

# Rehabilitation Protocol

## Phase 1: Immediately Postoperatively to Week 6

Condition	Stable	Unstable
Precautions	<ul style="list-style-type: none"> <li>-PWB 0-2 weeks</li> <li>-Tolerable WB at 2-6 weeks</li> <li>-ROM 0°~90° at 2 weeks</li> <li>-Isometric OKC at 3 weeks~</li> </ul>	<ul style="list-style-type: none"> <li>-NWB</li> <li>-ROM 0°~90° at 4 weeks</li> <li>-Isometric OKC at 3~7 week</li> <li>-No OKC hamstring exercise</li> </ul>
Goals/Criteria to Advance	<ul style="list-style-type: none"> <li>-Pain control</li> <li>-Reducing swelling</li> <li>-Recovering ROM</li> <li>-Normalizing gait</li> <li>-ROM symmetrical</li> <li>-Normal joint temperature</li> <li>-Minimal to no joint effusion</li> <li>*Unstable: adjusted ROM and WB timelines</li> </ul>	
Exercises	<ul style="list-style-type: none"> <li>-Patella mobilization</li> <li>-Quad sets</li> <li>-Self ROM (wall slides, heel slides, heel prop extension overpressure)</li> <li>-Ankle pumps</li> <li>-Straight leg raises with NMES</li> <li>-Terminal knee extension (OKC, consider NMES)</li> <li>-Calf/hamstring stretching</li> <li>-4-direction (flexion, extension, adduction, abduction) leg strengthening in full extension with elastic band</li> <li>-Sitting knee extension (isometric -&gt; band exercise, starting at 4 weeks)</li> <li>*Unstable: adapted for NWB and delayed timelines</li> </ul>	

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*Abbreviation: PWB, partial weight bearing; NWB, non-weight bearing; ROM, range of motion; OKC, open kinetic chain; NMES, neuromuscular electrical stimulation.*

## Phase 2: Postoperatively Weeks 6 to 12

Condition	Stable	Unstable
Precautions	<ul style="list-style-type: none"> <li>-FWB at 6 weeks</li> <li>-Full ROM at 6 weeks</li> <li>-CKC 90° at 10 weeks</li> </ul>	<ul style="list-style-type: none"> <li>-Tolerable WB at 6-8 weeks</li> <li>-FWB at 8 weeks</li> <li>-Full ROM at 8 weeks</li> <li>-OKC at 6 weeks (hamstring at 10 weeks)</li> <li>-CKC 60° at 8~16 weeks</li> <li>-Single-leg balance at 8 weeks</li> </ul>
Goals/Criteria to Advance	<ul style="list-style-type: none"> <li>-Muscle strengthening &amp; proprioception training</li> <li>-Achieve full WB</li> <li>-Normalize gait pattern on flat ground</li> <li>-Maintain trace to no joint effusion</li> </ul>	
Exercises	<ul style="list-style-type: none"> <li>-Progressive ROM</li> <li>-PWB to FWB gait training with and without crutches and brace</li> <li>-Calf/Hamstring stretching and strengthening</li> <li>-Weight shifting and bearing (single-leg balance)</li> <li>-Isometric wall squat (limited ROM)</li> <li>-Leg press (limited ROM, tolerable)</li> <li>-Progressive balance training (stable to unstable surface/both to single)</li> <li>-Hip strengthening (clam shell, hip bridge, hip abduction and etc.)</li> <li>-Core training (planks, dead bugs and etc.)</li> <li>-Stationary biking, CKC training (squat, lunge, leg press, step ups/downs, bridges and etc.)</li> <li>-OKC training (leg extension/curl, with elastic band to machine leg extension/curl)</li> </ul>	

*Abbreviation: FWB, full weight bearing; PWB, partial weight bearing; WB, weight bearing; ROM, range of motion; OKC, open kinetic chain; CKC, closed kinetic chain; NMES, neuromuscular electrical stimulation*

*\*Exercise parameters: 3sets, 15 to 25 repetitions, 30 to 60 second rest periods, 3 to 4 times per week*

### Phase 3: Postoperatively Weeks 13 to 24

Condition	Stable	Unstable
Precautions	-Running at 16 weeks	-CKC 90° at 16 weeks -Running at 20 weeks
Goals/Criteria to Advance	-Enhance muscle strength -Proprioception, and neuromuscular control (plyometric and agility) -Achieve 90% LSI scores (isokinetic test) -Symmetric balance scores -85% Single-leg hop scores	
Exercises	-Transition Gym-based program and/or supervised training -Cardiovascular training (biking and running) -Advance motor control training -High intensity and plyometric training -Progressive motor control training -Progressive running training (distance) -Agility training (side steps, ladder drills, one or double jump and etc.)	

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*Abbreviation: CKC, closed kinetic chain; LSI, limb symmetry index.*

*\*Exercise parameters: 3sets, 8 to 12 repetitions, 2-to-3-minute rest periods, 3 times per week*

## Phase 4: Postoperatively Weeks 24+

Condition	Stable	Unstable
Precautions	-Specific RTS training at 24 weeks	-Specific RTS training at 36 weeks
Goals/Criteria to Advance	-Sport-specific technical training -90% LSI scores -Symmetric balance scores -90% Single-leg hop scores	
Exercises	-High intensity power and maximal effort strength training -Progressive agilities and motor control training -Specific training for individualized to sport/position -Regular evaluations of strength, postural stability, and functional performance (at 9 and 12 months) -Education for secondary prevention	

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*Abbreviation: RTS, return to sports; LSI, limb symmetry index.*

*\*Single-leg hop: Single hop distance, Side hop*