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Meniscus Repair Protocol

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The following document is an evidence-based rehabilitation protocol for knee arthroscopy with meniscus repair. The protocol is both chronologically and criterion based for advancement through four post-operative phases:

- Phase 1 : Maximum protection
- Phase 2 : Progressive stretching and early strengthening
- Phase 3 : Advanced strengthening and plyometrics
- Phase 4 : Return to sports functional program

Repair types:

Body

-Often concomitant with a ligament injury

Root

-Often isolated tear

-Slower rehabilitation progression to minimize hoop stress on meniscus

	Weightbearing	**Crutches or assistive device**	**Brace**	**ROM Limitations**
Body	Toe touch weight bearing for 4 weeks	Wean over 1-2 weeks with progression to FWB at 5-6 weeks post-operative	0-30°, gradually open 10-20° as quad function improves	0°-90° knee flexion until 4 weeks, then full ROM
Root	Toe touch weight bearing for 6 weeks	Wean over 1-2 weeks with progression to FWB at 7-8 weeks post-operative	0-30°, gradually open 10-20° as quad function improves	0°-90° knee flexion until 6 weeks, then full ROM

Key factors in determining progression include:

- Anatomic site of tear
- Suture fixation – risk of failure if rehabilitation is too vigorous
- Location of tear – anterior vs posterior
- Other pathology such as ligamentous injury

Phase 1 – Maximum Protection Phase

Post-operative weeks 0-4 (body)
Post-operative weeks 0-6 (root)

Goals for Phase 1

- Protect surgical repair
- Decrease inflammation and swelling
- Restore normal knee extension
- Educate patient on post-operative restrictions, gait, and tissue healing
- Maintain tibiofemoral and patellofemoral joint mobility
- Facilitate appropriate quadriceps activation

Criteria for progression to Phase 2

- Minimal pain with Phase 1 exercises
- Knee ROM 0-90°
- Perform straight leg raise without lag sign
- Normal neuromuscular firing patterns of knee musculature

Brace

- Post-op hinged knee brace, unlocked 0-30°
- Gradually unlock in 10-20° increments as quad function improves
- Transition to Recover knee brace as quadriceps function improves

Weight Bearing

- Toe-touch only (TTWB) for 4 weeks for body repair, 6 weeks for root repair
  - Maximum of 20-25 lbs through affected leg

Range of Motion

- Gentle active and passive ROM 0-90°
  - Restrict hamstring activation for medial posterior horn repairs
- Progression managed by physician's office

Stretching

- Emphasis on terminal knee extension
- Heel prop for extension, calf stretch, prone hang

Manual Therapy

- Patellar mobilization – all directions
- Scar mobilization, soft tissue mobilization, lymph edema message as needed

NMES

- Quadriceps re-education
- Consider home unit if insurance allows

Strengthening

- Ankle pumps, calf sets
- Quadriceps sets, prone terminal knee extension
- Open kinetic chain hip strength including straight leg raises – all planes with goal of no lag sign
- Gluteal and core strengthening

Cardiovascular

- Upper body ergometer

Aquatics

- Initiate aquatic therapy when surgical incisions have healed
  - Focus on normalizing weight bearing and gait
  - Consider alternating between land and water-based sessions if available

Modalities

- Instruct on cryotherapy use with Game Ready or IceMan – at least three times per day for 20-30 minutes with leg elevated above heart
- NMES unit at home if significant quadriceps lag present
- Compression to be worn during all waking hours
  - May remove to sleep

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Phase 2 – Moderate Protection Phase

Post-operative weeks 4-12
Post-operative weeks 6-12

Goals for Phase 2

- Minimize pain and inflammation
- Introduce gentle strengthening
- Restore full knee ROM
- Progress weight-bearing and ROM
- Normalize gait pattern with proper lower extremity biomechanics OR ability to unilateral WB without pain

Criteria for progression to Phase 3

- Minimal pain with Phase 2 exercises
- Normalized gait
- Single leg balance > 15 seconds
- Forward step down or SL squat to specific ROM
- Full pain-free knee ROM
- Descend 8" stair with proper knee control/alignment

Brace

- Recover brace (neoprene sleeve with medial/lateral support) with knee sleeve
- Wear when up and active

Weight Bearing

- Progress to weight bearing as tolerated, if not already done
  - Increase by 25% body weight every 3-4 days until FWB

Strengthening

- Continue Phase 1 strengthening exercises
- Progress to closed kinetic chain as able (demonstrates strong quadriceps contraction, minimal swelling, able to bear at least 50% body weight)
  - Standing TKE, leg press, mini squats/weight shifts, forward step up program (8" stair goal), double leg bridging
- Progress closed kinetic chain quadriceps strength with progression from bilateral to unilateral
  - Leg press, squats, step-up/downs, lateral stepping, multi-directional lunges

Proprioception

- DL balance
  - Progress stable to unstable surfaces
  - Add perturbation and dual tasking as able

Cardiovascular

- Stationary bike, elliptical trainer, stair climber
- Retrograde treadmill walking

Aquatics

- Continue phase 1 aquatics, as needed

Modalities

- Utilize cryotherapy and other modalities, as needed

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Phase 3 – Advanced Strengthening, Proprioception and Plyometric

Post-Operative Weeks 12-20

Goals for Phase 3

- Minimize pain and inflammation
- Maintain full knee ROM
- Improve muscle strength and endurance
- Quad girth within 1 cm of contralateral
- Improve neuromuscular control
- Initiate return-to-running progression
- Initiate plyometrics and agility training
- Isokinetic test ≥ to 85% limb symmetry (or force plate/dynamometer)

Criteria for progression to Phase 4

- Minimal pain with Phase 3 exercises
- Isokinetic test ≥ 85% limb symmetry
- No apprehension with basic plyometric and agility activity
- Initiated return-to-running progression with proper lower extremity biomechanics and without pain
- Reports confidence in lower extremity with sport specific activities

Stretching

- Continue stretching of all lower extremity musculature, as needed

Manual Therapy

- As needed to maintain range of motion and flexibility

Strengthening

- Continue Phase 2 strengthening exercises
- Introduce isokinetic knee extension (full arc, pain and crepitus free)
- Single leg exercise progressions (step-ups/downs, lunges, squats & RDLs)
    - Progress to multi-directional stepping patterns
    - Progress stable to unstable surfaces
    - Add perturbations
- Progressive hip and hamstring strengthening
    - Multi-directional band walks and stability training
    - Introduce eccentric hamstring strength training
- Core Stabilization
    - Focus on rotational patterns

Neuromuscular Control

- Incorporate unstable surfaces and dynamic movement patterns with functional strengthening progression
- Incorporate dual tasking and sport-specific progressions

Advanced Gait Re-Training & Agility

- Initiate return-to-running progression (12-14 weeks)
    - Utilize Alter-G treadmill or underwater treadmill, if available
    - 14+ weeks: sagittal plane jogging, sub-maximal ladder drills
    - 16+ weeks: advance to multi-directional running, sub-maximal pivoting and cutting

Plyometrics

- Initiate and gradually progress return hoping activities
    - Sagittal → Frontal → Rotational
    - Double leg → Single leg
    - Ascending → Descending → Repetitive box jumps/hops

Aquatics

- Advanced gait re-training
- Plyometric drills

Athletic Republic

- Consider ACL Bridge as early as 12 weeks post-operatively if needed to enhance functional demands

Work Conditioning

- Consider at 12 weeks if physically demanding occupation

Modalities

- Utilize cryotherapy, thermotherapy, and electrical modalities as needed

Phase 4 – Return to Sports Functional Program

Post-Operative Weeks 20+

Goals for Phase 4

- Minimize pain and inflammation
- Restore muscle strength and endurance
- Restore neuromuscular control
- Safe and effective return to previous level of function for sport or activity
- Forward step down or SL squat to 60°

Criteria for Return-to-Sport and Activity

- Full, pain free knee ROM
- Normal lateral step-down test without compensation
- Successful completion of return-to-sport testing
- Lower Extremity Functional Scale score ≥ 80/80 (athletes) and 75/80 (sedentary)
- Reports confidence in lower extremity with sport specific activities (Tampa Scale)

Independent Gym Based Program (HEP)

- Stretching as needed
- Single leg strength stabilization, and power development with emphasis on dynamic knee control
- Continue incorporation of core integrated exercises with functional strengthening progression

Agility & Plyometrics

- Advanced agility and plyometric drills
  - Progress towards full speed with sudden changes in direction
  - Incorporate dual tasking and sport-specific progressions
  - Continue focus on proper lower extremity biomechanics

Sport-Specific Training

- Initiate sport-specific training programs
  - Interval sport programs for running, cycling, swimming, skating, throwing, golfing, etc.
  - Olympic/power weight-lifting exercises
- Transition to Athletic Republic program if competitive or recreational athlete with specific goals for return-to-sport
- Progress return-to-running program
  - Progress distances, speed intervals, surfaces, hill training, and sprint work if appropriate

Activity-Specific Training

- Transition to work re-conditioning program if physical laborer or if specific occupational demands

Modalities

- Utilize cryotherapy and other modalities as needed

Brace

- Custom fit functional brace to be utilized for contact or potential contact sports or activities for ~1 year post-op

Return to Sport Testing (6-12 months post-op per MD)

- Balance: Y-balance testing within 4 cm of uninvolved side
- Strength: Knee isokinetic test ≥ 90-95% of the uninvolved side, lateral step-down test without compensation
- Hop testing: ≥ 90-95% limb symmetry
- Agility: Full speed sport-specific drills without pain or compensation
- Tampa Scale to determine readiness to return-to-play

* This protocol has been adapted from the Brigham and Women's Hospital protocol for Meniscal Repair. That referenced protocol was adopted from Brotzman & Wilk, as published in Brotzman SB, Wilk KE, *Clinical Orthopaedic Rehabilitation*. Philadelphia, PA: Mosby Inc; 2003:315-319.

This protocol was updated and reviewed in April 2020 by Jonathon Henry, MD, Stacey Hladish, PA-C, MSPS, LAT, ATC, Rebecca Donnay, PT, DPT, SCS, Dan Reznichek, PT, DPT, MS, SCS, LAT, and Joe Woldt, PT, DPT, SCS.