

## Medial Patellofemoral Ligament Reconstruction Protocol

### Revised 2023

The following protocol utilizes a blend of both criteria and timeframes as the determinants for advancement. It is recognized that many patients will be pain free relatively early in their rehabilitation and want to advance to higher level activities as a result. In spite of rapid functional progress, it is important to respect the biological healing component of recovery and limit advancement if the timeframe for a given stage has not been completed. Overall, this protocol targets gradual return to full activity beginning at 9 months if all criteria are met. However, if the criteria are met prior to 9 months the surgeon may consider earlier return to sport based on the patient's performance.

At around 3 months, 6 months and 9 months patient will have scheduled follow-up visits with their surgeon. Strength and functional assessments should be completed prior to these visits at a CHOP sports physical therapy location. Clearance from the surgeon must be obtained to progress to the next phase at these points.

**WEEKS 1 to 2:** (Initial PT evaluation to be scheduled within 2 weeks following surgery)

#### Goals:

- Weight bearing: TTWB with crutches
- Brace use: locked in full extension (-10° on brace) at all times except for PROM exercises
  - Sleep with brace locked in full extension
- Minimize pain and effusion – compression wrap, elevation, ice
- Achieve/maintain full knee extension
- Increase knee flexion 10° per day
  - If a CPM is available: begin at 30° and increase 10° daily
- Restore quadriceps activation

#### Interventions:

- Effusion management (elevation, cryotherapy, compression, ankle pumps)
- PROM/Flexibility:
  - Prone hangs and/or Extension with heel prop
  - Wall slides and/or Heel slides
  - Seated active assisted knee flexion
  - Hamstring/Calf stretches (non-weight bearing)
- Manual therapy:
  - Low grade patellar mobilizations: medial, superior, inferior glides (avoid lateral)
- Strength:
  - Promote muscle activation (NMES with quad sets and/or biofeedback)
    - Suggested settings: 20-50 sec OFF, 10 sec ON, 2 sec RAMP, 10-15 mins total, 75 Hz pulse rate, 400 µsec pulse width, symmetrical waveform
    - Achieve an amplitude (in mA) for strong muscle contraction
  - Quad sets
  - SLR's with brace locked in extension (flexion, adduction, abduction, extension)
- Daily home exercise program
  - Include home NMES device 2-3 times per day (**until no quad lag present**)

## WEEKS 2 to 4:

### Goals:

- Weight bearing: WBAT - Wean, discontinue crutches **during week 2**
- Brace use:
  - Unlock brace to 90° for ambulation at post-op week 4 if:
    - Able to perform SLR without quadriceps lag
    - AROM  $\geq$  90°
  - Sleep with brace locked in full extension until consistently maintaining full knee extension
- Continue to restore quadriceps activation if necessary
- Minimize pain and effusion
- Knee flexion:
  - 90° by end of week 2
  - 130° by end of week 4
- Good patellar mobility (avoid lateral glide)

### Interventions (in addition to those listed in previous weeks):

- PROM/Flexibility:
  - Stationary bike for ROM
- Manual therapy:
  - Low grade patellar mobilizations: medial, superior, inferior glides (avoid lateral)
  - Scar tissue mobilization (once incisions are healed)
- Balance/Proprioception
- Strength:
  - SLR's without brace once quadriceps lag improves
  - Multi-angle quadriceps isometrics
  - Functional strengthening/ Neuromuscular control:
    - Step exercises with frontal plane control (step-ups, lateral step-downs, etc.)
    - Squats/Wall Sits (no greater than 90° of knee flexion)
  - Isolated strengthening/Weight machines:
    - Leg press (no greater than 90° of knee flexion)
    - Unilateral open chain knee extension from 90-45°
    - Isometric knee extension at 60° with or without use of functional NMES
  - Hamstring, hip, calf and core strengthening
- Daily home exercise program

## WEEKS 4 to 12:

### Goals:

- Brace Use: discontinue at 6 weeks **if the following criteria are met:**
  - AROM  $\geq$  100°
  - Perform multiple single leg squats to 30° with proper frontal plane control
- Minimize pain and effusion
- Regain full ROM
- Initiate non-impact cardiovascular training
- Initiate open chain knee extension through full range, progressing to resistance at 8 weeks
  - Decrease lever arm until tolerated through full ROM
- May begin closed chain exercises beyond 90° knee flexion at 8 weeks

**Interventions** (in addition to those listed in previous weeks):

- Strength:
  - Functional strengthening:
    - Unilateral strengthening - single leg squats, lunges (multi directional), lateral step-downs, Bulgarian split squats, single leg RDL, single leg bridges, etc.
  - Isolated strengthening/Weight machines:
    - Single leg knee extension, hamstring curls, leg press, hip abductor/adductor machine
- Core stabilization
- Balance/Proprioception
- Cardiovascular endurance: Elliptical, stationary bike, Stairmaster, fast paced walking
- Daily home exercise program

**WEEKS 12 to 16:**

**CRITERIA TO ADVANCE – 3-month assessment**

- **Surgeon clearance** (assessment to be completed at CHOP sports PT location prior to surgeon office visit)
- **Isokinetic strength testing - Quadriceps Peak Torque:**  $\leq 25\%$  deficit at  $180^\circ/\text{sec}$
- **Lateral step-down test (Set step height to achieve  $\sim 60^\circ$  knee flexion):**  $\leq 3/6$  errors
- **Y balance test (anterior reach only):**  $\leq 4$  cm difference as compared to uninvolved

**Goals:**

- Initiate straight ahead running (if above criteria are met) – begin with walk/jog progression
- May initiate plyometrics (double leg jumping only) once able to gradually advance to run  $\frac{1}{2}$  mile on level surface with good limb symmetry and without pain
- Continue improving strength (functional and isolated)

**Interventions** (in addition to those listed in previous weeks):

- Strength:
  - Functional strengthening/Neuromuscular control:
    - Unilateral functional strengthening with emphasis on control
  - Isolated strengthening/Weight machines:
    - Continue to progress isolated quadriceps/hamstring, and hip abductor/extensor/external rotator strengthening as necessary
- Cardiovascular endurance:
  - Advance resistance, duration, and speed with low impact exercise
  - Gradually advance with straight ahead running progression
- Plyometric training:
  - Begin with basic double leg jumps (50% effort for height/distance)
    - Focus on soft, symmetrical landing of both lower extremities
- Daily home exercise program

**MONTHS 4 to 6:**

**Goals:**

- Plyometrics: Transition to single leg jumps under the guidance of physical therapist once patient demonstrates proper symmetry and neuromuscular control with all double leg jumps and single leg squats.

- Continue improving strength (functional and isolated)

**Interventions** (in addition to those listed in previous weeks):

- Plyometrics:
  - Double leg jumps – Progress height/distance, multiple jumps in same direction, varying surfaces, jumping over/onto objects, etc.
  - Initiate single leg jumping focusing on soft landings with good control
    - Start with 50% effort for height/distance
- Strength:
  - Functional strengthening/Neuromuscular control: Unilateral functional strengthening and balance, with multiple components/dual tasking
    - Progress intensity/resistance, speeds, unstable surfaces, cognitive challenges, eyes closed and including upper body movements as appropriate
    - Focus on completing exercise without pain and with appropriate level of difficulty for balance/motor control
- Daily home exercise program

**CRITERIA TO ADVANCE – 6-month assessment**

- **Surgeon clearance** (assessment to be completed at CHOP sports PT location prior to surgeon office visit)
- **Full knee ROM**
- **No pain or swelling in the involved knee**
- **Isokinetic strength testing - Quadriceps Peak Torque:**  $\leq 15\%$  deficit at  $180^\circ/\text{sec}$
- **Lateral step-down test (Set step height to achieve  $\sim 60^\circ$  knee flexion):**  $\leq 1/6$  errors
- **Y balance test (all directions):**
  - Composite score  $\geq 90\%$
  - $< 4$  cm difference for anterior reach,  $< 6$  cm difference for posteromedial and posterolateral reach as compared to uninvolved limb
- **Functional hop testing battery:**  $\geq 85\%$  limb symmetry, pain free and good neuromuscular control
  - Single hop for distance
  - Triple hop for distance
  - Crossover triple hop for distance
  - Timed 6 meter hop
  - Unilateral vertical jump for height
- **Drop vertical jump using Landing Error Scoring System (LESS):**  $< 4$  errors

**MONTHS 6 to 9:**

**Goals:**

- Initiate sports specific drills and training, including agility exercises, under the supervision of your physical therapist if the above criteria are met.
- Overall focus/emphasis for all exercises, including plyometrics and agility training should be:
  - Symmetrical weight-bearing and good neuromuscular control
  - Demonstrating good tolerance for individual non-contact sport specific activities without knee pain/effusion, perceived instability, or asymmetrical movement patterns.
- Strength: Continued emphasis on regaining symmetrical quadriceps strength, while also incorporating hip strengthening and core stabilization

- Focus on completing exercises without pain and with appropriate level of difficulty for motor control

**Interventions:**

- Plyometrics:
  - Emphasize generating power and force dissipation with landings
  - Single leg - Progress if able to complete with soft landing and good control
    - Fade visual feedback e.g. mirror
    - Consider changing speeds, directions, and landing surfaces as appropriate
    - Incorporate sport or activity specific drills (kicking/catching balls, dribbling, holding sports equipment, etc.)
- Agility:
  - Start with single directional changes at slower speeds (forward sprint/back pedal, lateral shuffle)
  - Emphasize deceleration prior to change in direction, then progress with quicker changes in direction, carioca, resisted running (sport cords) and sport specific activities (incorporating ball or stick) as appropriate
- Strength:
  - Functional strengthening/ Neuromuscular control:
    - Advance to include sport specific demands and equipment (catching/throwing/kicking balls, uneven surfaces, reactive movements)
- Cardiovascular endurance:
  - Progress based on demands of sport, including sprint/distance running, cutting/agility drills (progressing speeds, duration, and changes in direction)
- Final home exercise program/injury prevention program

**CRITERIA TO ADVANCE – 9-month assessment/return to sport criteria**

- **Surgeon clearance** (assessment to be completed at CHOP sports PT location prior to surgeon office visit)
- **Full knee ROM**
- **No pain or swelling in the involved knee**
- **Isokinetic strength testing - Quadriceps Peak Torque:**  $\leq 10\%$  deficit at  $180^\circ/\text{sec}$
- **Lateral step-down test (Set step height to achieve  $\sim 60^\circ$  knee flexion):**  $\leq 1/6$  errors
- **Y balance test (all directions):**
  - Composite score  $\geq 90\%$
  - Limb symmetry  $\geq 90\%$
  - $< 4$  cm difference for anterior reach,  $< 6$  cm difference for posteromedial and posterolateral reach as compared to uninvolved limb
- **Functional hop testing battery:**  $\geq 90\%$  limb symmetry, pain free and good neuromuscular control
- **Drop vertical jump using Landing Error Scoring System (LESS):**  $< 2$  errors
- **Tuck jump:**  $< 6$  errors (if patient age and skill level appropriate)

**Once return to sport criteria are met, the patient will be advised to follow a specific and gradual return to sport progression program which will be provided by surgeon or physical therapist.**

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