MENISCUS ROOT/RADIAL TEAR REPAIR CLINICAL PRACTICE GUIDELINE

Summary of Recommendations

Meniscal Loading	• **Studies report CKC loading to medial and lateral posterior horns:**
	  ○ 4x more pressure at 90° than 0°
	  ○ Significant pressure increase from 30° to 60°
	  ○ Unlikely to stress roots in a safe progression from 0° to 45°

Weight Bearing Precautions	• Weeks 0-6
	  ○ NWB
	  ○ Brace- Total range of motion (TROM) locked in knee extension for 4-6 weeks
	• Weeks 7-12
	  ○ Progressive weightbearing (WB) with goal of full WB by 8-9 weeks
	  ○ Closed kinetic Chain (CKC) WB knee flexion less than 40 degrees until weeks 7-9
	  ○ CKC WB knee flexion <70° until weeks 10-15
	• Week 12-21
	  ○ Until week 20, maximum of 90° CKC WB knee flexion
	  ○ Weeks 22+
	  ○ Until 6 months, no deep squatting >90° of knee flexion

Hamstring Precautions	• No isometric hamstrings activity x 7 WEEKS • No isotonic isolated hamstring interventions x12 WEEKS

Strength Testing	• Isometric testing
	  ○ 4 months
	• Isokinetic testing
	  ○ 6 months

Criteria to Discharge Assistive Device	• **NWB x 6 WEEKS, Full WB with no assisted device (AD) by week 8-9** • ROM: Full active knee extension; no pain on passive overpressure • Strength: Able to perform strong quad isometric with full tetany and superior patellar glide and able to perform 2x10 SLR without quad lag • Effusion: 1+ or less is preferred • Weight Bearing: Demonstrates pain-free ambulation without visible gait deviation for 3 minutes at self-selected speed
Criteria to Initiate Running and Jumping	• ROM: full, pain-free knee ROM, symmetrical with the uninvolved limb 2. Strength: Isokinetic testing 80% or greater for hamstring and quad at 60º/sec and 300º/sec • Effusion: 1+ or less • Weight Bearing: normalized gait and jogging mechanics • Neuromuscular Control: Pain-free hopping in place

Criteria for Return to Sport	● ROM: full, painfree knee ROM, symmetrical with the uninvolved limb ● Strength: Isokinetic testing 90% or greater for hamstring and quad at 60º/sec and 300º/sec ● Effusion: No reactive effusion ≥ 1+ with sport-specific activity ● Weight Bearing: normalized gait and jogging mechanics ● Neuromuscular control: appropriate mechanics and force attenuation strategies with high level agility, plyometrics, and high impact movements ● Functional Testing: ○ Anterior reach on Y-Balance test, <5cm difference ○ Y Balance composite score, >94% ○ Modified Agility T Test, >90% of uninvolved ○ Single-leg hop series, >90% of uninvolved ● Physician Clearance

Phase 1 (Weeks 0-6): Protection, ROM, Muscle Activation

Goals	● Protect surgical repair ● Resolve joint effusion to 1+ or less ● Restore full ROM
Precautions	● NWB ● PROM: 0-90 degrees for 2 weeks ● Progress ROM as tolerated thereafter ● No isolated hamstrings activation
Pain and Effusion	● ≥ 1+ (using Modified Stroke Test)
ROM	● Extension: Emphasis on achieving full knee extension immediately following surgery. If full extension is not achieved by 4 weeks, contact surgeon regarding ROM concerns. ● Flexion: ○ Root/Radial Only: Limited to PROM due to hamstring/popliteus attachment to meniscus ○ Limited 0-90 degrees for first 2 weeks ○ After 2 weeks, gentle full PROM is allowed
Therapeutic Exercise	● Emphasis on quad activation without gluteal co-contraction ● Restore patellar mobility ● Symmetrical ROM ● Decrease effusion
Suggested Interventions	● Extension ROM: bag hangs or prone hangs ● Flexion ROM: Supine wall slides with PROM with self-monitoring for hamstring activation ● Patellar mobilization: superior, inferior, medial, lateral ● Quad Isometrics; SLR 4-way ● Terminal knee extension (TKE): prone ● Initiate open chain knee extension exercises

	○ Unweighted SAQ, LAQ ● Protected range with isotonic progression ● Neuromuscular re-education using NMES at 60º flexion
Criteria to Discharge Assistive Device	● ROM: Full active knee extension; no pain on passive overpressure ● Strength: Able to perform strong quad isometric with full tetany and superior patellar glide and able to perform 2x10 SLR without quad lag ● Effusion: 1+ or less is preferred (2+ acceptable if all other criteria are met) ● Weight Bearing: Demonstrates pain-free ambulation without visible gait deviation
Criteria to Progress	● ROM: Symmetrical to uninvolved limb ● Strength: Quadriceps set with normal superior patellar translation, SLR x 10 seconds without extensor lag ● Effusion: 1+ or less with Modified stroke test

Phase 2 (Weeks 7-9): Weight Bearing Tolerance

Precautions	● Gradual progression of WB to full WB with no AD by weeks 8-9 ● Knee flexion <40 degrees with CKC activity ● CKC activity limited to WBstatus
Pain and Effusion	● Cryotherapy/compression as needed for reactive effusion
ROM	● Monitor and progress knee ROM, patellar mobility, and LE flexibility ● Begin more aggressive techniques to achieve/maintain full knee extension (i.e. weighted bag hang) as needed ● Continue bike for ROM and warmup ● If full AROM knee extension is not achieved by 4 weeks, contact the surgeon regarding ROM concerns.
Suggested Interventions and Timelines	● Multi-angle knee isometrics from 60-90º for patients unable to tolerate high intensity NMES ● Progress WB quadriceps and hamstring exercises with emphasis on proper LE mechanics ● No isometric HS activity until 8 weeks, no isolated hamstring isotonics until 12 weeks ● Progress gluteal and lumbopelvic strength and stability ● Progress single leg balance ● NMES
Criteria to Progress	● Achieve full WBing ● Normalize gait pattern on flat ground ● Maintain trace to zero joint effusion ● Tolerate 25 minutes or standing and walking

Phase 3 (weeks 10-15): Endurance

Precautions	● Knee flexion <70 degrees with CKC activity
Pain and Effusion	● Effusion may increase with increased activity, ≤1+ and/or non-reactive effusion for progression of endurance activities
ROM	● Full, symmetrical to contralateral limb, and pain free with overpressure
Therapeutic Exercise	● Performance of the quadriceps, hamstrings and trunk dynamic stability with low load,high repetitions
Suggested Interventions	● Therapeutic Exercise/Neuromuscular Re-education ○ Double-leg squats (<70 degrees) ○ Stationary lunges progressing to walking lunges ○ Step down- starting at 2” step and progressing to 6” ● Cardiovascular Conditioning: permitted week 12 ○ Stationary bike with resistance ○ Treadmill walking ○ Freestyle swimming (no fins until week 16)
Criteria to Progress	● 90 second hold in single leg squat position at 45 degrees of knee flexion

Phase 4 (Weeks 16-21): Strength

Precautions	● Until week 20, maximum of 90 degrees of knee flexion with CKC activity
Pain and Effusion	● Effusion may increase with increased activity, ≤1+ and/or non-reactive effusion
ROM	● Full, symmetrical to contralateral limb, and pain-free with overpressure
Therapeutic Exercise	● Performance of the quadriceps, hamstrings and trunk dynamic stability with low load,high repetitions
Suggested Interventions	● Therapeutic Exercise/Neuromuscular Re-education ○ Single-leg squats ○ Single-leg deadlifts

	○ Single-leg sit to stand ○ Multi-directional lunges
Criteria to Progress	● Anterior reach on Y balance test, <8-cm difference compared to uninvolved side

Phase 5 (Weeks 22-Return to Sport): Power, Running, and Return

Precautions	● No deep squatting for 6 months ● Expected RTS by 9 months
Pain and Effusion	● Effusion may increase with increased activity, ≤1+ and/or non-reactive effusion
ROM	● Full, symmetrical to contralateral limb, and pain-free with overpressure
Therapeutic Exercise	● Performance of the quadriceps, hamstrings and trunk dynamic stability with sports-specific activity
Suggested Interventions	● Therapeutic Exercise/Neuromuscular Re-education ○ Double and single leg jump training ○ Ladder drill agility ○ Lateral hops with and without resistance ○ Progressive cutting activities
Criteria to Progress	● Anterior reach on Y balance test, <5 cm difference ● Single-leg hop series >90% LSI ○ SL hop for distance ○ Triple hop ○ Cross over hop ○ Timed 6m hop

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Appendix A: Vail Sports Test

Total Points: _____/54 (Patient must score 46/54 on the test in order to pass)

Single Leg Squat (Goal: 3 minutes): subject must perform each repetition at a cadence of 1 second up and 1 second down against resistance of a sportcord (placed under the foot of the leg that the test is being performed on).

	Yes (1) No (0) Minute 1	**Minute 2**	**Minute 3**
1. Knee flexion angle between 30° and 60°			
2. Patient performs repetitions without dynamic knee valgus 3. Patient avoids locking knee during extension			
4. Patient avoids patella extending past the toe during knee flexion 5. Patient maintains upright trunk during knee flexion			

Single Leg Squat Total Points _____/15

If patient repeats error on 3 consecutive repetitions after correction, they are not eligible to receive a point for that particular standard (within each 1-minute timeframe).

Lateral Bounding (Goal: 90 seconds): subject performs a lateral hopping motion against resistance of a sportcord attached to the subject's waist via a belt and on the other end to an immoveable object that is level with the waist. The injured leg is positioned as the inside leg or the leg closest to the wall. The patient is instructed to hop from one leg to the other (leg length distance), absorbing energy while they land by bending at the knee and hip. Landing boundaries (distance of the hop) are demarcated on the floor with two pieces of tape, one of which begins at the point of resistance of the sportcord as it is stretched away from the

wall and the other is the measured distance of the subject's leg length from the first piece of tape.

Yes (1) No (0) 1st 30 seconds		**2nd 30 seconds**		**3rd 30 seconds**
1. Knee flexion angle is 30° or greater during landing		4. Landing phase does not exceed 1 second in duration		
2. Patient performs repetitions without dynamic knee valgus 3. Patient performs repetitions within landing boundaries		5. Patient maintains upright trunk during knee flexion		

Lateral Bounding Total Points _____/15

If patient repeats error on 3 consecutive repetitions after correction, they are not eligible to receive a point for that particular standard (within each 30 second timeframe).

Forward Jogging (Goal: 2 minutes): subject performs forward jogging against resistance of the sportcord with the belt around waist. The patient is instructed to hop from one leg to the other in an up and down manner (similar to jogging in place) while using proper form and absorbing energy with each landing by bending at the knee and hip.

	Yes (1) No (0) Minute 1	**Minute 2**
6. Knee flexion between 30° and 60°		
7. Patient performs repetitions without dynamic knee valgus		
8. Patient performs repetitions within landing boundaries		
9. Patient avoids locked knee during extension		
10. Landing phase does not exceed 1 second in duration		
11. Patient maintains upright trunk during knee flexion		

Forward Jogging Total Points _____/12

If patient repeats error on 3 consecutive repetitions after correction, they are not eligible to receive a point for that particular standard (within each 1-minute timeframe).

Backward Jogging (goal: 2 minutes): subject performs backward jogging against resistance of the sportcord with the belt around waist. The patient is instructed to hop from one leg to the other in an up and down manner (similar to jogging in place) while using proper form and absorbing energy with each landing by bending at the knee and hip.

	Yes (1) No (0) Minute 1	**Minute 2**
12. Knee flexion between 30° and 60°		
13. Patient performs repetitions without dynamic knee valgus		
14. Patient performs repetitions within landing boundaries		
15. Patient avoids locked knee during extension		

16. Landing phase does not exceed 1 second in duration

17. Patient maintains upright trunk during knee flexion

Backward Jogging Total Points _____/12

If patient repeats error on 3 consecutive repetitions after correction, they are not eligible to receive a point for that particular standard (within each 1-minute timeframe).

Appendix B: Y Balance Test

Anterior

_____ Anterior

_____

Stance LEFT Stance RIGHT

tero ___ ___

me ___ Posteromedial

dial Posterolater _____

Posterolateral

___ al

_____

___ _____

Pos

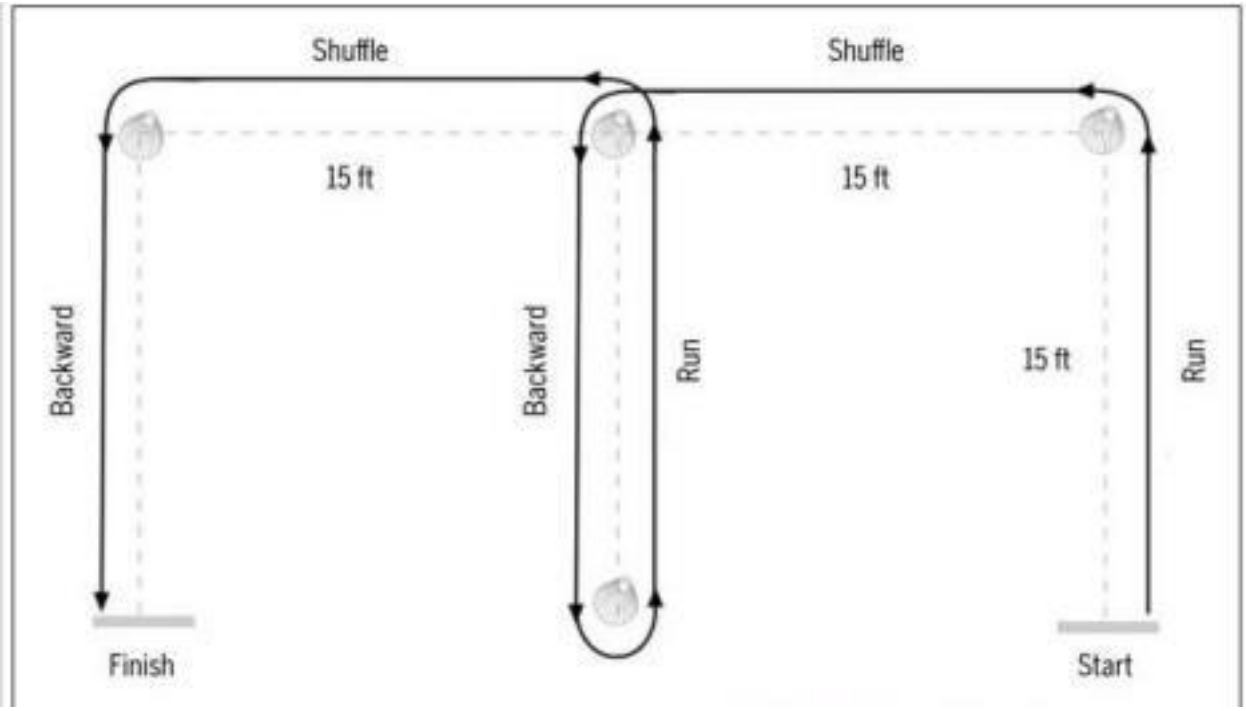
	Left	Right	Difference
Anterior			
Posteromedial			
Posterolateral			

Difference should be less than 4 cm for return to sport and preparticipation screening.

Composite Score = $\frac{\text{(Anterior + Posteromedial + Posterolateral)}}{\text{(3 x Limb Length)}} \times 100$

Right	
Left	

Appendix C: Modified Agility T-Test



The modified agility T-test was developed from the standard T-test to evaluate lower extremity side-to side differences in cutting and running maneuvers. The participant is initially guided through the course by the test administrator, who emphasizes the importance of performing a shuffling movement and not running or using crossover steps during the lateral movement portions of the test. Participant will performs test the test to each direction after adequate rest (2min). The total time is compared between each limb, the shuffle push-off limb determines involved or uninvolved limb.

Involved Time: _____
Uninvolved Time: _____

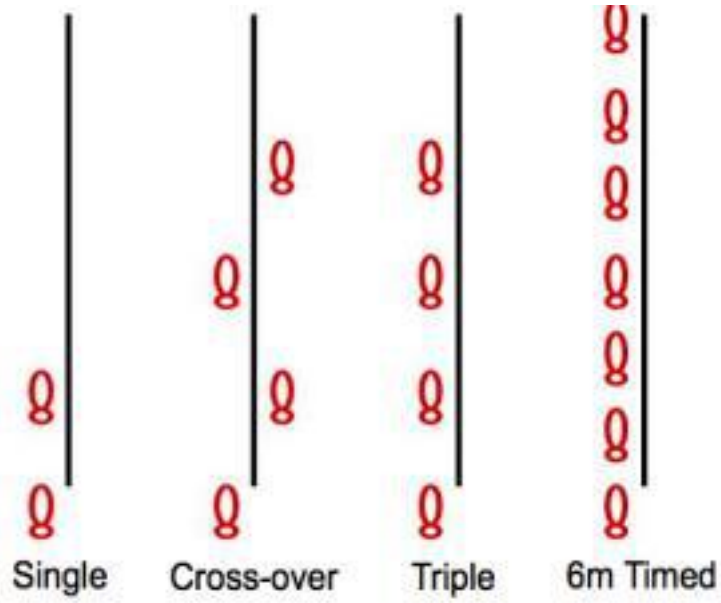
Appendix D: Single Leg Hop Series

1) **Single hop for distance:** Have the subject line their heel up with the zero mark of the tape measure, wearing athletic shoes. The subject then hops as far as he/she can, landing on the same push off leg, for at least 3 seconds. The arms are allowed to move freely during the testing. Allow him/her to perform 2 practice hops on each leg. Then, have the subject perform 2 testing trial, recording each distance from the starting point to the back of the heel. Average the distanced hopped for each limb. The Limb Symmetry Index: Involved limb distance/Uninvolved limb distance X 100%.

2) **Cross-over hop for distance:** The subject lines their heel up with the zero mark of the tape measure and hops 3 times on one foot, crossing fully over the center line each time. Each subject should hop as far forward as he/she can on each hop, but only the total distance hopped is recorded. The arms are allowed to move freely during the testing. Allow him/her to perform 2 practice hops on each leg. Then, have the subject perform 2 testing trial, recording each distance from the starting point to the back of the heel. Average the distanced hopped for each limb. The Limb Symmetry Index: Involved limb distance/Uninvolved limb distance X 100%.

3) **Triple hop for distance:** The subject lines their heel up with the zero mark of the tape measure and hops 3 times on one foot. Each subject should hop as far forward as he/she can on each hop, but only the total distance hopped is recorded. The arms are allowed to move freely during the testing. Allow him/her to perform 2 practice hops on each leg. Then, have the subject perform 2 testing trial, recording each distance from the starting point to the back of the heel. Average the distanced hopped for each limb. The Limb Symmetry Index: Involved limb distance/Uninvolved limb distance X 100%.

4) **Timed 6-meter hop:** The subject lines their heel up at the zero mark of the tape measure and hops, on cue with the tester, as fast as they can the length of the 6-meter tape. The arms are allowed to move freely during the testing. Allow him/her to perform 2 practice hops on each leg. Then, have the subject perform 2 testing trial, recording each distance from the starting point to the back of the heel. Average the distanced hopped for each limb. The Limb Symmetry Index: Involved limb time/Uninvolved limb time X 100%.


Single
Cross-over
Triple
6m Timed