

## Meniscus Root Repair Protocol

Phase 1: (Weeks 0–6)	
Rehabilitation Goals	<ul style="list-style-type: none"> <li>• Decreased joint effusion</li> <li>• Protect repair</li> <li>• Knee ext ROM <math>\geq</math> 0</li> <li>• Gradually improve knee flexion ROM</li> <li>• Quad set with visible quad activity and superior patellar glide</li> <li>• Non-antalgic gait pattern</li> </ul>
Brace	<ul style="list-style-type: none"> <li>• Locked in extension while weight bearing unless otherwise specified by MD</li> <li>• 0-6 weeks PROM 0-90 degrees</li> </ul>
Precautions	<ul style="list-style-type: none"> <li>• 25% weight bearing with B axillary crutches</li> <li>• Avoid hamstring contraction until 6-weeks post-op</li> </ul>
Interventions	<ul style="list-style-type: none"> <li>• <b>Modalities:</b> cryo pneumatic compression (game ready), IFC/Premod, adjust brace</li> <li>• <b>MT/PROM:</b> STM/edema massage, flx/ext with overpressure, patellar mobs (teach self)</li> <li>• <b>ROM/mobility:</b> Heel slides, hamstring stretch, gastroc stretch, LLLD heel prop</li> <li>• <b>Gait:</b> Step through pattern BL axillary crutches</li> <li>• <b>Neuromotor:</b> Quad set, multiangle knee ext isometrics, SLR, heel raises, weight shifting AP/ML/tandem</li> <li>• <b>NMES:</b> Daily, Biphasic or Russian (consider home unit)</li> <li>• <b>BFR:</b> in the absence of significant effusion/edema, bruising, concern for DVT (use with NMES)</li> </ul>
Progression Criteria	<ul style="list-style-type: none"> <li>• <math>\leq</math> 3+ knee joint effusion via stroke test</li> <li>• Knee extension ROM: 0 degrees</li> <li>• Knee flexion ROM: 90 degrees</li> <li>• Normal patellar mobility, superior glide with quad contraction</li> <li>• Pt ambulating with at least 25% weight bearing in brace with crutches</li> <li>• SLR with min quad lag at most</li> </ul>

Phase 2: (Weeks 6–10)	
Rehabilitation Goals	<ul style="list-style-type: none"> <li>• Continue to protect repair</li> <li>• Continue to decrease joint effusion</li> <li>• Progress active and passive TKE</li> <li>• Progress knee flexion ROM</li> <li>• Progress weight bearing</li> <li>• Initiate CKC activities</li> <li>• Wean off brace/crutches</li> </ul>
Precautions	<ul style="list-style-type: none"> <li>• Progressively increase knee flx ROM until WNL</li> <li>• While weight bearing: <ul style="list-style-type: none"> <li>• Gradual progression from 25% to FWB per tolerance</li> <li>• Unlock brace to 30 degrees at week 6. Progress 30 degrees/week. D/c at 9-weeks post-op</li> <li>• CKC exercise <math>\leq</math> 45 degrees knee flx, progress gradually (no more than 60 degrees in this phase)</li> </ul> </li> </ul>

### Phase 2: (Weeks 6–10) (continued)

<p><b>Interventions</b></p>	<ul style="list-style-type: none"> <li>• <b>Modalities/MT:</b> per patient need, minimize effusion/ecchymosis</li> <li>• <b>Gait/balance:</b> <ul style="list-style-type: none"> <li>• Tandem walk, SLS, foam beams, foam pad, SL RDL, circle/cone/hurdle walks, side stepping, turning           <ul style="list-style-type: none"> <li>• Walking w/catch+pass or dribble, hurdles on foam, hurdles/beam with catch+pass</li> <li>• SLS catch+pass, SLS foam pad 3-way hip, SL RDL on foam pad</li> </ul> </li> </ul> </li> <li>• <b>Therex:</b> <ul style="list-style-type: none"> <li>• Bike ROM, prone quad stretch, wall heel slides, standing hip flx and add stretch, therapist OP into ext</li> <li>• Wall squat/sit, high box squat, step up ant/lat, lat heel tap&gt;ant, leg press and multi-hip machine</li> <li>• Quad set towel under heel, TKE strap stretch, TKE ball wall&gt;w/strap, standing TKE band resistance</li> <li>• Band resisted 4-way SLR (standing&gt;table), SL heel raises, SAQ&gt;LAQ, hamstring curl standing&gt;supine</li> <li>• Straight leg bridge, clamshell, hollow body holds, front plank&gt;alt hip ext, banded side steps</li> <li>• BFR: continued use with OKC and CKC exercises</li> <li>• Conditioning: UBE or arms only Aerodyne</li> </ul> </li> </ul>
<p><b>Progression Criteria</b></p>	<ul style="list-style-type: none"> <li>• &lt;2+ knee joint effusion via stroke test</li> <li>• Passive knee ext WNL, active TKE nearing normal limits</li> <li>• Knee flexion ROM &gt;/= 110 degrees</li> <li>• Consistent SLR/LAQ without quad lag</li> <li>• Discharge brace and crutches</li> <li>• Min gait deviations</li> <li>• Min-mod pain/limitations with functional activities/Pt interventions</li> </ul>

### Phase 3: (Weeks 10–16 weeks)

<p><b>Rehabilitation Goals</b></p>	<ul style="list-style-type: none"> <li>• Continue to progress quad/hamstring strengthening</li> <li>• Normalize knee ROM</li> <li>• Progress to controlled frontal/transverse/multiplanar loading</li> <li>• Progress aerobic conditioning</li> <li>• Initiate kneeling</li> <li>• Assess quad/hamstring strength</li> </ul>
<p><b>Precautions</b></p>	<ul style="list-style-type: none"> <li>• Gradual progression of CKC activities to 90 degrees of knee flexion</li> <li>• No impact activities until Phase 4</li> </ul>
<p><b>Interventions</b></p>	<ul style="list-style-type: none"> <li>• <b>Modalities/MT:</b> majority of passive modalities should be discontinued by this phase</li> <li>• <b>Gait/Balance:</b> High hurdles, bosu balance &gt; mini squat &gt; step up &gt; lunge ant/lat, SL RDL cone tap, bosu SL RDL</li> <li>• <b>Therex:</b> <ul style="list-style-type: none"> <li>• Foot on step/kneel flx stretch, quadruped/prayer stretch variations, kneeling on pad, half kneeling DF stretch</li> <li>• Standing and prone hamstring curl with resistance, LAQ with resistance, machine resisted quad/hamstring</li> <li>• Squat, kickstand box squat, ¼ split squat &gt; retro slider lunge &gt; split squat to foam pad</li> <li>• 4-way slider lunge &gt; curtsy step up &gt; 4-way lunge &gt; RFE split squat &gt; 4-way heel tap, single leg squat to box &gt; shrimp squat &gt; unsupported single leg squat</li> <li>• Dead lift from ground, lift and carry, farmer's carry, chaos carry, waiter's carry</li> <li>• Bridge hamstring curl eccentric &gt; full &gt; SL, plank on ball, side plank, adductor side plank</li> </ul> </li> <li>• <b>Aerobic conditioning:</b> Aquatic program</li> </ul>
<p><b>Progression Criteria</b></p>	<ul style="list-style-type: none"> <li>• &lt;/=1+ knee joint effusion</li> <li>• Flexion ROM &gt;/= 90% contralateral limb</li> <li>• Quad/hamstring strength &gt;/= 4-/5 (LSI) &gt;/= 0%</li> <li>• Symmetrical modified squat/lunge</li> <li>• No gait deviations</li> <li>• Min difficulty/pain with ADLs (including stairs)</li> </ul>

Phase 4: (Months 4–5)	
Rehabilitation Goals	<ul style="list-style-type: none"> <li>• Progress knee flex angle with functional movement patterns</li> <li>• Continue to progress quad/hamstring strengthening</li> <li>• Involve gym program/strength and conditioning specialist</li> <li>• Progress kneeling activities</li> <li>• Prepare patient for plyometric activities</li> </ul>
Precautions	<ul style="list-style-type: none"> <li>• Gradually progress squat depth past 90 degrees</li> </ul>
Interventions	<ul style="list-style-type: none"> <li>• <b>Therex:</b> Half kneeling hip flexor/adductor stretch, standing quad stretch, inch worms, light walking stretches</li> <li>• <b>Stability/speed prep:</b> <ul style="list-style-type: none"> <li>• Bosu lunge (forward/lateral), bosu med ball catch and pass, bosu med ball slams, bosu SL RDL, foam beam med ball slams, SLS unstable surface catch and pass</li> <li>• Shuttle kick back (slow &gt; fast), med ball slam to mini squat (BL/UL), Split squat med ball slam, SL RDL row (slow &gt; fast), SL RDL med ball throw</li> </ul> </li> <li>• <b>Aerobic conditioning:</b> road bike, swimming, elliptical, stair master</li> </ul>
Progression Criteria	<ul style="list-style-type: none"> <li>• Trace/no knee joint effusion with progressions made</li> <li>• Quad/hamstring strength <math>\geq 4/5</math> (LSI) <math>\geq 80\%</math></li> <li>• Symmetrical and full squat/lunge</li> </ul>

Phase 5: (Months 5–6)	
Rehabilitation Goals	<ul style="list-style-type: none"> <li>• Continue to progress quadriceps/hamstring strength</li> <li>• Introduce sagittal plane plyometrics</li> <li>• Introduce jogging/running</li> <li>• Prepare patient for interval running program</li> <li>• Initiate jump/hop testing</li> </ul>
Criteria for Plyometrics	<ul style="list-style-type: none"> <li>• ROM WNL</li> <li>• Trace effusion at most</li> <li>• Min anterior knee pain with loading</li> <li>• Strength: Symmetrical squat/lunge, 10x shrimp squats to at least 60 degrees, 10x ant heel tap on 6-8" with minimal compensatory patterns</li> </ul>
PWB Plyometrics	<ul style="list-style-type: none"> <li>• Single plane and PWB (on shuttle or with band assistance)</li> <li>• <math>\leq 100</math> foot contacts initially</li> <li>• 1-2 sessions per week, 5-10% progression of foot contacts per week</li> </ul>
Sagittal Plyometrics	<ul style="list-style-type: none"> <li>• PWB &gt; box jump up &gt; box jump down &gt; 2 to 1 box jump &gt; in place jumps &gt; scissor hops &gt; in place jog &gt; line jumps &gt; line hops &gt; single leg box jumps &gt; squat jumps &gt; sagittal plane ladder drills &gt; jogging</li> </ul>
Frontal Plane Plyometrics	<ul style="list-style-type: none"> <li>• PWB &gt; lateral box jumps &gt; single leg lateral box jumps &gt; lateral line jumps &gt; lateral line hops &gt; Frontal plane ladder drills &gt; lateral shuffling</li> </ul>
Hop Testing	<ul style="list-style-type: none"> <li>• Single hop for distance, triple hop for distance, crossover hop for distance, 6m hop for time</li> </ul>
Progression Criteria	<ul style="list-style-type: none"> <li>• No effusion with progressions made</li> <li>• Good tolerance and performance of plyometric activities</li> <li>• Good tolerance and performance of jogging/running</li> <li>• <math>\geq 70\%</math> hop testing LSI</li> <li>• Quad/hamstring strength <math>\geq 4+/5</math> (LSI) <math>\geq 85\%</math></li> </ul>

Phase 6: (6+ months)	
<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>• Continue to progress quadriceps/hamstring strength</li> <li>• Initiate interval running program</li> <li>• Initiate cutting/pivoting/agility</li> <li>• Initiate sprinting</li> <li>• Transition to self-management/strength and conditioning</li> </ul>
<b>Return to Run</b>	<ul style="list-style-type: none"> <li>• 1 mile ~1500 foot contacts, initiate interval program once pt demonstrates tolerance to this foot contact volume as well as 30-minute walk without pain/effusion</li> <li>• Further clearance via metronome set to 60-90BPM, complete heel tap to this cadence</li> <li>• Cue against asymmetrical running pattern due to decreased load acceptance (decreased knee flexion angle) on affected limb</li> <li>• See return to run protocol for volume progression</li> </ul>
<b>Agility</b>	<ul style="list-style-type: none"> <li>• Change of direction, multiplanar movements, cutting, pivoting</li> <li>• Progress to multiplanar ladder drills and cone drills</li> <li>• Reaction activities, buddy exercises, sport specific drills</li> <li>• Track progress with T-drill and 5-10-5</li> </ul>
<b>Sprinting</b>	<ul style="list-style-type: none"> <li>• See return to sprinting protocol</li> </ul>
<b>Progression Criteria</b>	<ul style="list-style-type: none"> <li>• No effusion with progressions made</li> <li>• Good tolerance and performance of interval running program</li> <li>• Good tolerance and performance of agility exercises</li> <li>• Good tolerance and performance of interval sprinting program</li> <li>• Hop testing LSI <math>\geq</math> 80%</li> <li>• Quad/hamstring strength LSI <math>\geq</math> 90%</li> <li>• ACL RSI <math>\geq</math> 60% at 6 months</li> </ul>
<b>Return to Sport Criteria</b>	<ul style="list-style-type: none"> <li>• Quadriceps/hamstring strength LSI 90-100%</li> <li>• Hop testing LSI 90-100%</li> <li>• ACL RSI <math>\geq</math> 70%</li> <li>• Restore pre-injury conditioning/performance</li> <li>• Return to sport specific activities- non-contact practice, full practice, full play</li> <li>• Competitive play at 6+ months</li> </ul>