Rehabilitation Protocol for Patellar/Quadriceps Tendon Anterior Cruciate Ligament Reconstruction

The intent of this physical therapy protocol is to provide the clinician with a guideline of the post-operative rehabilitation course of a patient who has undergone an Anterior Cruciate Ligament (ACL) Reconstruction with Ortho Rhode Island. It is by no means intended to be a substitute for one's clinical decision making regarding the progression of a patient's postoperative course based on their physical exam/findings, individual progress, and/or the presence of post-operative complications. If a clinician requires assistance in the progression of a post-operative patient, the clinician should consult with the referring surgeon.

Phase 1: Immediate Post-Op (Weeks 0–1) PT appointments begins 3–5 days after surgery, and then approx. 1–2x/week	
Rehabilitation Goals	• Decrease joint effusion • Protect reconstruction • Knee ext ROM>/= 0 • Gradually improve knee flexion ROM • Quad set with visible quad activity and superior patellar glide • Non-antalgic gait pattern (brace/crutch use will vary)
Precautions and Edu	• Brace use, AD use, transfers, gradual progression of activity and limb use • Pain management with medication, cryotherapy and thermotherapy
Interventions	**Modalities:** cryo-pneumatic compression (game ready), IFC/Premod, adjust brace (teach self) **MT/PROM:** STM/edema massage, flx/ext with overpressure, patellar mobs **ROM/mobility:** Heel slides, hamstring stretch, gastroc stretch, LLLD heel prop **Gait:** • Step through pattern regardless of AD/brace • If brace unlocked, bend and kick heel to toe pattern **Neuromotor:** Quad set, SAQ, LAQ, SLR 4 ways (standing>on table), Hamstring curl, standing TKE, heel raises, weight shifting/narrow stance/tandem stance **NMES:** Biphasic or Russian (consider home unit) **BFR:** in the absence of significant effusion/edema, bruising, concern for DVT (use with NMES)
Criteria to Progress	• </=3+ knee joint effusion via stroke test • Knee extension ROM >/= -5 degrees • Knee flexion ROM >/= 90 degrees • Normal patellar mobility, superior glide with quad contraction • Pt ambulating with least restricted AD/brace with min gait deviations • SLR with min quad lag at most

Phase 2: Early Rehab (Weeks 2–4)	
Rehabilitation Goals	• Continue to decrease joint effusion • Progress active and passive TKE • Progress knee flexion ROM • No quad lag during SLR/LAQ • Discharge Crutches • Unlock and then wean out of brace
Precautions and Edu	• Precautions: Unlocked/discharge brace, be purposeful with walking, continue wearing brace for longer bouts of walking, uneven surfaces or in busy public places • Based on quadriceps strength (10x SLR min quad lag to unlock) • Edu: Pushing into discomfort to return ROM, potential arthrofibrosis/cyclops lesion

Phase 2: Early Rehab (Weeks 2–4) (continued)	
Interventions	**Modalities/MT:** per patient need, minimize effusion/ecchymosis **Gait/balance:** • Circle/cone/hurdle walking, light sled push (bend and extend), side stepping, turning • Tandem walk, SLS, foam beams, foam pad, SL RDL **Therex:** • Bike rocking, prone quad stretch, foot on step stretch, wall heel slides, manual OP emphasis on extension • Quad set towel under heel, TKE strap stretch, TKE ball wall > w/strap, standing TKE band resistance • Wall squat/sit, high box squat, step up ant/lat, lat heel tap > ant, SL heel raises, LAQ/hamstring w/BFR • Straight leg bridge, bridge, clamshell, hollow body holds, front plank>alt hip ext, banded side steps • Multitasking/reaction- catch/throw during LE activity, cognitive challenges **Conditioning:** UBE or arms only Aerodyne
Criteria to Progress	• <2+ knee joint effusion • Knee extension PROM >/= 0 • Knee flexion ROM >/= 110 degrees • Minimal gait deviations without AD or brace • Consistent SLR/LAQ without quad lag • Min-mod pain/limitations with functional activities/PT interventions

Phase 3: (Weeks 4–6)	
Rehabilitation Goals	• Knee flexion nearing normal limits • Normalize Gait pattern and reciprocal stair ambulation • Assess quad/hamstring strength • Assess closed chain DF • Assess closed chain movement patterns • Avoid anterior knee overload
Precautions	• Graft in the process of ligamentization. Educate pts to avoid progressing too quickly.
Interventions	**Modalities/MT:** per patient need, encourage less reliance on cryotherapy and other passive modalities **Gait/Balance:** • Walking w/catch+pass or dribble, high hurdles, hurdles on foam beam, hurdles/beam with catch+pass • Bosu balance > mini squat > step up, foam pad 3-way hip, SL RDL cone tap, SL RDL on pad **Therex:** • Kneel flx stretch, quadruped/prayer stretch variations, kneeling on pad, half kneeling DF stretch • Box squat, air squat, kickstand squat, single leg wall squat, leg press, single leg press, weighted step ups, ant heel taps, sled pull, bridge hamstring curl, BFR leg press/weight bearing exercise if indicated • Hip hinge, RDL, dead lift from box • Plank on bosu/physioball, dead bug variations, monster walks, paloff press/cable chop variations
Criteria to Progress	• </=1+ knee joint effusion with progressions made • Passive knee ext WNL, active TKE nearing normal • Flexion ROM>/= 90% contralateral limb • Quad/hamstring strength>/= 3+/5 • No gait deviations • Min difficulty/pain with ADLs (including stairs)

Phase 4: (Weeks 6–10)	
Rehabilitation Goals	• Collaborate with orthopedic team if significant ROM deficits/joint effusion persists • Progress quad/hamstring strengthening • Progress aerobic conditioning • Involve gym program/strength and conditioning specialist • Progress to controlled frontal/transverse/multiplanar loading • Prepare patient for plyometric activities
Precautions	• Impact activities ~week 10
Interventions	**Modalities/MT:** majority of passive modalities should be discontinued by this phase **Therex:** • Half kneeling hip flexor/adductor stretch, standing quad stretch, inch worms, light walking stretches • Machine resisted hamstring/quadriceps, ¼ split squat > retro slider lunge > split squat > 4-way slider lunge > curtsy step up > 4-way lunge > RFE split squat > 4-way heel tap, single leg squat to box > shrimp squat > unsupported single leg squat • Dead lift from ground, lift and carry, farmer's carry, chaos carry, waiter's carry • SL bridge hamstring curl eccentric > full, side plank, adductor side plank **Stability/speed prep:** • 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 • Shuttle kick back (slow > fast), med ball slam to mini squat (BL/UL), Split squat med ball slam, SL RDL row (slow>fast), SL RDL med ball throw **Aerobic conditioning:** road bike, swimming, elliptical, stair master. Low impact, long duration
Criteria to Progress	• Trace knee joint effusion with progressions made • Normalize PROM flx/ext • Normalize TKE AROM • Quad/hamstring strength >/=4/5 (LSI>/= 70%) • No difficulty with ADLs (including stairs)

Phase 5: (Weeks 10–16)	
Rehabilitation Goals	• Continue to progress quadriceps/hamstring strength • Introduce sagittal plane plyometrics • Introduce jogging/running • Prepare patient for interval running program • Initiate jump/hop testing
Criteria for Plyometrics	• ROM WNL • Trace effusion at most • Min anterior knee pain with loading • Strength: Symmetrical squat/lunge, 10x shrimp squats to at least 60 degrees, 10x ant heel tap on 6-8" with minimal compensatory patterns
PWB Plyometrics ~10 weeks	• Single plane and PWB (on shuttle or with band assistance) • </= 100 foot contacts initially • 1-2 sessions per week, 5-10% progression of foot contacts per week
Sagittal Plyometrics ~12 weeks	• PWB > box jump up > box jump down > 2 to 1 box jump > in place jumps > scissor hops > in place jog > line jumps > line hops > single leg box jumps > squat jumps > sagittal plane ladder drills > jogging
Frontal Plane Plyometrics ~14 weeks	• PWB > lateral box jumps > single leg lateral box jumps > lateral line jumps > lateral line hops > Frontal plane ladder drills > lateral shuffling

Phase 5: (Weeks 10–16) (continued)	
Hop Testing	• Single hop for distance, triple hop for distance, crossover hop for distance, 6m hop for time
Criteria to Progress	• No effusion with progressions made • Good tolerance and performance of plyometric activities • Good tolerance and performance of jogging/running • >/= 70% hop testing LSI • Quad/hamstring strength>/= 4+/5 (LSI>/=80%)

Phase 6: (4–6 Months)	
Rehabilitation Goals	• Continue to progress quadriceps/hamstring strength • Initiate interval running program • Initiate cutting/pivoting/agility • Initiate sprinting • Transition to self-management/strength and conditioning
Return to Run	• 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 • Further clearance via metronome set to 60-90BPM, complete heel tap to this cadence • Cue against asymmetrical running pattern due to decreased load acceptance (decreased knee flexion angle) on affected limb • See return to run protocol for volume progression
Agility	• Change of direction, multiplanar movements, cutting, pivoting • Progress to multiplanar ladder drills and cone drills • Reaction activities, buddy exercises, sport specific drills • Track progress with T-drill and 5-10-5
Sprinting	• See return to sprinting protocol
Criteria to Progress	• Adequate tolerance to progressions, minimal pain, good muscle activity • Full PROM all planes • Progressive improvement in AROM in all planes • Trace scapular compensation with active motions

Phase 7: (6+ months)	
Return to Sport Criteria	• Quadriceps/hamstring strength LSI 90-100% • Hop testing LSI 90-100% • ACL RSI>/= 70% • Restore pre-injury conditioning/performance • Return to sport specific activities- non-contact practice, full practice, full play • Competitive play at 9+ months