# Rehabilitation Protocol for Microfracture of Femoral Condyle and Patella/Trochlear Groove

This protocol is intended to guide clinicians and patients through the post-operative course for microfracture of the femoral condyle or patella/trochlear groove. Microfracture technique is a reparative technique used to treat articular cartilage defects. It is indicated for full-thickness articular cartilage loss in a weightbearing area between the femur and tibia or between the patella and trochlear groove. Controlled perforation of the subchondral bone is performed to stimulate marrow and stem cells to create a fibrocartilage callus that covers the lesion. This protocol is time based (dependent on tissue healing) as well as criterion based. Specific intervention should be based on the needs of the individual and should consider exam findings and clinical decision making. If you have questions, contact the referring physician.

**Considerations for the Post-operative Microfracture of femoral condyle and Patella/Trochlear groove protocol**
Many different factors influence the post-operative rehabilitation outcomes of the microfracture technique including: lesion size and location, cartilage quality and presence of concomitant injuries/procedures. Whether the procedure is performed on the femoral condyle (FC) versus the patella/trochlear groove (PTG) effects the protocol, see below for more detailed description. It is important to know location of the lesion and biomechanics of the knee for articular contact areas through the range of motion. Individual factors can also influence rehabilitation outcomes including: athlete's age, BMI, sport, and competitive level. It is recommended that clinicians collaborate closely with the referring physician regarding these factors.

If the patient develops a fever, intense calf pain, uncontrolled pain, uncontrolled swelling, or any other symptoms that are of concern call the physician immediately.

## *PHASE I: PROTECTION & JOINT ACTIVATION (0-8 WEEKS AFTER SURGERY)*

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| **Rehabilitation Goals** | • Protect the surgical repair from shear and load forces<br>• Restore full passive knee extension<br>• Gradually restore knee flexion<br>• Decrease pain and effusion<br>• Restore quad control | |
| **Weight Bearing & Brace** | **FC Lesions: no brace**<br>• TTWB (20-30% BW) 0 to 6-8 weeks *dependent on size and location of lesion* | **PTG Lesions:**<br>• Week s 0-2: PWB (50%) – brace locked in extension.<br>• Week 3: Progress to WBAT - brace locked in extension till week 6<br>• Weeks 6-8: progressively open brace to maximum of 40° in weightbearing |
| **CPM** | **FC Lesion:**<br>• Use 6-8 hours/day, in 2-hour blocks.<br>• Start with knee at full extension to 30-40° degrees knee flexion.<br>• Increase by 5-10°/day as tolerated<br>• If unable to use a CPM perform 500 reps, 3x/day of PROM knee flexion and extension.<br>• Monitor for joint effusion and pain | **PTG Lesion:**<br>• Day 1: Use 10 hours (0-30°)<br>• Day 2+: 6-8 hours/day, in 2-hour blocks<br>• Progress to 60-90° by end of week 2.<br>• Increase by 5-10°/ day<br>• If unable to use a CPM perform 500 reps, 3x/day of PROM knee flexion and extension.<br>• Monitor for joint effusion and pain<br>• May progress more slowly than FC lesions |
| **ROM Goals** | **FC Lesions** *(PTG lesions will progress more slowly based on location of lesion):*<br>• Week 1: 0-90°<br>• Week 2: 0-105° | |

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| | • Week 3: 0-115°<br>• Week 4: 0-125° |
| **Intervention** | *Pain and swelling management:*<br>• Cryotherapy<br>• Elevation<br>• Compression<br><br>*Manual Therapy:*<br>• Patella mobilizations – **gentle with PTG lesions**<br>• Soft tissue mobilization<br><br>*Range of motion*:<br>• Heel prop for knee extension<br>  ○ May use overpressure of 6-12 lbs for low-load, long duration stretch – *Only if having trouble attaining full extension.*<br>• Passive seated and supine heel slides: **No forced flexion past 90° for 1st 2 weeks for PTG lesions**<br>• Ankle pumps<br>• Gastrocnemius stretching<br>• Hamstring stretching<br>• Bike: **Start at week 3,**<br>  ○ No resistance<br>  ○ Pain-free<br><br>*Strengthening:* **No active NWB knee extension for PTG lesions**<br>• Weeks 0-4<br>  ○ Quad set<br>  ○ Multi-angle Isometrics<br>  ○ Glut and hamstring isometrics<br>  ○ NMES or biofeedback with quadriceps isometrics<br>  ○ 4-way SLR<br>  ○ Standing 4-way SLR<br>  ○ Long sitting PF with band in knee extension<br>  ○ Standing hamstring curl<br>  ○ Open chain knee EXT (90°-40°): **FC Lesions only**<br>  ○ SAQ: **FC lesions only**<br>  ○ Weight shifting: **Start week 2, PTG lesions only**<br>  ○ Standing heel and toe raises: **Start week 4, PTG lesions only**<br>• Weeks 4-6:<br>  ○ Partial weight bearing leg press: 0-60°<br>  ▪ **PTG lesions and small FC lesions (< 2cm²)**<br>• Weeks 6-8:<br>  ○ PTG and small FC lesions: Progress partial weight bearing leg press: 0-90°<br>  ○ FC Lesions: Progress open chain knee Ext (90°-40°) 1 lb/week<br>  ○ Heel and toe raises: **FC lesions**<br>  ○ Small FC lesions (< 2cm²): Front lunges, lateral step up, front step ups, wall squats(0-45°) – *With assistive device, UE assist, or body weight support*<br>  ○ PTG Lesions: Loaded flexion from 0-30° in brace<br>  ▪ Mini squat, 4-inch step up<br><br>*Aquatic Therapy:* Once incision is healed (2-3 weeks post-op)<br>• Deep water to maintain weight bearing restrictions<br>• Gait Training, kickboard<br>• **No flutter kicks for PTG lesions**<br><br>*Patient Education:* |

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| | • Weight bearing restrictions<br>• Use of CPM<br>• Minimization of joint effusion |
| **Criteria to Progress** | • Full passive knee extension<br>• Minimum of 125° knee flexion<br>• < 3/10 knee pain<br>• Minimal to no joint effusion<br>• Elimination of quad lag with SLR |

## *PHASE II: PROGRESSIVE LOADING (8-12 WEEKS AFTER SURGERY)*

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| **Rehabilitation Goals** | • Gradually increase mechanical stress applied to repaired tissue<br>• Correct altered joint mechanics and neuromuscular control<br>• Full knee ROM equal to uninvolved side<br>• Gradual increase in quadriceps strength and endurance<br>• Gradual return to functional activities<br>• Maintain minimal to no joint effusion or pain | |
| **Weight-Bearing/Brace** | **FC Lesions:**<br>• Progress to full weightbearing | **PTG Lesions**<br>• Full weightbearing<br>• Discontinue use of brace |
| **CPM** | • Discontinue use of CPM – unless directed otherwise by surgeon | |
| **Contraindications** | • No stair-master<br>• No impact exercises<br>• Avoid Pivoting<br>• Avoid varus/valgus stress<br>• No open chain knee extension with PTG lesions | |
| **Additional Intervention** **Continue with Phase I interventions* | *Pain and swelling management:*<br>• Modalities as needed<br><br>*Manual Therapy*:<br>• Patella mobilizations as needed<br>• Soft tissue mobilization as needed<br><br>*Aquatic Therapy:*<br>• Gait/running training<br>• Strengthening<br><br>*Therapeutic Exercise:*<br>• Large FC Lesions (>2cm$^2$)<br>  ○ Front lunge, front step ups, lateral step ups, wall sits and partial squats (0-45°)<br>  ○ Initiate partial weight bearing leg press(0-60°)<br>• Bridges, bridge with legs on ball, single leg bridge<br>• Mini Squat: 0-45°<br>• Romanian dead lifts<br>• 4-way SLR: Progress resistance<br>• Standing Hamstring curls<br>  ○ Limit ROM with PTG lesions based on location for articulation<br>• Step up progression: 2inches to 8 inches<br>• TKE<br>• Single leg knee bends<br>  ○ PTG 0°-30°<br>  ○ FC lesions: 0°-45°<br>• Progress closed chain LE exercise within a ROM that doesn't affect repairing cartilage.<br>• Core strengthening: Planks, side planks<br><br>*Cardiovascular conditioning:* | |

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| | • Elliptical<br>• Initiate a walking program @ 10-12 weeks<br>  ○ Start with -5-10 minutes; add 5min/wk<br><br>*Balance and proprioception:*<br>• Double leg:<br>  ○ Stable and unstable<br>  ○ Eyes open and closed<br>  ○ Squats on wobble board<br>• Single leg: begin when cleared to progress to full weight bearing<br>  ○ Stable and unstable<br>  ○ Eyes open and closed<br>  ○ External distractions/perturbations |
| **Criteria to Progress** | • Full and painless knee ROM<br>• < 3/10 pain with all activity<br>• No or minimal effusion<br>• Single leg balance ≥ 30% of uninvolved side or greater than 15 seconds<br>• 10 repeated single knee bends with good form and no reactive effusion or exacerbation of symptoms<br>• Star excursion balance test: 20-30% of uninvolved side with good form and no reactive effusion or exacerbation of symptoms |

## *PHASE III: REMODELING (12-16WEEKS AFTER SURGERY)*

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| **Rehabilitation Goals** | • Improve muscular strength and endurance<br>• Increase functional activities.<br>• Perform activities with minimal to no joint effusion or pain |
| **Weight Bearing** | • Full weight bearing |
| **Precautions** | • Post-activity soreness should resolve within 24 hours<br>• Avoid post-activity swelling |
| **Additional Intervention** **Continue with Phase II Interventions* | *Cardiovascular conditioning:*<br>• Elliptical<br>• Bike: 30 -45 min slowly increasing resistance as tolerated.<br>• Stairmaster<br>• Treadmill walking – increasing distance, speed, incline<br><br>*Strengthening:*<br>• Open chain knee extension:<br>  ○ PTG Lesions: Initiate open chain knee extension 90°-40°; **or angle that avoids articulation with lesion. – No resistance**<br>  ○ FC Lesions: Progress to 0°-90°<br>• Unilateral step-up progression: 2-inch to 8-inch<br>• Leg Press: 0°-90°<br>• Squats: 0°-60°<br>• Step downs: 2-inch to 8-inch progression **Crucial to have adequate quad control with PTG lesions, if not then avoid until have adequate quad control.**<br>• Hip Strengthening: Band walks, side planks with clam, side planks with hip ABD<br>• Progress core strengthening<br><br>*Balance and Proprioception:*<br>• Progress single leg balance: Bosu single leg balance, bosu squats, bosu single leg squats, dyna-disk single leg balance/squats<br>• Addition of ball toss, or UE coordination drills in DL/SL positions and stable/unstable surfaces |

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| **Criteria to Progress** | • Full non-painful ROM<br>• No reactive pain, inflammation or swelling with activities<br>• Hamstring and quad strength ≥ 80% of uninvolved side with HHD or isokinetic testing<br>• Balance and/or stability ≥ 75-80% of uninvolved leg<br>• 20 repeated single leg step downs with good form and no reactive effusion or symptoms<br>• 20 repeated SL partial squats to 60° with good form and no reactive effusion or symptoms |

## *PHASE IV: MATURATION PHASE (16+ WEEKS AFTER SURGERY)*

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| **Rehabilitation Goals** | • Gradual return to full unrestricted activities<br>• Single leg hop test within 75-80% of uninvolved leg<br>• Begin progression to jogging<br>• All activities are performed with good form and without reactive, pain, inflammation, and effusion |
| **Additional Intervention** **Continue with Phase III interventions* | Begin impact loading programs depending on location and size of lesion and surgeon clearance.<br>• Staged running program: **4-5 months for small lesions, 6 months for large lesions**<br>  ○ Perform on a forgiving surface<br>  ○ Start with 1 min/running, 4-min/walk<br>  ○ Running time is increased 1 min/week and walking time decreased 1-min/week, until able to complete 20 minutes of continuous running after week 5<br>• Initiate agility drills: single plane completed at 25% maximum speed;<br>  ○ Increase 25% increase speed/week<br>  ○ Progress to multi-direction drills<br>*Strengthening:*<br>• Emphasize entire lower extremity strengthening<br>• Progress resistance as tolerated<br>• NWB Knee Extension: PTG lesions – **Starting week 20**<br>  ○ Add 1lb/2weeks if no pain or crepitus<br>  ○ Perform from 90-40 deg or angle that avoids lesion articulation<br>*Plyometrics:*<br>• 16-18 weeks: PWB plyometrics, aquatic plyometrics, Gravity eliminated double leg hopping<br>  ○ Progress to SL aquatic plyometrics, SL gravity eliminated hopping, SL PWB hopping/plyometrics<br>• 18-20 weeks: DL box drop to forgiving surface, DL hopping forgiving surface<br>  ○ Progress to SL hopping, and to firmer surfaces<br>  ○ Box jumps, Double leg hopping in place, Single leg hopping in place, quick hops(front/back/side)<br>• Slowly progress amount of body weight with double leg 1st then progress through single leg.<br>• Start with compliant surfaces like foam |
| **Return to sport timelines** | • Low-impact sports/activities: Swimming, skating, rollerblading, and cycling<br>  ○ 2 months – Small FC lesions and PTG lesions<br>  ○ 3 months – Large FC lesions<br>• Higher-impact sports/activities: jogging, running, and aerobics<br>  ○ 4-5 months: Small FC lesions and PTG lesions<br>  ○ 6 months: Large lesions<br>• High-impact activities (requires jumping, pivoting, cutting): football, basketball, tennis, soccer, baseball<br>  ○ 6-8 months: Small FC lesions and PTG lesions<br>  ○ 9-12 months: Large FC lesions |

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| **Criteria to Return to Sport** | • Physician Clearance<br>• LE strength within 90% of uninvolved leg with HHD or isokinetic testing<br>• Score ≥ 90% of Knee Outcome Survey activities of daily living scale (KOS-ADLS)<br>• Symmetry with functional testing:<br>  ○ Triple hop<br>  ○ Crossover hopping<br>  ○ Long jump<br>• No reactive pain, inflammation, effusion, or instability with sport-specific activity |

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| **Contact** | Please email MGHSportsPhysicalTherapy@partners.org with questions specific to this protocol |

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