Microfracture / Marrow Stimulation (Knee)

Physical Therapy Protocol · Lesion Location-Specific (Femoral Condyle vs Patellofemoral)

Based on the Ohio State University Wexner Medical Center Knee Microfracture Clinical Practice Guideline (2023) and the Mass General Brigham microfracture rehabilitation protocol, supplemented by the Steadman group's rehabilitation review (Hurst et al., Clin Sports Med 2010).

AT A GLANCE

TIMELINE	6-12 months to full return depending on lesion size and location; progression is criterion-based, not time-based
WEIGHT BEARING	Femoral condyle (FC): TTWB (20-30% BW) for 6-8 weeks, typically no brace. Patellofemoral (PTG): PWB-WBAT early in a brace locked in extension; brace gradually opened weeks 6-8. Confirm against operative note - lesion size drives WB status
KEY MILESTONES	Full passive extension by week 4 (red flag if absent); flexion 0-125° by weeks 4-8; full weight bearing without assistive device by ~8 weeks; effusion ≤1+ before impact loading
RETURN TO ACTIVITY	Low-impact (cycling, swimming) 2-3 months; staged running 4-6 months (small lesions earlier, large FC lesions ~6 months); cutting/pivoting/jumping 6-12 months with physician clearance

KEY PRECAUTIONS

- CPM is commonly ordered 6-8 hours/day in 2-hour blocks starting 0-30/40°, advancing 5-10° per day; PTG lesions avoid forced flexion past 90° in the first 2 weeks.
- PTG lesions: avoid resisted OKC knee extension through the lesion-engaging arc; FC lesions may perform OKC extension 90°-40° early. No stairmaster, impact, pivoting, or varus/valgus stress before Phase 3.
- Avoid activities generating high compression, shear, or rotational load until 4-6 months or per surgeon; post-activity soreness should resolve within 24 hours and reactive effusion warrants regression.
- Red flags: DVT signs, mechanical block or clunk, or lack of full extension by week 4 - refer back to the surgeon.

PHASED REHABILITATION

PHASE 1 - PROTECTION & JOINT ACTIVATION	Weeks 0-8
GOALS	• Protect the maturing marrow clot while restoring motion (0-90° week 1, 0-125° by week 4) • Full passive knee extension by week 4 • Effusion ≤2+ (Modified Stroke Test) and quad activation without lag
INTERVENTIONS	• WB per lesion: FC TTWB 20-30% BW for 6-8 weeks; PTG PWB 50% progressing to WBAT in brace locked in extension, opened to ~40° in weight bearing at weeks 6-8 • CPM 6-8 hours/day (2-hour blocks), 0-30/40° advancing 5-10° per day • Patellar mobilization (4 directions), bag/prone hangs for extension, heel slides and wall slides for flexion • Quad sets, multi-angle isometrics, 4-way SLR, prone TKE; FC only: unresisted OKC extension 90°-40° (weeks 4-6) • NMES to quadriceps after suture removal (10 s on / 50 s off × 15 min at ≥50% MVIC); BFR training 2×/week once sutures removed and cleared • Stationary bike without resistance from ~week 3 when ROM permits • Cryotherapy and compression for pain/effusion control
CRITERIA TO ADVANCE	• Full passive extension symmetrical to opposite side; flexion ≥125° • Quad set with normal patellar translation; 20× SLR without lag • Effusion ≤1+ and pain <3/10

PHASE 2 - PROGRESSIVE LOADING	Weeks 8-12
GOALS	• Full weight bearing with normalized gait; discontinue assistive device and brace • Full pain-free ROM (flexion goal by week 8) • Initiate closed-chain strengthening without reactive effusion
INTERVENTIONS	• Gait progression to full weight bearing; assistive device discharge per criteria (full active extension, 20× SLR without lag, no gait deviation) • Bridges, mini squats 0-45° progressing to 0-90°, Romanian deadlifts, step-ups 2-8 inches, TKEs • Single-leg knee bends (PTG 0-30°; FC 0-45°); leg press from ~week 8 • Gluteal and lumbopelvic strengthening; single-leg balance and proprioceptive training on stable then unstable surfaces • Elliptical from ~week 10; continue NMES at 60° flexion and BFR as indicated • No stairmaster, impact, pivoting, or varus/valgus stress in this phase
CRITERIA TO ADVANCE	• Full painless ROM; no or minimal effusion • 10 repeated single-leg knee bends with good form and no reactive effusion • Single-leg balance >15 seconds; isometric quad/hamstring strength ≥80% of uninvolved side

PHASE 3 - REMODELING	Weeks 12-16
GOALS	• Strength ≥80% of uninvolved limb (HHD or isokinetic testing at 12-16 weeks) • Tolerate progressive CKC/OKC loading without reactive pain or effusion
INTERVENTIONS	• OKC knee extension: FC progress to 0-90°; PTG 90°-40° or lesion-avoiding arc with low resistance • Leg press 0-90°, squats 0-60°, unilateral step-ups and step-downs 2-8 inches, lunges • Progressive balance/proprioception (BOSU, single-leg progressions, perturbations) • Cardiovascular conditioning: bike or elliptical 30-45 minutes; stairmaster and treadmill walking now permitted • Isometric strength testing at 12 weeks; isokinetic testing at 16 weeks
CRITERIA TO ADVANCE	• Full non-painful ROM; no reactive effusion with progressions • Quad/hamstring strength >80% of uninvolved side • 20 repeated single-leg step-downs and 20 single-leg squats to 60° with good form

PHASE 4 - MATURATION & RETURN TO SPORT	Week 16 to Months 6-12
GOALS	• Staged return to running, then agility, plyometrics, and sport • Limb symmetry: isokinetic strength ≥90% and hop-test LSI ≥90% before unrestricted sport
INTERVENTIONS	• Running initiation at 4-5 months (small lesions) to 6 months (large FC lesions) once ROM is full and symmetrical, isokinetic strength ≥80% (60°/s and 300°/s), effusion ≤1+, and hopping is pain-free without valgus collapse; interval program (1 min run / 4 min walk, add 1 min/week) • Plyometric progression: partial-WB and aquatic plyometrics (weeks 16-18), box drops and double-leg hopping progressing to single-leg on firmer surfaces (weeks 18-20) • Agility progression from 25% speed increasing ~25% per week: side shuffle, carioca, figure-8, backpedaling • Continued heavy strengthening: squats, leg press, deadlifts, multi-directional lunges, rotational trunk work • Isokinetic testing at 4, 6, 9, and 12 months; hop testing after 80% LSI achieved
CRITERIA TO ADVANCE	• Isokinetic quad/hamstring symmetry ≥90% at 60°/s and 300°/s; hop-test LSI ≥90% on all tests • No reactive effusion (≤1+) with sport-specific activity; normalized running mechanics • Physician clearance; full return typically 6-8 months (small lesions) to 9-12 months (large FC lesions)

GUIDING PRINCIPLES

This protocol follows criterion-based progression over rigid time-based advancement; phased rehabilitation balancing tissue healing with controlled stress application; objective milestones (ROM, strength LSI, functional testing) to guide phase transitions; individualization based on surgical findings, tissue quality, and patient factors; and ongoing surgeon–therapist communication throughout recovery.

REFERENCES

1. Ohio State University Wexner Medical Center Sports Medicine. Knee Microfracture Clinical Practice Guideline (2023). https://medicine.osu.edu/-/media/files/medicine/departments/sports-medicine/medical-professionals/knee-ankle-and-foot/microfracture_2023.pdf

2. Massachusetts General Hospital Sports Physical Therapy. Rehabilitation Protocol for Microfracture - Femoral Condyle. https://www.massgeneral.org/assets/MGH/pdf/orthopaedics/sports-medicine/physical-therapy/rehabilitation-protocol-for-microfracture-femoral-condyle.pdf

3. Hurst JM, Steadman JR, O'Brien L, Rodkey WG, Briggs KK. Rehabilitation Following Microfracture for Chondral Injury in the Knee. Clin Sports Med. 2010;29(2):257-265.

For clinical use by licensed physical therapists treating patients of Robert Pettit, MD. This document is a rehabilitation guideline, not a substitute for clinical judgment. Progression must be individualized based on intraoperative findings, tissue quality, and patient response. Scan the QR code for the current version of this protocol.