PALMETTO MOTION
PHYSICAL THERAPY | PERFORMANCE | SPORTS MEDICINE

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Post-Operative Rehabilitation Protocol
"ACL Reconstruction (BTB, HS, Allograph) Revision"
Revised 2021

General Considerations: This rehabilitation program will vary in time and intensity based on multiple factors including the age of the patient, the extent of the repair, history of prior surgery, instability and laxity prior to surgery, and individual functional readiness in all stages. Early range of motion and progressive strengthening is valuable to prevent arthrofibrosis, promote circulation, and facilitate return to prior activity level.

Physical therapy will begin immediately following surgery. The initial focus will be on regaining motion before emphasizing resistance exercises. Progression through the different phases of rehab will be individually based. A variety of factors will be considered including control of pain and inflammation, recovery of normal motion, strength, endurance, and generally accepted tissue healing guidelines. In addition to activities in physical therapy, the patient will also receive a home exercise program to complement his/her physical therapy plan of care. Some procedures may offer additional restrictions and precautions. It is up to the rehabilitation professional to appropriately address specific concerns with different procedures.

Progressive Weight Bearing Philosophy: Controlled environments are either in the patient's home or in the physical therapy clinic. All patients with lower extremity procedures are to progress with their weight bearing restrictions in controlled environments. Patients may walk without crutches (WBAT) in controlled environments if gait is normal (or close to normal) and pain increases no greater than 1-2 VAS points from using crutches to no crutches. This may begin in 1–2-hour intervals and as long as pain decreases, ROM increases, gait improves, progressing to no crutches the entire day in controlled environments. Only the physical therapist can progress you to no crutches in the community. Once adequate hip/thigh muscle and pain control is attained, the patient may discharge the crutches completely. However, certain procedures have specific restrictions that may need to be followed.

	Answering yes or no should be based over the past 2-3 days.	Yes/No
1	Is the patient's subjective pain report on the 1-10 Visual Analog Scale decreasing?	
2	Is the patient's use of narcotics decreasing?	
3	Is the patient's PROM increasing gradually following the procedures based protocols?	
4	Is the patient's uninterrupted sleeping habits gradually reaching normal for them? - The patient may increase in 1 hour long increments. - The patient may also be progressing from sleep destination (e.g. recliner/couch, to elevated postures in bed to supine)	
5	Is the patient tolerating the progression off of the crutches?	
6	*Is the patient compliant with procedure protocol precautions? - This is an absolute criterion. - If the patient is non-compliant and at risk of compromising the repair they are to stay on the crutches.	
	*This criteria must be answered yes in order to progress. Of the first 5 criteria they must meet 4/5 to continue the progression.	

Pre-op Instructions:

Exercises	• Instruct in Phase I post-op exercises: AP's, QS, SLR, Heel Slides/AROM less than 90 degrees, 3-5 times per day
Weight Bearing	• Instructions in WBAT (Level surfaces and Stairs) as appropriate • Follow DOR-Progressive Weight Bearing Philosophy Criteria
Education	• Understand the need of compliance in rehabilitation, timelines, and goals. • Educate on sleep hygiene • Review Precautions • Schedule follow-up appointment at 3-5 days post operative

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PHASE I: Weeks 1-2

BRACE:	Patients wear knee brace except during rehabilitation/HEP **HINGED POST OP KNEE BRACE,** Brace is initially locked in extension during ambulation, open to available ROM at 2 weeks with(no extensor lag with 30 SLRs
PRECAUTIONS:	**If Hamstring graft, NO HS resistive strengthening exercises x 4wk post operative** **Normally WBAT**
CRUTCHES:	Gradual progressive WBAT to tolerance May wean to cane once SLS can be held x 20 seconds Assistive devices are discontinued when the patient Demonstrates a normal gait
WOUND:	Change dressing at PT Eval, check for s/s of infection, Tubigrip or TED hose in place for edema control until resolved May shower after bandages removed by PT, but do not scrub over sutures and do not soak them
EXERCISE:	Exercises to be performed 3-5 times per day Patella mobilization Quad, HS, Gastroc & soleus stretch Ankle pumps - may include tubing Supine passive knee extension with bolster Heel slides or passive extension/active flexion (PEAF) 0-90*(note HS Precautions) Exercise bike for ROM—no resistance Quad isometrics –Use E-stim as needed to assist 4 way SLR on mat (note HS precautions) – use brace or perform in standing if lag is present Multi angle HS isometrics (note HS precautions) Mini squat on total gym Weight shift Double leg heel raises Cardiovascular with UBE, etc
MODALITY:	Ice with knee elevated and in an extended position on bolster x 20 minutes 3-5 times per day E-stim for strengthening in full ext prn. Pain relieving modalities prn
Goals/Criteria for Progression to Phase II:	1. *Pain and effusion under control* 2. *Good patella mobility* 3. *Full extension, knee flexion 90 degrees* 4. *Perform 15 SLR without extensor lag*

PHASE II: Weeks 2-4

BRACE:	Patients wear knee brace except during rehabilitation/HEP Brace initially locked in extension during ambulation, open to available ROM with no extensor lag with 30 SLRs
PRECAUTIONS:	**If Hamstring graft, NO HS resistive strengthening exercises x 4wk post operative** **Normally WBAT**
CRUTCHES:	Gradual progressive WBAT to tolerance May wean to cane once SLS can be held x 20 seconds Crutches are discontinued when the patient Demonstrates a normal gait
WOUND:	Scar Massage when incision healed.
EXERCISE:	Exercises to be performed 3-5 times per day Continue Phase I exercises as needed Theraband: 4 way SLR, weight proximal to knee joint *Note: use light or no weight with ADD* (note HS precautions) Terminal Knee Extension exercises Wall squats (0-45 deg) Standing Hamstring curls (precaution 4wks with HS graft, only to pt tolerance) Balance/proprioception activity SLS, with or w/o brace depending upon quad strength

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	Leg press with light resistance Closed chain Hamstring curls – stool scoot (Not with HS grafts) Treadmill walking progression (if gait normal without crutches) Cardiovascular with UBE, etc
MODALITY:	Ice with knee elevated and in an extended position on bolster x 20 minutes 3-5 times per day E-stim for strengthening in full ext prn. Pain relieving modalities prn
Goals/Criteria for Progression to Phase III:	1. *Good patella mobility* 2. *Full extension, knee flexion 110 degrees* 3. *Perform 30 SLR without extensor lag*

PHASE III: Weeks 4-6

BRACE:	Brace is discontinued after 6 weeks (post-op minimum) when patient is able to do 30 SLR's without an extensor lag and 10 Single leg mini-squats
CRUTCHES:	Crutches are discontinued at 4-6 weeks when the patient: Demonstrates a normal gait
WOUND:	Scar massage
EXERCISE:	Exercises to be performed 1-2 times per day Continue Phase II exercises as needed Exercise bike – low resistance, high RPM Treadmill: walk and retro walk Beginner Pool (optional) – may begin after the incision site is completely closed and scab sloughs (walking and closed chain strengthening but no kicking) Forward and lateral step-ups (2" →4" → 6") Leg press/ hamstring curls – progressive weight, high repetition in pain-free Squats progression Double Leg (progress to single leg when quad control is sufficient) Heel raise progression & gastroc/soleus leg press Single Leg Body Blade
MODALITY:	Ice after exercising
Goals/Criteria for Progression to Phase IV:	1. *Full ROM* 2. *Normal gait* 3. *Ambulate up/down stairs without swelling or instability*

PHASE IV: Weeks 7-12

EXERCISE:	Exercises to be performed 3-5 times per week Continue prior Phase exercises as needed Bike stationary 20-30min, at least 70rpm Elliptical &/or Stairmaster (gradual progression up to 20–30 minutes) Progressive Quad & HS Strengthening (Supersets: 3 Total Sets). Exercise to "muscle failure (First set: 20 repetitions, then 2 additional sets at the same weight doing as many repetitions as possible) Leg press isolate involved LE and incorporate eccentric strengthening Squat Machine w/progressive resistance Lunge progression Carioca walks Progress proprioceptive exercises – BAPS LEVEL 1 AND 2 ONLY(eyes open & closed), foam, ball toss, body blade, etc Proprioception – star lunge, star excursion, progress to unstable surfaces Treadmill – forward walking, approaching 15min/mile pace Advanced pool exercises (optional) Fitter / slide board Crunches, may begin sit-ups when cleared by PT Elevated push ups
MODALITY:	Ice after exercises
Goals/Criteria for	1. *Able to hop repetitively 20 times without pain*

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Progression to Phase V:	*2. 10 rep bilateral LE squats with 80-90% weight bearing v. contra lateral at scales* *3. Walk 2 miles at 15min/mile pace (9wks)* *4. Walk 3 miles at 15min/mile pace (12wks)*

PHASE V: Months 3-6

EXERCISE:	Exercises to be performed 3-5 times per week Continue prior Phase exercises as needed increasing intensity and duration Walk to run progression, **Hold run for allograft/revision until 4 months** Patients should progress slowly (under direction from PT) through "functional" training exercises with emphasis on control and technique including: Plyometric progression Level 1 (Mos 3-4): squat jump, pattern jumping, jumping rope, etc. Sit-up progression Functional tests to clear for sports and discharge (begin testing at 4 months post-op) ○ Single leg hop for distance ○ Triple single leg hop for distance ○ Star balance excursion testing
PRECAUTIONS:	No squatting > 90 degrees
Goals/Criteria for Progression to Phase VI:	*1. Run 2 miles at normal pace, symmetric gait pattern* *2. Single leg squat & hold @ 60 deg x5 sec* *3. Functional testing – single, triple hop and 6 meter hop for time* *4. Negative Lachman's, Pivot Shift, etc*

PHASE V: Months 6-8

EXERCISE:	Plyometrics Level 2-3 (Mos 4-8) – box jumps, lateral & fwd/backward hops (single leg), depth jumps, split jump, hurdles, cones, etc Directional running (i.e. loops, figure 8's, cutting) 50-75% speed progressing to 75-90%, basic to advanced agility exercises, sport specific Balance/proprioception exercises, sport cord shuttle runs, weight vest with CKC cardio prn, controlled sporting activity
Rehabilitation Goals:	*1. Lachman's within 1 grade of contra lateral LE* *2. Pivot Shift symmetrical to contra lateral LE* *3. Functional testing ≥ 90% of contra lateral LE* *4. Return to all activities* *5. Able to pass run portion of APFT (6-8 months)*

**No contact sports until 9-12 months post-op or cleared by surgeon*

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Lower Extremity Plyometrics

Phase 1	Phase 2	Phase 3
Quick Feet: 15-30 Sec x 3 sets - Laterals, V's, Toe Taps	**Quick Fee**t: 30-60 sec x 3 sets - Laterals, V's, Toe Taps, switch stances	**Quick Feet**: 60 sec x 3 sets -Laterals, V's, Toe Taps, switch stances (Single leg pauses and jumps)
Light Cariocas	**Cariocas and Tapiocas**	**Shuttle Runs**: cariocas/tapiocas incorporated into cone drills with direction changes.
Light Ladder Drills: forward and lateral	**Ladder Drills:** diagonals with single leg pauses (Heisman's, skips, etc.)	**Ladder Drills:** Single leg (entire drill on involved and uninvolved)
Box Jumps: Low-Med (eccentric Landing with Hip ER moment) with emphasis on preventing medial knee collapse.	**Box Jumps:** All Level (up and down repetitive jumps over multiple boxes)	**Box Jumps:** Medium --> High with squat jumps with continuous effort to fatigue.
Cone Drills: Short (<1ft apart) with double leg forward directions	**Cone Drills:** Short - Medium (2-3ft apart) Double leg, progressing towards single leg landing.	**Cone Drills:** Distance to challenge patient's ability. Single leg broad jump progressing towards triple.

Lower Extremity Proprioception

Phase 1	Phase 2	Phase 3
Single Leg Stance: 15-45 seconds level surfaces progress to unstable	**Single Leg Stance:** 30-60 seconds uneven surfaces	**Single Leg Stance:** Unstable surfaces (foam mat) with perturbation
Trampoline: Double leg hopping for time progressing from 15-45 seconds	**Trampoline:** Double --> Jogging in place for time.	**Trampoline:** Single leg hopping for repetitions in a minute.
Fitter Board: Fitter with UE support to no support (light resistance)	**Fitter Board:** Medium Resistance (timed for repetitions in a minute)	**Fitter Board:** High resistance (timed for repetitions in a minute)
Lunges: Static Lunges to dynamic single stepping on stable surfaces.	**Lunges:** Dynamic from stable surfaces to unstable (floor --> Bosu may add medicine ball)	**Lunges:** Dynamic onto unstable surfaces (e.g. on Bosu ball and stepping onto another bosu ball)

Return to Sport Progression

6-7 Months	**Practice** Full speed conditioning ¾ speed position drills No contact drills
7-8 Months	**Practice** Full speed position drills ¾ speed contact drills
8-9 Months	**Practice** Full speed position drills Full speed contact drills
9 Months	**Cleared for full sport participation and games**

Walk to Jog Progression

Phase	Surface	Type
Phase I	Treadmill	DDEAMC Walk to Jog Progression
Phase II	Track	DDEAMC Walk to Jog Progression
Phase III	Road/Concrete	DDEAMC Walk to Jog Progression

*Pain, swelling, may indicate progression or regression. Patient individual preferences may vary.

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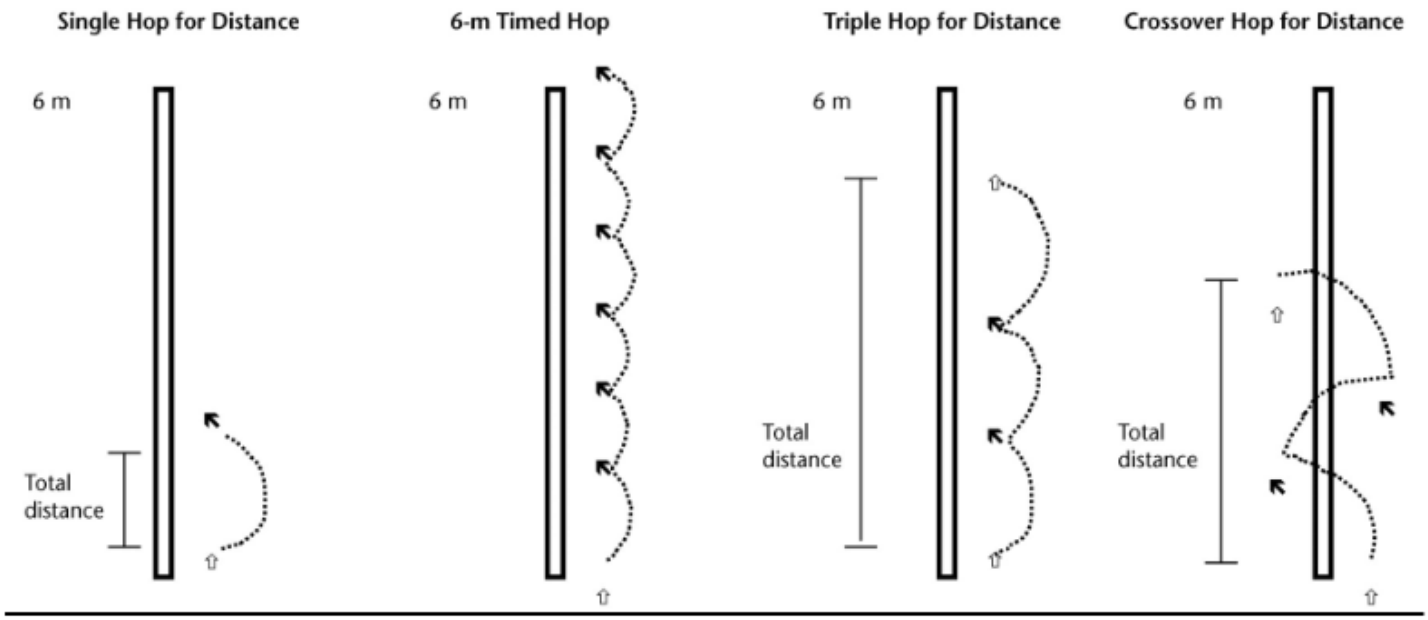
FUNCTIONAL TESTING DESCRIPTION



One leg hop for distance

Subjects will perform a single leg hop for distance with each lower extremity. After demonstration, each subject will be allowed 1 trial per leg. Beginning with the toes immediately behind the starting line, subjects will perform one hop to complete a trial. The hop will be measured from the starting line to the end of the toes after completion of a trial. Each limb will be tested two times with the maximal distance scored for each limb

One leg triple hop for distance

Subjects will perform a single leg triple hop for distance with each lower extremity. After demonstration, each subject will be allowed 1 trial per leg. The test will begin with the toes immediately behind the starting line. The subject will perform three hops consecutively prior to the completion of a trial. The hop will be measured from the starting line to the end of the toes after the third hop on each trial. Each limb will be tested two times with the maximal distance scored for each limb.

Timed single leg hop

Subject will hop on the trampoline a maximum number of times in a 30-second period. The subject will be on a single lower extremity and not be allowed to use hands for balance. The foot has to completely clear the trampoline for the repetition to be counted. One trial will be given to each limb after a 10-second pre-test warm-up.

Picture from: Reid A, Birmingham TB, Stratford PW, Alcock GK, & Giffin JR. Hop testing provides a reliable and valid outcome measure during rehabilitation after anterior cruciate ligament reconstruction. Phys ther, 2007; 87(3), 337-349.

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