

Rehabilitation Protocols: Root vs Peripheral Meniscal Repair

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Disclosures

No Disclosures

Learning Objectives

- Discuss considerations for developing rehabilitation guidelines for meniscal repairs
- Develop appropriate rehabilitation protocols for peripheral and root meniscal repairs

Why Do We Care?

Meniscus tears are the most common cause of orthopedic surgeries

- 60 per 100,000 people
- 850,000 patients per year

Repair rates are increasing

- More active population
- Meniscectomies & non-operative management lead to increased knee instability & earlier OA

Significant variety in post-op protocols:

- Limited Weightbearing
- Limited ROM
- Dual restriction
- Accelerated



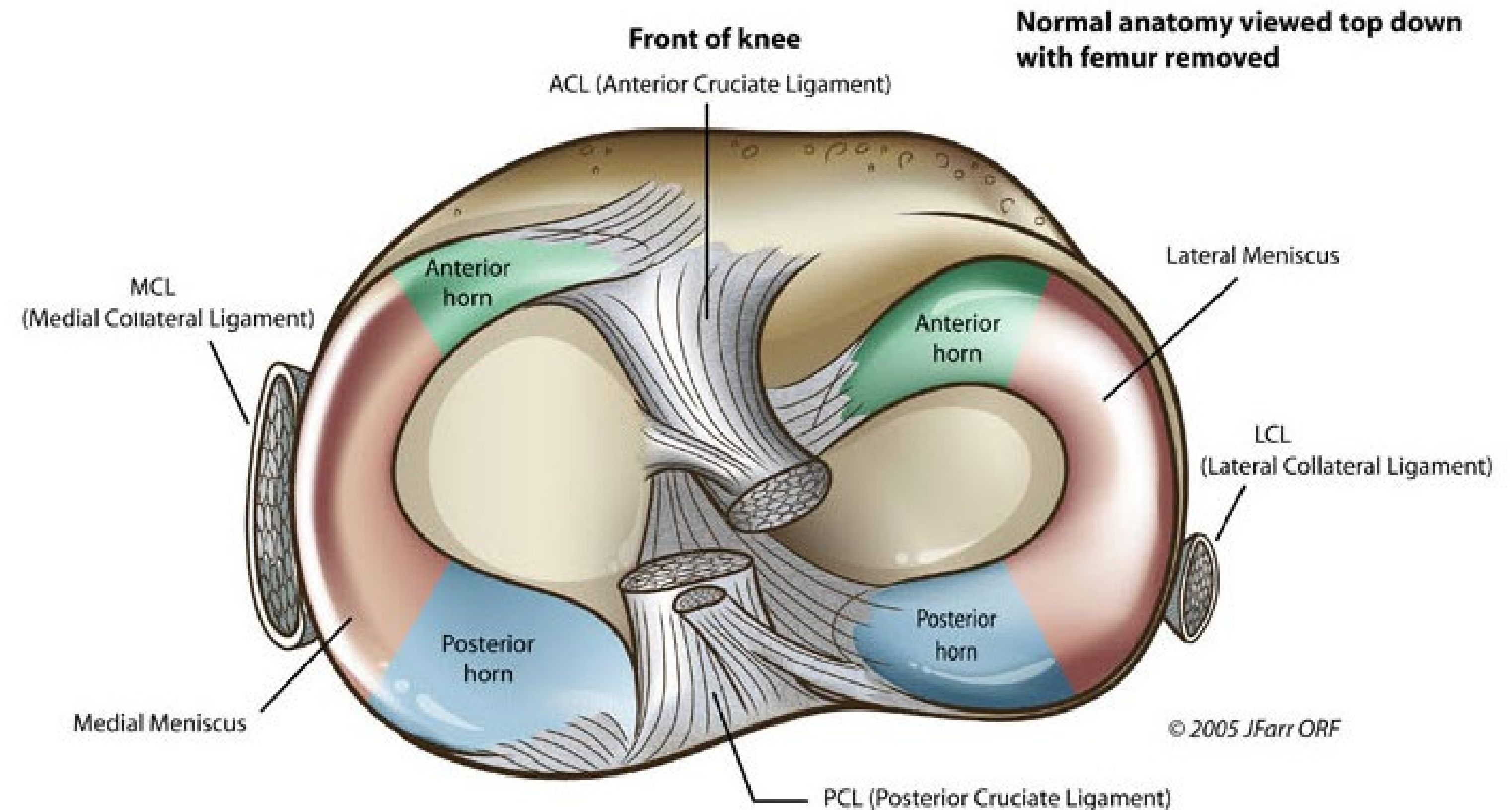
The Meniscus: A Quick Review

Anatomy

Function

- Load distribution
- Shock-absorption
- Stabilization
- Lubrication

Types of Tears



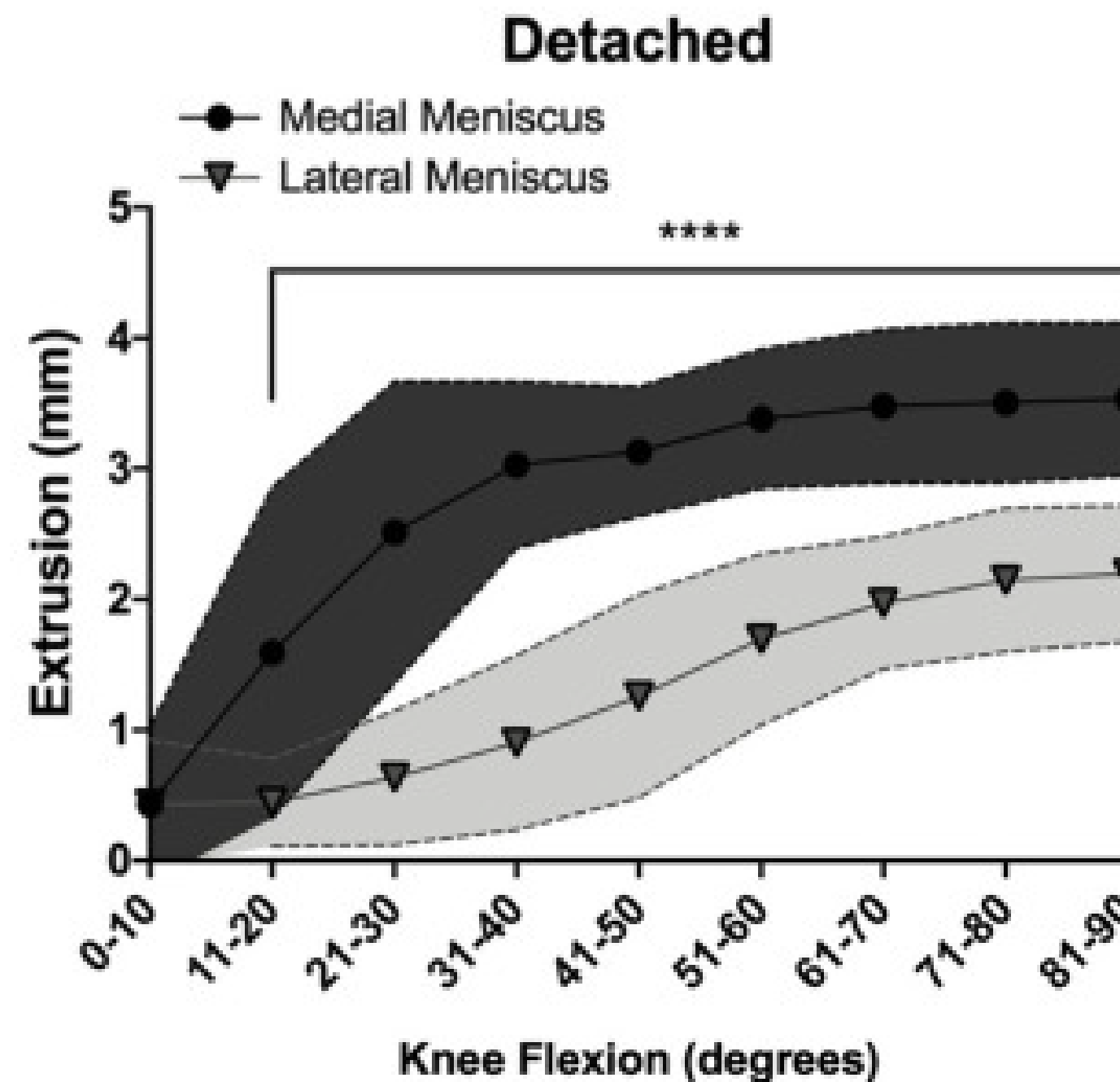
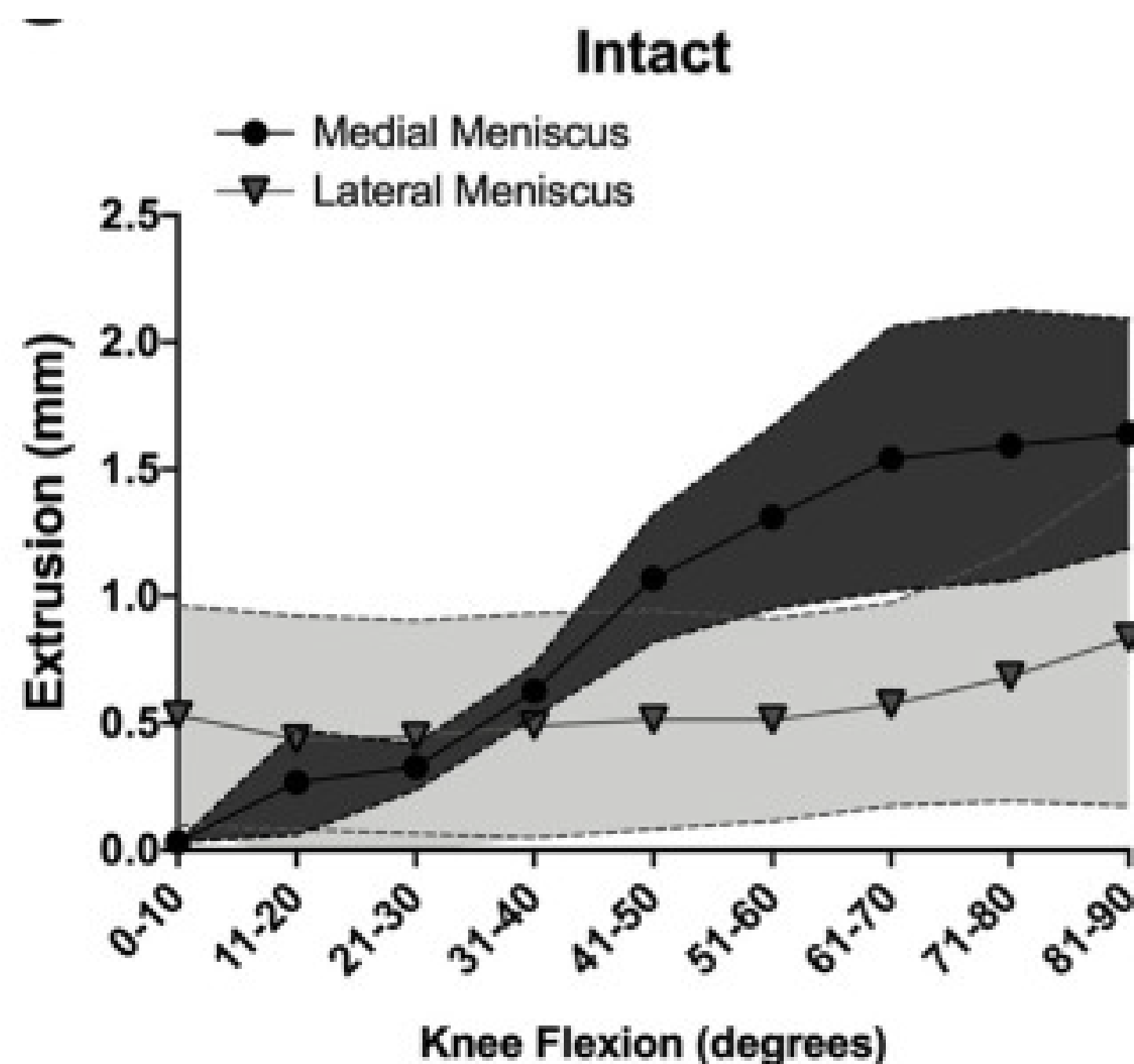
Medial vs Lateral Meniscus

MEDIAL MENISCUS

- More common in 4th-5th decade
- Degenerative
- Higher likelihood meniscal extrusion
- 3x more common

LATERAL MENISCUS

- More common in younger, athletes
- Traumatic (81% comorbid ACL tear)
- Less prone to biomechanical changes



Current Controversies: ROM & WBing Limitations

Table 2 Main findings of accelerated and restricted rehabilitations protocols described in literature

Manuscript	No of patients	WB limitations	ROM limitations	Failure rate and follow-up	Level of evidence
Choi et al. [28]	14	Toe-touch WB for 6 weeks, followed by a gradual increase of weight-bearing over the following 4 weeks	ROM exercises were allowed from 0° to 90° of flexion for 6 weeks	Failure rate 7% Follow-up 36 months	Case series: Level of evidence 4
Haklar et al. [29]	5	No WB 6–8 weeks	ROM 0°-120°	Failure rate 0% Follow-up 31 months	Non-randomised cohort: Level of evidence 3
Kocabey et al. [27]	52	Immediate WB as tolerated	ROM 0°-125°	Failure rate 4% Follow-up 10 months	Retrospective case series: Level of evidence 4
Lind et al. [21]	60 (32 accelerated protocol, 28 restricted protocol)	Accelerated protocol: 2 weeks toe-touch WB Restricted protocol: 6 weeks toe-touch WB	Accelerated protocol: ROM 0° – 90°, without brace, then return to normal activities Restricted protocol: 6 weeks with locked brace, gradual increase ROM to 90°	Failure rate 28% (accelerated) 36% (restricted) Follow-up 24 months	Randomised controlled clinical trial: Level of evidence 1
Logan et al. [31]	42	Protected WB for 6 weeks	ROM 0°-120° for 6 weeks	Failure rate 24% Follow-up 102 months	Case series: Level of evidence 4
Mariani et al. [11]	22	Immediate WB as tolerated	Immobilisation with brace locked in full extension for 1 month, passive ROM 0° – 90° for 2 weeks, than gradual increase	Failure rate 9% Follow-up 28 months	Non-randomised cohort study: Level of evidence 3
Noyes et al. [30]	29	Partial WB for 4 or 6 weeks	ROM 0°- 135° for 6 weeks	Failure rate 25% Follow-up 51 months	Non-randomised cohort study: Level of evidence 3

WB Weightbearing, ROM Range of motion

Current Controversies:

Weightbearing Limitations

Axial loading *compresses* bucket handle & vertical longitudinal tears, but *distracts* radial tears

Vertical: No differences in failure rates with early weightbearing

- ❖ May improve compliance & patient comfort

Root: Studies more limited

Nearly all suggest NWB status for a defined period (4-6 weeks)

- ❖ **ALL** fixation types are 3-5x weaker than intact root

Current Controversies:

Recommendations

Create an individualized program based on:

- Type
- Location
- Extent
- Tissue quality

Use combination of time & criteria to determine safe progression

❖ If in doubt, lean towards a more conservative approach

Peripheral Meniscal Repairs

PROTECTION PHASE (Week 0-4)

GOALS: Regain quad control, restore ROM, limit edema & pain

PRECAUTIONS:

1. ROM:

- Extension: full extension immediately
- Flexion: no forced flexion >90 degrees x 4wks

2. Weight bearing:

- Day 0 to 3 = 25% with B crutches
- Day 3 to 2 Wks = progress to WBAT with B crutches
- After 2 Wks = FWB no AD

3. No isolated hamstring strength x 8 wks

CRITERIA TO D/C CRUTCHES:

1. ROM:

- Full active knee extension
- No pain on passive overpressure

2. Strength:

- Strong quad isometric with full tetany & superior patellar glide
- 2x10 SLR without quad lag

Peripheral Meniscal Repairs

PROTECTION PHASE (Week 0-4)

SUGGESTED INTERVENTIONS:

- Extension ROM: hangs, quad sets
- Flexion ROM: heel & wall slides, stationary bike
- Quad strength/activation:
 - 4 way SLR
 - Multi angle isometrics (90, 60 deg)
 - TKEs
 - SAQs, LAQs
- ✓ NMES: Russian Stim 10-20:50 reach 50% MVIC
@ 0d, 60d, 90d flexion
- ✓ BFR: 20-40% 1RM (max 1# increase per week)
30x, 15x, 15x, 15x with 45-60sec rest
- Ambulation:
 - Gait training
 - Weight shift
 - Mini squat
- Calf, glutes, lumbopelvic stability
- Balance training
- Patellar mobilizations - all directions

Peripheral Meniscal Repairs

EARLY LOADING PHASE (Week 4-8)

GOALS: Regain full ROM & quad activation, reduce effusion & pain, protect healing tissues

PRECAUTIONS: NO isolated hamstring x 8 wks

ROM: Progress flexion

- ❖ If lacking full extension immediately contact surgeon

CRITERIA TO PROGRESS TO NEXT PHASE:

1. ROM: Full painfree AROM
2. Strength: demonstrate proper LE mechanics with all exercises (Bilaterally)
3. Weightbearing: Full without pain
4. Effusion: no reactive effusion with activity

SUGGESTED INTERVENTIONS:

- Progress WB exercises
 - Squats
 - Heel taps
 - Step ups
- Progress calf, glutes, lumbopelvic stability
- Progress SL balance
- ✓ Continue BFR & NMES as appropriate

Peripheral Meniscal Repairs

CONTROLLED STRENGTH & POWER PHASE (Week 8-12)

GOALS: Build strength and power for functional movements

ROM: Monitor & progress as needed

- ❖ Contact surgical team with any concerns

CRITERIA TO INITIATE RUNNING AND JUMPING:

1. 12 wks s/p and surgeon approval
2. Full, symmetrical ROM
3. Strength: FAST >70%
4. No reactive effusion
5. Normal WB, gait, and jogging mechanics
6. Pain free hopping in place (DL/SL)

CRITERIA TO PROGRESS TO NEXT PHASE:

Able to tolerate all above criteria

Full return to run/hop without pain or effusion

SUGGESTED INTERVENTIONS:

- Max effort multi angle isometrics
- Isolated hamstring strengthening
 - SL/DL RDL
 - Ball HS curl
 - Hamstring curl machine
- Progress accessory muscle work
- Progress balance
- Continue BFR & NMES as needed
- At 10 wks: Begin PWB plyometrics (shuttle hop)
 - ❖ If no reactive effusion, full ROM, good strength/control on SL squat & heel tap

Peripheral Meniscal Repairs

RETURN TO FUNCTION PHASE (Week 12+)

GOALS: Protect healing tissues; regain strength, power, & dynamic ability to prepare for return to functional activity

SUGGESTED INTERVENTIONS:

- Continue ROM/strengthening PRN
- Muscle power generation & plyometrics
- Agility (as strength and control allow)
 - Side shuffling
 - Carioca
 - Figure 8
 - Zig-zags
 - Resisted jogging (Sports Cord) in straight planes
 - Backpedaling

CRITERIA TO RETURN TO SPORTS:

1. ROM: full, pain free & symmetrical
2. Strength: Isokinetic testing $\geq 90\%$ hamstring & quad at $60^\circ/\text{sec}$ and $300^\circ/\text{sec}$
3. Effusion: No reactive effusion $\geq 1+$ with sport-specific activity
4. Weight Bearing: normalized gait and jogging mechanics
5. Neuromuscular control: appropriate mechanics & force attenuation strategies with high level agility, plyometrics, and high impact movements
6. Functional Hop Testing: LSI $\geq 90\%$ for all tests
7. Physician Clearance

Meniscal Root Repairs

MAXIMUM PROTECTION PHASE (Week 0-4)

GOALS: Protect repair, improve quad activation, limit edema & pain

PRECAUTIONS:

1. ROM:

- Extension: full extension immediately after surgery
 - ❖ Immediate referral if lacking full extension by 4 wks
- Flexion: gradually increase to 90d PROM
 - ❖ No forced flexion

2. Weight bearing:

- TTWB x 4 wks with brace locked in extension

3. No isolated hamstring strength x 10 wks

CRITERIA TO D/C NMES:

<20% deficit on isometric testing

CRITERIA TO PROGRESS TO NEXT PHASE:

1. ROM: minimum 0-0-90d

2. Strength:

- Full tetanic quad contraction with superior patellar translation
- 2x10 SLR with no extensor lag
- Able to hold SLR >10sec without lag

Meniscal Root Repairs

MAXIMUM PROTECTION PHASE (Week 0-4)

SUGGESTED INTERVENTIONS:

- Extension ROM: hangs, quad sets
- Flexion ROM: assisted heel & wall slides
 - ❖ Avoid active knee flexion
- Patellar mobilizations - all directions
- Glute strengthening
- Lumbopelvic stability
- Quad strength/activation:
 - 4 way SLR
 - Multi angle isometrics (90°, 60°)
 - Prone TKE
 - Knee ext 0-60°
- ✓ NMES: Russian Stim 10-20:50
 - attempting to reach 50% MVIC
 - @ 0°, 60°, 90° flexion
- ✓ BFR: 20-40% 1RM (max 1# increase per wk)
 - 30x, 15x, 15x, 15x with 45-60sec rest

Meniscal Root Repairs

MODERATE PROTECTION PHASE (Week 4-8)

GOALS: Regain full PROM, improve quad control, restore gait mechanics, protection of repair, limit edema & pain

PRECAUTIONS:

1. NO isolated hamstrings
2. NO twisting, pivoting, running, or deep squatting >90 degrees
3. ROM: Gentle progression of flexion PROM
 - ❖ If lacking full extension immediately contact surgeon
4. Weight bearing
 - Progressive WB 4-8wks
 - May unlock brace if there is good quad control.
 - Goal is full WB without brace at 8 wks

CRITERIA TO D/C CRUTCHES & BRACE:

1. ROM: Full active knee extension; no pain with overpressure
2. Strength: Full quad tetany with superior patellar glide; 2x10 SLR without quad lag
3. Weight Bearing: Painfree & no gait deviations
4. Effusion: <1+ preferred (2+ acceptable if all other criteria met)

Meniscal Root Repairs

MODERATE PROTECTION PHASE (Week 4-8)

SUGGESTED INTERVENTIONS:

- Gait training
- Weight shifts
- OKC quad strengthening
- Progress WB exercises:
 - Squat 0-60d
 - Heel tap
 - Step up/down
 - Leg press 0-70d
 - Hip abd/add
- Progress calf, glutes, lumbopelvic stability
- Progress balance
- ✓ Continue BFR & NMES as appropriate

CRITERIA TO PROGRESS TO NEXT PHASE:

1. Full, pain free PROM
2. Full WB without pain
3. No reactive effusion with exercises or activity
4. Neuromuscular control: demonstration of proper LE mechanics with all exercises (bilaterally)

Meniscal Root Repairs

EARLY LOADING PHASE (Week 8-12)

GOALS: Normalize gait without AD/brace; regain full AROM; build strength & power for function

PRECAUTIONS:

1. NO isolated hamstring strengthening until 10 weeks
2. NO twisting, pivoting, running and deep squatting >90d
3. ROM: full AROM by week 10
 - ❖ Contact surgical team with any concerns

CRITERIA TO INITIATE RUNNING AND JUMPING:

1. 16 wks s/p and surgeon approval
2. Full, symmetrical ROM
3. Strength: FAST >70%
4. No reactive effusion
5. Normal WB, gait, and jogging mechanics
6. Pain free hopping in place (DL/SL)

CRITERIA TO PROGRESS TO NEXT PHASE:

Able to tolerate all above criteria and full return to run/hop without pain or effusion

Meniscal Root Repairs

EARLY LOADING PHASE (Week 8-12)

GOALS: Normalize gait without AD/brace; regain full AROM; build strength & power for function

SUGGESTED INTERVENTIONS:

- Full OKC resisted extension
- Multi angle isometrics with max effort
- Week 10 : Isolated hamstring strengthening
 - SL/DL RDL
 - Ball HS curl
 - Hamstring curl machine
- Isolated calf strengthening
- Progress accessory muscle work
- Progress balance
- ✓ BFR and NMES – as needed
- ❖ Initiate jogging per MD auth

Meniscal Root Repairs

RETURN TO FUNCTION PHASE (Week 12+)

GOALS: Protect healing tissue; regain strength, power & dynamic ability for functional movements

PRECAUTIONS:

1. Deep squatting permitted at 5 ½ months
2. Initiate pivoting and cutting: 5-6 months
3. Initiate agility training: 5-6 months

RETURN TO FULL SPORT PARTICIPATION:

1. 5-6 months
2. >90% FAST
3. Surgeon clearance

SUGGESTED INTERVENTIONS:

- Quadriceps, hamstring, glute, calf, and trunk dynamic stability
- Muscle power generation and plyometrics
- Begin agility:
 - Side shuffling
 - Carioca
 - Figure 8
 - Zig-zags
 - Resisted jogging (Sports Cord) in straight planes
 - Backpedaling

Thank You

SCOPE PROTOCOL TEAM

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Questions?

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