

# MACI Patellofemoral Joint

Weeks One to Three	Weeks Four to Six
Evaluate	Evaluate
<ul style="list-style-type: none"> <li>➤ Range of motion</li> <li>➤ Joint hemarthrosis</li> <li>➤ Ability to contract quad/vmo</li> <li>➤ Gait: TTWB-PWB with 2 crutches</li> <li>➤ Patella Mobility</li> <li>➤ Inspect for infection/signs of DVT</li> <li>➤ Assess RTW and sport expectations</li> </ul>	<ul style="list-style-type: none"> <li>➤ Range of Motion</li> <li>➤ Ability to contract quad/vmo</li> <li>➤ Signs of infection or DVT</li> <li>➤ Patella mobility</li> <li>➤ Evaluate/discuss footwear to optimize foot and ankle biomechanics</li> </ul>
Patient Education	Patient Education
<ul style="list-style-type: none"> <li>➤ Support Physician prescribed meds</li> <li>➤ <b>Brace:</b> Locked in full knee extension</li> <li>➤ <b>Crutch Use:</b> 2 crutches at all times</li> <li>➤ <b>WB Status:</b> &lt;20% WB week 1, progress to 30% week 2, 50% WB by end of week 3</li> <li>➤ <b>CPM:</b> 0-20° week 1, progress to 0-30° week 2, 0-60° by end of week 3 (at minimum 6 hours per day for 6 weeks)</li> <li>➤ <b>ROM:</b> A/PROM 0-20° week 1, 0-30° week 2, 0-60° by end of week 3</li> </ul> <p style="text-align: center;"><b><u>PRECAUTIONS</u></b></p> <ul style="list-style-type: none"> <li>➤ <b>Week 1: No active knee extension thru ROM, no more than 20° of knee flexion*</b></li> <li>➤ <b>Brace use 24 hours per day for first 3 weeks</b></li> <li>➤ Discuss frequency and duration of treatment (2-3x/wk is expected for 12 weeks, intermittent after 12)</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Brace:</b> locked in full knee extension week 4-5, May D/C brace week 6 with good quad control</li> <li>➤ <b>WB Status:</b> 75% WB week 4, progress to FWB by week 6.</li> <li>➤ <b>Crutch Use:</b> transition to 1 crutch week 4, wean from crutch starting week 6</li> <li>➤ <b>CPM:</b> Maximum comfortable ROM</li> <li>➤ <b>AROM:</b> 0-90° week 4, progress to 0-125° by end of week 6</li> <li>➤ <b>Reinforce precautions regarding ROM, brace use, crutch use, and WB status.</b></li> <li>➤ Continue cryotherapy as needed, 20 min, 3x or more per day</li> </ul>
Therapeutic Exercise (Wk 1-3)	Therapeutic Exercise (Wk 4-6)
<ul style="list-style-type: none"> <li>➤ Week 1: Isometrics (quad, glute, HS), ankle pumps, PROM knee flex/ext to 20°</li> <li>➤ Week 2-3: PROM/AROM heel slides, quad sets with NMES, supine or sitting hangs/heel prop, 4-way leg raises, HS/Calf stretching</li> </ul> <p style="text-align: center;"><u>Initiate aquatics at 3-4 weeks post-op</u></p> <ul style="list-style-type: none"> <li>➤ Deep water walking (Fwd, Bwd, Sws), deep water calf raises, 4-way leg raises, Passive knee flexion, stretch HS/Calf</li> <li>➤ <b>Must maintain full knee extension when performing WB aquatic exercises until week 6*</b></li> </ul> <p>*Focus on duration of each exercise versus repetitions (30-45 seconds, progress to 60-90 seconds)</p>	<ul style="list-style-type: none"> <li>➤ Initiate recumbent bicycle week 5-6 (modified knee flexion, 90°)</li> <li>➤ Progress 4-way leg raises with weights/bands</li> <li>➤ Initiate clamshells</li> <li>➤ Initiate heel raises</li> <li>➤ Initiate core stabilization exercises</li> </ul> <p style="text-align: center;"><u>Progress aquatics at 4 weeks post-op</u></p> <ul style="list-style-type: none"> <li>➤ Shallow water walking (Fwd, Bwd, Sws), Initiate partial squats, shallow water heel raises, and standing HS curls</li> <li>➤ <b>Must Maintain full knee extension when performing WB aquatic exercises until week 6*</b></li> <li>➤ Open Chain aquatics: Initiate gentle bicycle, jumping jacks and cross-country skiers</li> </ul>
Manual Techniques	Manual Techniques
<ul style="list-style-type: none"> <li>➤ Patella mobilization as needed</li> <li>➤ PROM within precautions as tolerated (focus on extension)</li> <li>➤ Incision mobilization/edema STM week 2</li> </ul>	<ul style="list-style-type: none"> <li>➤ Patella mobilization as needed</li> <li>➤ PROM as needed within precautions</li> <li>➤ Incision mobilization</li> </ul>
Modalities	Modalities
<ul style="list-style-type: none"> <li>➤ NMES / Interferential/Biofeedback</li> <li>➤ Ice</li> </ul>	<ul style="list-style-type: none"> <li>➤ Modalities may be used as needed</li> </ul>
Goals	Goals
<ul style="list-style-type: none"> <li>➤ Gain full knee extension/restore quad contraction</li> <li>➤ Reduce joint hemarthrosis</li> <li>➤ Independence with post-op precautions</li> <li>➤ 0-60° ROM by end of week 3</li> </ul>	<ul style="list-style-type: none"> <li>➤ Pain-free gait, FWB by week 6</li> <li>➤ Pain-free knee flexion to 125°</li> <li>➤ SLR without quad lag</li> <li>➤ Proficiency with HEP</li> </ul>

Weeks Seven to Twelve	Months three to six
<b>Evaluate</b>	<b>Evaluate</b>
<ul style="list-style-type: none"> <li>➤ Gait pattern</li> <li>➤ ROM</li> <li>➤ Balance</li> </ul>	<ul style="list-style-type: none"> <li>➤ Gait pattern</li> <li>➤ Address any deficits that may limit return to work or sport.</li> <li>➤ HEP compliance</li> </ul>
<b>Patient Education</b>	<b>Patient Education</b>
<ul style="list-style-type: none"> <li>➤ <b>Brace:</b> D/C</li> <li>➤ <b>CPM:</b> To maximum comfortable range as required</li> <li>➤ <b>AROM:</b> Progress to full knee AROM by week 8</li> <li>➤ <b>WB Status:</b> FWB</li> <li>➤ <b>Crutch Use:</b> D/C</li> <li>➤ <b>**STEP TO PATTERN ON STAIRS OUTSIDE OF POOL**</b> -despite transition to FWB with flat surface ambulation. May begin to slowly progress stair training FWB at week 12.</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>AROM:</b> Full ROM</li> <li>➤ Transition to intermittent visits (land therapy)</li> <li>➤ <b>No plyometric activities</b></li> <li>➤ Initiate light jogging activities at 6 months</li> <li>➤ <b>High impact, shear, and rotational loads are to be avoided until 12-18 months post-op.</b></li> </ul>
<b>Therapeutic Exercise (Wk 7-12)</b>	<b>Therapeutic Exercise (Months 3-6)</b>
<ul style="list-style-type: none"> <li>➤ Initiate upright bicycle week 9</li> <li>➤ Initiate quad stretch week 9</li> <li>➤ Initiate standing weighted/resisted hip add/abduction</li> <li>➤ Single leg static/dynamic balance activity starting week 10</li> <li>➤ May initiate cardiovascular training at 12 weeks (Bike, Swim, and rowing)</li> <li style="padding-left: 40px;"><u>Progress Aquatics</u></li> <li>➤ Continue with current program</li> <li>➤ Progress squatting activities</li> <li>➤ Initiate weight supported lunge activities</li> <li>➤ Initiate weight supported step ups/down</li> <li>➤ Initiate quad stretching week 9</li> <li>➤ Introduce “Patter kick” week 12</li> </ul> <p>*Progress exercises using resistance fin(s) or hydrocuff(s)</p>	<ul style="list-style-type: none"> <li>➤ Progress cycling with resistance</li> <li>➤ Progress squatting activities (<math>\leq 90^\circ</math> of knee flexion)</li> <li>➤ Initiate rowing ergometer/elliptical</li> <li>➤ Initiate step up activities on land</li> <li>➤ Initiate bridging exercises</li> <li>➤ Initiate single leg calf raises</li> <li>➤ Initiate leg press (<math>\leq 90^\circ</math> of knee flexion, <math>\leq 50\%</math> body weight)</li> <li>➤ Initiate light jogging on mini-trampoline at 6 months</li> <li>➤ May initiate light jogging in pool at 6 months</li> </ul>
<b>Manual Techniques</b>	<b>Manual Techniques</b>
<ul style="list-style-type: none"> <li>➤ Patella mobilization as needed</li> <li>➤ PROM as needed</li> </ul>	<ul style="list-style-type: none"> <li>➤ Any as indicated</li> </ul>
<b>Modalities</b>	<b>Modalities</b>
<ul style="list-style-type: none"> <li>➤ Any as indicated</li> </ul>	<ul style="list-style-type: none"> <li>➤ Any as indicated</li> </ul>
<b>Goals</b>	<b>Goals</b>
<ul style="list-style-type: none"> <li>➤ Full pain-free knee AROM</li> <li>➤ Pain-free 6 minute walk test</li> <li>➤ Pain-free bicycle ergometer without brace</li> <li>➤ Proficient with performance of HEP</li> </ul>	<ul style="list-style-type: none"> <li>➤ Minimal to no pain</li> <li>➤ Normal gait pattern</li> <li>➤ Pain-free stair climbing</li> <li>➤ Leg press 50% body weight to 60-90° of flexion</li> <li>➤ Return to work</li> </ul>

## Months Six to Discharge

### Evaluate

- Single leg Stance stability
- Tolerance to stairs and ambulation on uneven surfaces
- Goals for return to recreational activities

### Patient Education

- Initiate light jogging activities at 6 months
- **High impact, shear, and rotational loads are to be avoided until 12-18 months post-op.**
- Return to competitive activities suggested after 12 months
- Intermittent visits with transition to CFA when appropriate

### Therapeutic Exercise (Months 6-D/C)

- Progress step up activities
- Progress OKC and CKC (lunges/squats) activities to unstable surfaces
- Initiate low-impact agility exercises at 9 months

### Manual Techniques

- Any as indicated

### Modalities

- Any as indicated

### Goals

- Return to running Program: walk/jog, jog/run, run on soft surface (grass or soft sand) by 12 months
- HS/Calf strength within 90% of contralateral leg by 9 months
- Transition to CFA at 9 months post-op per physician clearance
- Return to recreational activities

### References

1. Ebert, J. MACI Rehabilitation Manual. Vericel Corporation. 2016.
2. Ebert, J., Fallon, M., Janes, G., Wood, D. Minimum 10 Year Clinical and Radiological Outcomes of a Randomized Controlled Trial Evaluating Accelerated Weight Bearing After Matrix-Induced Autologous Chondrocyte Implantation. Orthopaedic Journal of Sports Medicine. 2019. 7(7 suppl5): 2325967119S00260.
3. Ebert, J., Schneider, A., Fallon, M., Wood, D.J., Janes, G.C. A Comparison of 2-Year Outcomes in Patients Undergoing Tibiofemoral or Patellofemoral Matrix-Induced Autologous Chondrocyte Implantation. American Journal of Sports Medicine. 2017. 45(14): 3243-3253.
4. Edwards, P.K., Ackland, t., Ebert J.R. Clinical Rehabilitation Guidelines for Matrix-Induced Autologous Chondrocyte Implantation on the Tibiofemoral Joint. Journal of Orthopaedic & Sports Physical Therapy. 2014. 44(2): 102-119.
5. Jones, K.J., Cash, B.M. Matrix-Induced Autologous Chondrocyte Implantation With Autologous Bone Grafting for Osteochondral Lesions of the Femoral Trochlea. Arthroscopy Techniques. 2019. 8(3): 259-266.
6. Kraeutler, M.J., Belk, J.W., Carver, T.J., McCarty, E.C. Is Delayed Weightbearing After Matrix-Associated Autologous Chondrocyte Implantation in the Knee Associated With Better Outcomes? A Systematic Review of Randomized Controlled Trials. Orthopaedic Journal of Sports Medicine. 2018. 6(5): 2325967118770986.

Created 2020