAUTIONS

- Avoid exceeding ROM limitations in therapeutic exercises
- Avoid resistive knee flexion exercises
- Avoid pain with therapeutic exercise and functional activities
- Monitor activity level (prolonged standing/walking/stairs)
- No active open kinetic chain (OKC) hamstring exercises

ASSESSMENT

- LEFS
- NPRS
- Swelling
- Girth measurement
- Patellar mobility
- LE PROM and AROM
- LE flexibility, where appropriate
- Quality of quadriceps contraction
- LE strength, where appropriate
- SLR in supine
- Functional assessment (e.g., single leg stance, step ups/downs, squat, gait)
- Balance testing (e.g., Star Excursion Test, etc.)
- Quadriceps isometrics testing with dynamometer at 60° at 12 weeks

TREATMENT RECOMMENDATIONS

- Patient education regarding monitoring of response to increase in activity level
- Gait training (discharge crutches when gait is non-antalgic)
- Underwater treadmill system and/or pool for gait training
- Retrograde treadmill ambulation
- Brace changed to surgeon preference (e.g., off the shelf brace, patella sleeve, unloader brace, etc.)
- Flexibility exercises
- Foam rolling
- Active assisted ROM exercises
- Perturbation training
- Active knee extension – OKC PRE 60° → 0° (monitor patellar symptoms)
- Core and LE strengthening
• Leg press (progress to eccentrics) and mini squats (ROM 60° → 0° arc)
• Initiate forward step-up program
• Initiate step-down program
• Proprioception training
  o Multiplanar support surfaces
  o Progress to unilateral support and contralateral exercises with elastic band
• Step machine
• Consider BFR program with FDA approved device if patient cleared by surgeon and qualified therapist available
• Cryotherapy
• Progressive home exercise program
• Standard ergometry (if knee ROM > 110°)

CRITERIA FOR ADVANCEMENT
• Knee ROM 0° → 130°
• Normal gait pattern
• Demonstrate ability to ascend 8-inch step
• Demonstrate ability to descend a 6-inch step
• Single leg bridge holding for 30 seconds
• Symmetrical squat to 60°
• Balance testing and quadriceps isometrics (@ 60°) at 70% of contralateral lower extremity

EMPHASIZE
• Functional progression pending functional assessment
• PROM and AROM
• Address impairments
• Functional movement
• Functional strength
KNEE PCL RECONSTRUCTION POST-OPERATIVE GUIDELINES
Post-Operative Phase 4: Weeks 13-24

PRECAUTIONS

- Initiate return to running upon meeting criteria > 16 weeks
- Avoid pain with exercises and functional training
- Monitor tolerance to load, frequency, intensity, and duration
- Avoid too much too soon

ASSESSMENT

- LEFS
- NPRS
- Swelling
- Girth measurements
- Patellar mobility
- LE flexibility, where appropriate
- LE AROM and PROM
- Quality of quadriceps contraction
- LE strength, where appropriate
- Functional assessment (e.g., single leg stance, step ups/downs, squat, single leg squat, gait)
- Balance testing (e.g., Star Excursion Test, etc.)
- Quadriceps and hamstring isometric or isokinetic testing
- Functional hop testing
- Return to Sport (RTS) Assessment

TREATMENT RECOMMENDATIONS

- Patient education regarding monitoring of response to increase in activity level
- Cryotherapy and/or compression therapy
- Flexibility exercises and foam rolling
- Core and UE strengthening
- Continue exercises from phase 2
- Continue foundational hip-gluteal progressive resistive exercises
- Progress squats to 0°-90° knee flexion, initiating movement with hips
- Progress leg press 0°-90° knee flexion (eccentrics, progressing to unilateral)
- Progress to single leg squats
- Forward step-up and step-down progression
- Progress lateral step-ups, crossovers
- Initiate lunges
• Progress proprioception training
• Progress cardiovascular conditioning
• Stationary bicycle
• Elliptical
• Incorporate agility and controlled sports-specific movements
• Initiate running progression at week 16 upon meeting criteria
  o Full ROM/Ability to descend 8” step without pain or deviations
• Initiate plyometric progression (see appendix 4)
• Knee ligament arthrometer exam at 6 months
• Progressive home exercise program
• Consider BFR program with FDA approved device if patient cleared by surgeon and qualified therapist available

CRITERIA FOR ADVANCEMENT
• No swelling
• Full LE ROM
• Descending 8-inch steps without pain or deviation
• Improved flexibility to meet demands of running and sport specific activities
• Quantitative strength and functional assessments >85% of contralateral LE
• Note: uninvolved side may be deconditioned; use pre-injury baseline or normative data for comparison, if available

EMPHASIZE
• Return to normal functional activities
KNEE PCL RECONSTRUCTION POST-OPERATIVE GUIDELINES

Post-Operative Phase 5: Weeks 25+

PRECAUTIONS

- Note the importance of gradual return to participation with load and volume monitoring under guidance of physical therapist, exercise physiologist, surgeon, certified athletic trainer (ATC) and coach
- Avoid premature or too rapid full return to sport

ASSESSMENT

- LEFS
- NPRS
- Swelling
- LE flexibility
- LE strength
- Balance testing (e.g., Star Excursion Test, etc.)
- Functional tests (e.g., hop testing)
- Quadriceps isometrics or isokinetic testing
- Return to Sport (RTS) Assessment

TREATMENT RECOMMENDATIONS

- Address quadriceps and hamstring strength deficits
- Gradually increase volume and load to mimic load necessary for return to activity
- Progress movement patterns specific to patient’s desired sport or activity
- Progression of agility work
- Progression of plyometric training
- Increase cardiovascular load to match that of desired activity
- Collaborate with ATC, performance coach/strength and conditioning coach, skills coach, exercise physiologist, and/or personal trainer to monitor load and volume as return to participation
- Consult with referring surgeon on timing return to sport including any recommended limitations

CRITERIA FOR ADVANCEMENT

- Quantitative strength & functional assessments ≥ 90% of contralateral lower extremity
- Movement patterns, functional strength, flexibility, motion, endurance, power, deceleration, and accuracy to meet demands of sport

EMPHASIZE

- Return to participation
- Collaboration with sports performance experts

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References


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