

# Patellofemoral MACI Cartilage Restoration Surgery Rehabilitation Protocol

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## NOTES:

- These are guidelines for the trained therapist.
  - Note that swelling is common in patella transplants up to 9 months post-op.
  - Continued improvement in comfort occurs for 2-3 years before maximal outcome is achieved.
- This is complex surgery with a delicate graft – it is critical to review the operative report (may be obtained from the office) to **ensure not to overload the graft at any point throughout the rehabilitation process.**
- Attaining the goals of each phase are important prior to progressing to the next phase. If at any point the range of motion is not achieved within 20 degrees of goal by the time period suggested in the protocol, please contact my office.
- Primary goals include restoration of normal gait, full ROM, improvement in strength and endurance and restoration of neuromuscular control. Modify activities if increased pain, swelling or catching.
- **Please note:** the protocol starting on the page 5 is SPLIT between femoral condyle MACI surgeries and Patellofemoral MACI surgeries. It is **critical** that the appropriate protocol is followed depending on the location of the MACI surgery (my additional guidelines below are **patellofemoral-specific** MACI surgeries). If both femoral condyle and patellofemoral MACI is performed, follow the less aggressive guideline at each stage and reference my MACI femoral condyle additional guidelines document.
- **Please note:** below are additional guidelines that are modifications by Dr. Ayzenberg to the MACI protocol (Yellow background protocol beginning on page 5 after these modifications). These guidelines **take precedence** over the referenced protocol.
  - **Phase I (0-6 weeks) additional guidelines:**
    - Weight bearing progression per MACI protocol starting page 5. **Brace to be locked in full extension for first 4 weeks when weight bearing.**
    - If tibial tubercle osteotomy, then NWB locked brace and **nonweightbearing** x 6 wks
    - Brace locked at 0 degrees first week (and x3 weeks at night except for CPM use), 0-20 degrees week 2, 0-45 week 3, 0-60 week 4, 0-75 week 5, 0-90 week 6.

- Range of Motion
    - Goal to restore full passive knee extension immediately
    - No active extension ROM x 4 weeks. Passive ROM 0-20 degrees first 2 weeks **max**, then progress 0-45 week 3, 0-60 week 4, 0-75 week 5, 0-90 wk 6.
    - Gentle multidirectional patella mobilizations – teach patient to do these 6x daily as well.
    - Continuous Passive Motion Machine (CPM) should be initiated 24 hours after surgery and should be performed **6-8** hours daily first 6 weeks: starting at 0-20 degrees motion first 2 weeks, then increasing per motion guidelines above.
  - Weeks 0-2
    - Strengthening
      - Calf pumps
      - **If tubercle osteotomy**, no quad sets or hamstrings until week 5.
      - Passive extension with heel on bolster or prone hangs
      - E-stim in full extension with quad sets and SLR
      - Quad sets, co-contraction quads/hamstrings
      - SLR x 4 on mat in brace (parallel bars if poor quad control)
      - Double leg heel raises
      - Gentle hamstring stretching
  - Weeks 2-4
    - Add scar massage once incisions healed
    - SLRL x 4 on mat without brace, no resistance.
    - Single leg heel raises
    - Hamstring, hip flexor, ITB stretches.
  - Weeks 4-6
    - AROM, AAROM increase 0-90
    - SLR x 4 with light ankle weight
    - No closed chain leg press or squatting until week 12
    - Hamstring curls 0-45 degrees – carpet drags or rolling stool (closed chain)
    - Stationary bike for ROM
    - Pool therapy
  - E-stim for VMO/quadriceps muscle re-education/biofeedback encouraged early after surgery if needed.
  - Cryotherapy, compression stockings for swelling and pain control
  - Pool therapy starting week 4 if available
  - **Avoid** open chain active extension and repetitive knee flexion 40-70 degrees due to increased patellofemoral contact forces.
  - Gentle massage/deep friction to hamstring insertions, suprapatellar quadriceps, medial/lateral gutters at 2-3 weeks post-op.
  - No progression to phase II until these goals and those of below protocol met.
- **Phase II (6-9 weeks) additional guidelines:**
- Brace 0-105 weeks 6-7, 0-120 weeks 7-9 and DC brace
  - Continue appropriate prior exercises and PROM, AAROM, AROM through range.
  - Gentle A/AAROM flexion and extension permitted

- Standing SLR x 4 with theraband bilaterally
  - Hamstring curls through full range – carpet drag, rolling stool (closed chain)
  - Stationary bike – without resistance and elliptical trainer.
  - Treadmill – forwards and backwards walking
  - E-stim for VMO/quadriceps muscle re-education/biofeedback encouraged early after surgery if needed.
  - Gentle massage/deep friction to hamstring insertions, suprapatellar quadriceps, medial/lateral gutters at 2-3 weeks post-op.
  - No progression to phase III until these goals and those of below protocol met.
- **Phase III (9-12 weeks) additional guidelines:**
- Goal to be able to walk 2 miles and 15 min/mile pace
  - D/C brace with good quad control
  - Exercises
    - Continue appropriate prior exercises
    - Work to regain full ROM active and passive
    - Isometrics and closed-chain terminal knee extension 0-40 degrees only.
    - **No open chain knee strengthening** until 6 months post-op
    - Backward treadmill walking with safety bars for reduced PF forces.
    - Hip, hamstring, quad elastic band closed chain strengthening
    - Treadmill – walking progression program
    - Toward 12 weeks, may begin:
      - Proprioception – double leg BAPS, progress to single leg, ball toss, body blade
      - Wall squats (**no** flexion beyond 45 degrees)
      - Forward, lateral and retro step downs (no knee flexion beyond 45 degrees initially, progress to medium and large step in phase IV)
  - E-stim for VMO/quadriceps muscle re-education/biofeedback encouraged early after surgery if needed.
  - Gentle massage/deep friction to hamstring insertions, suprapatellar quadriceps, medial/lateral gutters at 2-3 weeks post-op.
  - No progression to phase II until these goals and those of below protocol met.
- **Phase IV (3-6 months) additional guidelines:**
- Maintain full ROM
  - Gentle progression of strengthening and closed chain leg press and squatting.
  - Stationary bicycle with very low resistance
  - Treadmill forward/retrowalking
  - TKE 0-40 degrees and 120-70 degrees extension from a flexed position.
  - Full active flexion with resistance permitted.
  - Multidirectional patella mobilization as needed.
  - **No open chain strengthening** until 6 months.
  - Pool therapy recommended for motion
  - **No running or jumping** until 9-12 months post-op

- **Phase V (6-12 months) additional guidelines:**

- Goals: restore preoperative function, return to sport/recreation, unrestricted ADLs, maintenance of full ROM and initiation of running program
- Begin jogging program (earliest at 9 months)
  - Start with 2 min walk/2 min jog
  - Progress time and intensity as symptoms allow
- Strengthening
  - Continue maintenance program
  - Advance strength training and progress as tolerated
  - Plyometrics
- Functional Progressions
  - Begin agility program at 9 months with emphasis on sports-specific training.
  - Low-impact sports such as swimming, cycling, skating permitted at 6 months if goals are met.
  - Medium impact sports such as running, aerobics permitted at 8-9 months for small lesions, 9-12 months for larger lesions.
  - High impact sports such as basketball and tennis permitted between 12-18 months if all goals met.

**MACI protocol starts next – please combine with additional guidelines noted above. Remember to follow the patellofemoral-specific MACI protocol.**