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PHYSICAL THERAPY PROTOCOL
ACL RECONSTRUCTION

Procedure	**Date of Surgery:** _____ **R L B/L** Knee Arthroscopy, ACL Reconstruction with: BTB Hamstring Quad Allograft **Additional Procedures:** [ ] Meniscus Repair - [ ] Medial [ ] Lateral [ ] MCL [ ] LCL [ ] PLC – Add Collateral Ligament PT protocol recs [ ] Cartilage Restoration: _____ Other: _____	**PLAN** **Physical Therapy for R L B/L** Lower Extremity 2-3x Per Week x 8 Weeks **If procedures combined - combine protocol instructions and follow more conservative recommendations.**
General Guidelines	The following ACL guidelines were developed by HSS Rehabilitation and **modified for specific considerations for Dr. Ode.** Please read and follow guidelines below. Progression is both criteria-based and patient specific. Phases and time frames are designed to give the clinician a general sense of progression. Phases and time frames are designed to give the clinician a general sense of progression. Concomitant procedures such as additional ligament reconstruction, meniscal repair and articular cartilage procedures may alter the guideline. Follow physician's modifications as prescribed. ***Modifications from the HSS protocol are noted.*** Follow physician's modifications as prescribed	
PHASE I **(WEEKS 0-2)** ***Days 1-14***	**GOALS:** ▪ ROM: ▪ Full passive extension ▪ Minimum of 90° knee flexion ▪ Normalize patella mobility ▪ Weightbearing ▪ Post op day 0 - WBAT ambulating first with <u>two</u> crutches.	**PRECAUTIONS:** ▪ Avoid active knee extension ▪ Avoid ambulation without brace locked @ 0° ▪ Avoid heat application ▪ Avoid prolonged standing/walking

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PHASE I (WEEKS 0-2) Cont'd	▪ Transition to single crutch after Week 1 ▪ Discontinue crutches Day 14 (end of Week 2) once sufficient quad control (ex. SLR quad sets x 20 reps without fatigue or lag) ▪ Control post-operative pain / swelling ▪ Prevent quadriceps inhibition ▪ Promote independence in home therapeutic exercise program TREATMENT RECOMMENDATIONS: ▪ Gait training with progressive WB with brace locked at 0° as per physician instructions ▪ Towel under heel for knee extension, A/AAROM for knee flexion, patella mobilization ▪ Stationary bicycle for ROM o Short (90mm) crank ergometry (requires knee flexion > 85°) o Standard crank for ROM and/or cycle (requires 115° knee flexion) ▪ Quadriceps re-education: quadriceps sets with towel under knee with neuromuscular electric stimulation (NMES) or biofeedback ▪ SLR flexion with brace locked at 0° ▪ SLR abduction, adduction, extension ▪ Calf strengthening unilateral elastic band → bilateral calf raises ▪ Leg press bilaterally in knee 80°- 5° arc if knee flexion ROM > 90° ▪ Proprioception board/balance system (bilateral WB) ▪ Edema/effusion reduction (including elasticized wrap/tubing), cryotherapy (no submersion), compression device, elevation, gentle edema mobilization avoiding incision	ASSESSMENT ▪ LEFS/ IKDC/ SANE/ ACL RSI/ NPRS ▪ Wound status ▪ Edema/effusion ▪ Girth measurement of thigh and joint line ▪ Neurovascular assessment ▪ Patellar mobility ▪ Quality of quadriceps contraction ▪ LE PROM and AROM ▪ LE flexibility, where appropriate ▪ Hip and ankle strength, where appropriate ▪ SLR in supine ▪ Functional assessment: gait, SLS, when appropriate <u>MINIMUM CRITERIA FOR ADVANCEMENT TO NEXT PHASE:</u> ▪ Able to SLR without quadriceps lag ▪ 0° knee extension, minimum of 90° knee flexion ▪ Able to demonstrate unilateral (involved extremity) weight bearing without pain

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	▪ Progressive home exercise program ▪ Upper body ergometry (UBE) for cardiovascular conditioning EMPHASIZE: ▪ Patella mobility ▪ Full knee extension ▪ Improving quadriceps contraction ▪ Controlling pain/effusion	
PHASE II (WEEKS 3-6) Day 15+	GOALS: ▪ ROM 0° - 125°, progressing to full ROM ▪ Good patella mobility ▪ Minimal swelling ▪ Restore normal gait (non-antalgic) without assistive device ▪ Ascend 8" stairs with good control, without pain TREATMENT RECOMMENDATIONS: ▪ Patient education o Regarding monitoring of response to increase in activity level and weight bearing o May unlock brace when patient able to perform SLR without extension lag and demonstration of knee stability in single leg stance position with unlocked knee. o Then may transition from hinged brace to low profile brace as needed.	PRECAUTIONS: ▪ Do not place pillow under operated knee ▪ Avoid pain during and after exercises, standing, walking and other activities ▪ Monitor response to load, frequency, intensity, and duration to avoid reactive effusion ▪ Avoid premature discharge of assistive device - should be used until gait is normalized ▪ Avoid advancing weight bearing too quickly which may prolong recovery ▪ Avoid active knee extension 40° → 0° ▪ Avoid heat application ▪ Avoid prolonged standing/walking ▪ Avoid ascending/descending stairs reciprocally until adequate quadriceps control & lower extremity alignment

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PHASE II (WEEKS 3-6) Cont'd	▪ Continue phase I exercises as appropriate
	▪ Progress knee flexion PROM/AAROM as tolerated
	▪ Hip-gluteal progressive resistive exercises
	  o May introduce Romanian Dead Lift (RDL) toward end of phase
	▪ Hamstring strengthening (unless hamstring autograft)
	▪ SLR progressive resisted exercises (PRE) in all planes
	  o With brace locked at 0° in supine until no extension lag demonstrated
	  o Brace may be removed in other planes
	▪ Terminal knee extension in weight bearing
	▪ Calf strengthening: progression from bilateral to unilateral calf raises
	▪ Leg press progression bilaterally → unilateral eccentric 2 up/1 down → unilateral
	▪ Functional strengthening
	  o Mini squats progressing to 0°- 60°, initiating movement with hips
	  o Forward step-up progression starting with 2"-4" and then progress
	▪ Consider blood flow restriction (BFR) program with FDA approved device if patient cleared by surgeon and qualified therapist available
	▪ Proprioception board/balance system
		▪ Brace Guidelines
		  o Brace may be unlocked for gait when full passive and active knee extension is achieved as demonstrated by a SLR without quadriceps lag for 15 repetitions.
		  o Patient should be able to demonstrate knee stability in single leg stance position with unlocked knee
		  o Brace should not be unlocked unless patient can demonstrate appropriate heel strike and quadriceps control during gait.
		  o May consider only partially unlocking brace (e.g., if patient has 95° flexion, consider unlocking brace to 90°).
		  o If flexion ROM deficits persist, brace may need to be unlocked (e.g., knee flexed while sitting) to facilitate return to full ROM. Also consider decreasing weight bearing/loading

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PHASE II (WEEKS 3-6) Cont'd	○ Progression from bilateral to unilateral weight bearing ○ Once single leg stance achieved with good alignment and control, progress from stable to unstable surfaces ▪ Edema/effusion reduction (including elasticized wrap/tubing), cryotherapy (no submersion), compression device, elevation, gentle edema mobilization avoiding incision ▪ Progressive home exercise program ▪ Stationary bicycle - progress to cardiovascular and power development for LE, transitioning off of UBE **EMPHASIZE** ▪ Normalizing gait pattern ▪ Patellar mobility ▪ Knee ROM ▪ Quadriceps contraction ▪ Activity level to match response and ability	**ASSESSMENT** ▪ LEFS/ IKDC/ SANE/ ACL RSI/ NPRS ▪ Wound status ▪ Edema/effusion ▪ Girth measurement of thigh and joint line ▪ Neurovascular assessment ▪ Patellar mobility ▪ LE flexibility, where appropriate ▪ LE AROM and PROM ▪ Quality of quadriceps contraction ▪ Hip and ankle strength, where appropriate ▪ SLR in supine ▪ Functional assessment: gait, single leg stance, when appropriate ▪ 6-week HSS Return to Sport Testing MINIMUM CRITERIA FOR ADVANCEMENT: ▪ Non-antalgic gait and discharged brace ▪ Minimal edema/effusion ▪ Good patellar mobility ▪ Knee ROM 0°-130° ▪ SLS FWB without pain ▪ Ascend 6" stairs with good control without pain

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PHASE III (WEEKS 7-12)	GOALS:	PRECAUTIONS:
	▪ Restore Full ROM ▪ Able to descend 8"stairs with good leg control & no pain ▪ Improve ADL endurance ▪ Improve lower extremity flexibility ▪ Protect patello-femoral joint	▪ Avoid pain with therapeutic exercise & functional activities ▪ Avoid running and sport activity till adequate strength development and MD clearance ▪ Avoid active knee extension 40° → 0° until post-op week 12

	TREATMENT RECOMMENDATIONS:
	▪ Progress squat/leg press program, initiate step down program, advance proprioceptive training, agility exercises, retrograde treadmill ambulation/running, quadriceps stretching
	▪ Quadriceps strengthening
	  ▪ Isometric knee extension 60°
	  ▪ Open chain knee extension progression
	  ▪ At week 12 initiate PRE in limited arc 90°-40°
	▪ Functional strengthening
	  ▪ Progress squats to 0°- 90°, initiating movement with hips
	  ▪ Continue forward step-up progression
	  ▪ Initiate step-down progression starting with 2”- 4” and then progress
	  ▪ Lateral and crossover step-ups
	  ▪ Lunges
	  ▪ Add weight to functional strengthening exercises when appropriate
	▪ Advance BFR program to include weight bearing strengthening
	▪ Advance proprioception training to include perturbations
		ASSESSMENT
		▪ LEFS/ IKDC/ SANE/ ACL RSI/ NPRS
		▪ Edema/effusion
		▪ Girth measurement of thigh and joint line
		▪ Neurovascular assessment
		▪ Scar mobility
		▪ Patellar mobility
		▪ LE flexibility, where appropriate
		▪ LE AROM and PROM
		▪ LE strength: quadriceps isometrics testing with dynamometer (handheld or other) at 60° at 12 weeks
		▪ Functional assessment: squat, single leg stance, step ups/downs, balance testing

		MINIMUM CRITERIA FOR ADVANCEMENT: ▪ ROM to WNL ▪ Ability to descend 8" stairs with good leg control without pain ▪ Functional progression pending functional assessment

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	▪ Edema/effusion reduction/prevention (including elasticized wrap/tubing), cryotherapy, compression device, elevation, edema mobilization ▪ Progressive home exercise program ▪ Can begin elliptical when able to perform 6" step-up with good form EMPHASIZE ▪ Improving quadriceps strength ▪ Eccentric quadriceps control ▪ Emphasize patient compliance to both home & gym exercise program	
PHASE IV (WEEKS 13-22)	GOALS: ▪ Demonstrate ability to run pain free ▪ Maximize strength and flexibility as to meet demands of ADLS ▪ Hop Test > 75% limb symmetry TREATMENT RECOMMENDATIONS: ▪ Start forward running (treadmill) program when 8" step down satisfactory ▪ Advance agility program / sport specific ▪ Start plyometric program when strength base sufficient ▪ Patient education regarding monitoring of response t to increase in activity level ▪ Flexibility exercises and foam rolling as indicated ▪ Total body strength and conditioning ▪ Advance foundational hip-gluteal, hamstring and calf progressive resistive exercises ▪ Open chain knee extension progression (if cleared by Surgeon)	PRECAUTIONS: ▪ Avoid pain with therapeutic exercise & functional activities ▪ Avoid sport activity till adequate strength development and MD clearance ASSESSMENT ▪ LEFS/ IKDC/ SANE/ ACL RSI/ NPRS ▪ Edema/effusion ▪ Girth measurement of thigh and joint line ▪ Neurovascular assessment ▪ Scar mobility ▪ Patellar mobility ▪ LE flexibility, where appropriate ▪ LE PROM and AROM ▪ LE strength: quadriceps isometrics or isokinetic testing

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PHASE IV (WEEKS 13-22) Cont'd	o At week 12 initiate PRE in limited arc 90°- 40° o Progress to 90°- 30° o Progress to 90°- 0° by end of phase ▪ Functional strengthening o Progress to single leg squats o Forward step-up and step-down progression o Progress lateral and crossover step ups o Progress lunges ▪ Initiate running progression (see appendix 3) ▪ Initiate plyometric progression (see appendix 4) ▪ Supplementing use of BFR for higher level strengthening ▪ Progress proprioception training ▪ Incorporate agility and controlled sports-specific movements o Starting with planned agility and progress to reactionary movements o Emphasize uncompensated movement strategies with acceleration and deceleration o Begin with linear movements, progress to lateral and then rotational ▪ Preventative cryotherapy and/or compression therapy, if needed ▪ Progressive home exercise program	▪ Functional assessment: squat, single leg stance, step ups/downs, balance testing, hop testing ▪ 12-week HSS Return to Sport Testing ▪ 6-month HSS Return to Sport Testing MINIMUM CRITERIA FOR ADVANCEMENT: ▪ Symptom-free running ▪ Hop Test > 75% limb symmetry ▪ Functional progression pending & functional assessment

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PHASE V (WEEKS 22+) RETURN TO SPORT	GOALS: ▪ Lack of apprehension with sport specific movements ▪ Maximize strength & flexibility to meet demands of individual's sport activity ▪ Quantitative assessments ≥ 90% of contralateral lower extremity TREATMENT RECOMMENDATIONS: ▪ Gradually increase volume and load to mimic load necessary for return to activity ▪ Progress movement patterns specific to patient's desired sport/ activity ▪ Increase cardiovascular load to match that of desired activity ▪ Collaborate with certified athletic trainer (ATC), performance coach/strength and conditioning coach, skills coach, and/or personal trainer to monitor load/volume as return to participation ▪ Consult with referring surgeon on timing return to sport including any recommended limitations EMPHASIZE ▪ Return to participation: o Begin with non-contact play and progress to contact play o Progress minutes with team in controlled practice setting before advancing to game situations ▪ Collaboration with Sports Performance experts o Encourage continued strength and conditioning maintenance	PRECAUTIONS: ▪ Avoid pain with therapeutic exercise & functional activities ▪ Note importance of gradual return to participation with load and volume monitoring under guidance of physical therapist, surgeon, athletic trainer, and coach ▪ Avoid premature or too rapid full return to sport until adequate strength development and MD clearance CRITERIA FOR DISCHARGE: ▪ 9-month (and 12 month if needed) HSS Return to Sport Testing ▪ Quantitative assessments ≥ 90% of contralateral lower extremity ▪ Movement patterns, functional strength, flexibility, motion, endurance, power, deceleration, and accuracy to meet demands of sport ▪ Independence with gym program for maintenance and progression of therapeutic exercise program at discharge