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TTO/MPFL RECONSTRUCTION REHABILITATION PROTOCOL

Phase I, 0-2 weeks. Pain and edema control, start flexibility and strengthening exercises.

PRECAUTIONS	- Do not put a pillow under the operated knee for comfort when elevating LE, i.e. maintain full knee extension - Do not bear weight, but you may rest your foot on the ground. We call this Toe-Touch Weight Bearing (TTWB) - Avoid heat application - Do not bend the knee beyond 30° - No active knee extension - Avoid ambulating without crutches - The brace remains locked in extension for ambulation and sleep for 4 weeks
Emphasize	- Patellar mobility (no lateral) - Full PROM knee extension - Improving quadriceps contraction - Controlling pain and swelling - Compliance with HEP and precautions
Assessment	- LEFS, IKDC, SANE, ACL RSI, NPRS - Swelling - Girth measurements - Neurovascular assessment - Wound status - Patellar mobility - Quality of quadriceps contraction - LE AROM and PROM - Straight leg raise (SLR) in supine
Treatment Recommendations	- Passive knee extension with towel under heel - Quadriceps re-education: quadriceps sets with towel under knee with neuromuscular electric stimulation (NMES) or biofeedback - Patellar mobilization (no lateral) - AROM knee flexion to 30° - No active knee extension - PROM knee flexion no more than 90° - SLR in all planes (With brace locked at 0° in supine) - Hip progressive resistive exercises - Calf strengthening (Unilateral elastic band) - Upper extremity ergometry, as tolerated - Edema management, e.g. cryotherapy (no submersion), elevation, gentle edema mobilization avoiding incision - Progressive home exercise program
Criteria for Advancement	- Ability to SLR without quadriceps lag or pain - Knee ROM 0°- 30° - Pain and swelling controlled

Phase II, 2-6 weeks. Progressive ROM and strengthening while protecting the repair.

PRECAUTIONS	- Do not put a pillow under the operated knee for comfort when elevating LE, i.e. maintain full knee extension - **TTWB for 4 weeks, then begin progressive weight bearing** - Do not bend the knee beyond 90° - No active knee extension - Avoid ambulating without crutches - The brace remains locked in extension for ambulation and sleep for 4 weeks
Emphasize	- Patellar mobility (no lateral) - Full PROM knee extension - Improving quadriceps contraction - Controlling pain and swelling - Compliance with HEP and precautions
Assessment	- LEFS, IKDC, SANE, ACL RSI, NPRS - Swelling - Girth measurements - Gait and Neurovascular assessment - Wound status - Patellar mobility - Quality of quadriceps contraction - LE AROM and PROM - Straight leg raise (SLR) in supine
Treatment Recommendations	- Passive knee extension with towel under heel - Quadriceps re-education: quadriceps sets with towel under knee with neuromuscular electric stimulation (NMES) or biofeedback - Patellar mobilization (no lateral) - ROM goals: • 45 degrees by week 3, progress 15 degrees/week, goal of 90 degrees flexion by week 6. - AROM knee flexion to 90° - **No active knee extension for 6 weeks** - Straight leg raises (SLR) PRE's in all planes • With brace locked at 0° in supine until no extension lag - Calf strengthening (Progression to unilateral calf raises) - Flexibility exercises - Upper extremity ergometry, as tolerated - Gait training WBAT around 5-6 weeks - Edema management, e.g. cryotherapy (no submersion until incision adequately healed), elevation, gentle edema mobilization avoiding incision - Progressive home exercise program - Patient education regarding monitoring of response to increase in activity level and weightbearing
Criteria for Advancement	- Knee ROM 0°-90° - Good patellar mobility - Minimal swelling - Full weight bearing without pain

Phase III, 7-12 weeks. Regain functional movement and strength.

PRECAUTIONS	- Begin weight bearing as tolerated - Discontinue brace when stability, balance, and control achieved - Avoid pain with exercises, standing, walking and other activities - Monitor tolerance to load, frequency, intensity and duration - Avoid too much too soon
Emphasize	- Address impairments - Functional movement and strength - Activity level to match response and ability
Assessment	- LEFS, IKDC, SANE, ACL RSI, NPRS - Swelling - Girth measurements - Gait and Neurovascular assessment - Wound status - Patellar mobility - Quality of quadriceps contraction - LE AROM and PROM - Straight leg raise (SLR) in supine - Functional assessment, e.g. single leg stance, step ups/downs, squat, gait - Balance testing, e.g. Star Excursion Test, Biodex Balance SystemTM - Quadriceps isometrics testing with dynamometer at 60° at 12 weeks
Treatment Recommendations	- Patellar mobilization - ROM 0-110° (8 wks), 120° (10 wks), then full - SLR PRE's in all planes - Progression from seated to standing (wall slides) to bike ROM - Leg press bilaterally in 80°-5° arc after 6 weeks • Progression from bilaterally, to 2 up/1 down, to unilateral - Functional strengthening • Mini squats up to 0°-60° after 6 weeks • Forward step-up progression starting with 2”-4” (around 8 weeks) - Terminal knee extension in weight bearing - Consider blood flow restriction (BFR) program - Hip-gluteal progressive resistive exercises • May introduce Romanian Dead Lift toward end of phase - Hamstring and calf strengthening - Proprioception board/balance system - Flexibility exercises and foam rolling - Core and UE strengthening * Cardiovascular conditioning • Stationary bicycle • Elliptical when able to perform 6” step-up with good form - Gait training WBAT - Cryotherapy - Progressive home exercise program

Criteria for Advancement	- Ability to perform 8” step-up with good control and alignment without pain - Full symmetrical knee ROM - Symmetrical squat to parallel - Single leg bridge holding for 30 seconds - Balance testing and quadriceps isometrics 70% of contralateral lower extremity

Phase IV, 13-24 weeks. Begin job- or sport-specific training.

PRECAUTIONS	- Initiate return to running/sport only when cleared by physician - Avoid pain with exercises and functional training - Monitor tolerance to load, frequency, intensity and duration - Avoid too much too soon
Emphasize	- Address impairments - Return to normal functional activities
Assessment	- LEFS, IKDC, SANE, ACL RSI, NPRS - Swelling - Girth measurements - LE AROM and PROM - Functional assessment, e.g. single leg stance, step ups/downs, squat, gait - Balance testing, e.g. Star Excursion Test, Biodex Balance SystemTM - Quadriceps isometrics or isokinetic testing - QMA – Quality of Movement Testing
Treatment Recommendations	- Progress leg press eccentrically * Functional strengthening • Progress squats to 0°-90°, initiating movement with hips • Progress to single leg squats • Forward step-up and step-down progression • Progress lateral step-ups, crossovers • Progress lunges - Initiate running progression - Initiate plyometric progression - Continue foundational hip-gluteal progressive resistive exercises - Continue hamstring and calf strengthening - Flexibility exercises and foam rolling - Core and UE strengthening - Consider BFR program * Progress proprioception training • Continue foundational exercises • Incorporate agility and controlled sports-specific movements * Progress cardiovascular conditioning • Stationary bicycle • Elliptical - Cryotherapy and/or compression therapy - Progressive home exercise program - Patient education regarding monitoring of response to increase in activity level
Criteria for Advancement	- No swelling - Normal neurovascular assessment - Normal scar and patellar mobility - Normal quadriceps contraction - Full LE ROM, flexibility and strength - Quantitative assessments = 85% of contralateral lower extremity

Phase V, weeks 24 - discharge. Return to full activity without impairment or restrictions.

PRECAUTIONS	- Note importance of gradual return to participation with load and volume monitoring under guidance of physical therapist, MD, athletic trainer and coach - Avoid premature or too rapid full return to sport
Emphasize	- Return to participation - Collaboration with Sports Performance experts
Assessment	- LEFS, IKDC, SANE, ACL RSI, NPRS - Swelling - LE AROM and PROM - Balance testing, e.g. Star Excursion Test, Biodex Balance SystemTM - Quadriceps isometrics or isokinetic testing - Functional and Return to Sport tests, e.g. hop testing, QMA – Quality of Movement Testing
Treatment Recommendations	- Gradually increase volume and load to mimic load necessary for return to activity - Progress movement patterns specific to patient's desired sport or activity - Progression of agility work - Increase cardiovascular load to match that of desired activity - Collaborate with ATC, performance coach/strength and conditioning coach, skills coach and/or personal trainer to monitor load and volume as return to participation - Consult with referring MD on timing return to sport including any recommended limitations
Criteria for Return to Sport	- Quantitative assessments = 90% of contralateral lower extremity - Movement patterns, functional strength, flexibility, motion, endurance, power, deceleration and accuracy to meet demands of sport