Endeavor Health
Orthopaedic & Spine Institute

ACL RECONSTRUCTION PROTOCOL

Date of Surgery:_____

Note: *For special considerations, please adhere to modifications noted within the attached appendix*

Special Consideration(s): ○ Meniscus repair ○ Cartilage restoration ○ Other ligament repair/reconstruction

Phase	Precautions	Treatment Recommendations	Emphasize
Preoperative phase *Goals:* *-Knee PROM: Full extension to 120° degrees flexion* *-Minimal to no swelling* *-Active quadriceps contraction with superior patella glide* *-Demonstrates normal gait* *-Able to ascend stairs* *-Able to verbalize, demonstrate post-operative plan of care*	▪ Avoid pain w/ ROM and strengthening exercises ▪ Modify/minimize activities causing pain or swelling ▪ Use appropriate assistive device as needed	▪ Patient education o Understand post-operative plan of care o Edema control o Activity modification o Gait training with expected post-operative assistive device o Basic home exercise program (HEP) ▪ Ankle pumps, quadriceps sets, gluteal sets ▪ Knee flexion and extension AAROM ▪ Straight leg raises in multiple planes ▪ LE flexibility exercises (supine calf and hamstring stretches) ▪ Passive knee extension with towel roll under heel ▪ Plantar flexion with elastic band or calf raises ▪ Gait training with appropriate pre-operative assistive device if needed ▪ Additional recommendations for patients attending multiple sessions pre-operatively o Edema management o ROM exercises e.g. knee flexion AAROM, supine knee extension PROM o LE flexibility exercises o LE progressive resistive exercises o Balance/proprioceptive training o Stationary bike	▪ Familiarization with post-operative plan of care ▪ Quadriceps contraction ▪ Control swelling ▪ Knee ROM with focus on extension unless mechanically blocked
Day of Surgery *Criteria for Discharge:* *- Independent ambulation with appropriate assistive device on level surfaces and stairs* *- Independent brace management* *-Independent with transfers* *- Independent with HEP*	▪ Avoid prolonged sitting, standing, and walking ▪ Avoid advancing weight bearing too quickly, which may prolong recovery ▪ Avoid pain with walking & exercises ▪ Avoid heat on knee ▪ Avoid weightbearing without brace ▪ Avoid ambulating without crutches ▪ Do not place pillow under the operated knee- keep extended when resting and sleeping	▪ Transfer training ▪ Gait training with assistive device on level surfaces and stairs ▪ Patient education: o Edema management o Activity modification o Brace management o Initiate and emphasize importance of HEP ▪ Quadriceps sets, gluteal sets, ankle pumps, ▪ Seated knee AAROM ▪ Straight leg raise with brace locked in extension, if able ▪ Passive knee extension with towel roll under heel	▪ Control swelling ▪ Quadriceps contraction ▪ Independent transfers ▪ Gait training with appropriate assistive device ▪ P/AAROM (focus on extension) ▪ Appropriate balance of activity and rest

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Phase	Precautions	Treatment Recommendations	Emphasize
Weeks 0-2 Postoperative Phase 1 *Criteria for Advancement:* *-Ability to SLR without quadriceps lag or pain* *-Knee ROM 0°-90°* *-Pain and swelling controlled*	▪ Do not put a pillow under operative knee- keep extended when resting and sleeping ▪ BTB only: Avoid resisted active knee extension 40° → 0° ▪ Avoid ambulation without brace locked at 0° ▪ Avoid heat application ▪ Avoid prolonged standing/walking ▪ Avoid ambulating without crutches ▪ Weightbearing: TTWB x1 week, PWB (50%) x1 week, then full WB	▪ 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** ▪ AROM knee flexion to tolerance, AAROM knee extension to 0° ▪ May start small short arc active quads (10-0°) immediately ▪ Straight leg raises (SLR) in all planes o With brace locked at 0° in supine ▪ Hip progressive resistive exercises ▪ Calf strengthening o Unilateral elastic band → bilateral calf raises ▪ Initiate flexibility exercises ▪ Upper extremity ergometry, as tolerated ▪ Gait training with progressive WB o Gradual progression with brace locked at 0° with crutches ▪ Edema management, e.g. cryotherapy (no submersion), elevation, gentle edema mobilization avoiding incision ▪ Progressive home exercise program	▪ Patellar mobility ▪ Full PROM knee extension ▪ Improving quadriceps contraction ▪ Controlling pain and swelling ▪ Compliance with HEP and precautions
Weeks 3-6 Postoperative Phase 2 *Criteria for Advancement:* *-Knee ROM 0°-130°* *-Good patellar mobility* *-Minimal swelling* *-SLS FWB without pain* *-Non-antalgic gait* *-Ascend 6" stairs with good control without pain*	▪ Do not put a pillow under the operated knee- keep extended when resting and sleeping ▪ Avoid pain with exercises, standing, walking and other activities o Monitor tolerance to load, frequency, intensity and duration ▪ Avoid premature discharge of assistive device until gait is normalized ▪ Avoid advancing weight bearing too quickly which may prolong recovery ▪ BTB only: Avoid resisted active knee extension 40° → 0° ▪ Avoid heat application *(continued)* ▪ Avoid prolonged standing/walking ▪ Avoid ascending or descending stairs	▪ 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** ▪ AROM knee flexion to tolerance o Progression from seated to standing (wall slides) to bike ROM ▪ AAROM knee extension to 0°, short arc active quads (45-0°) ▪ Straight leg raises (SLR) PRE's in all planes o With brace locked at 0° while supine until no extension lag demonstrated o Brace may be removed in other planes ▪ Leg press bilaterally in 80°-5° arc if knee flexion ROM > 90° o Progression from bilaterally to 2 up/1 down, to unilateral ▪ Functional strengthening o Mini squats progressing to 0°-60°, initiating movement with hips o Forward step-up progression starting with 2"-4" ▪ Terminal knee extension in weight bearing ▪ **Consider blood flow restriction (BFR) program with FDA approved device if qualified therapist available** ▪ Hip-gluteal progressive resistive exercises o May introduce Romanian Dead Lift (RDL) toward end of phase ▪ Hamstring strengthening (unless hamstring autograft) ▪ Calf strengthening *(continued)* o Progression from bilateral to unilateral calf raises ▪ Flexibility exercises ▪ Proprioception board/balance system (later in phase) o CAREFUL progression from bilateral to unilateral WB	▪ Knee ROM ▪ Patella mobility ▪ Quadriceps contraction ▪ Normalizing gait pattern ▪ Activity level to match response and ability

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Phase 2 (Continued)	reciprocally until adequate quadriceps control & lower extremity alignment	o Once single leg stance achieved with good alignment and control, progress from stable to unstable surfaces ▪ Stationary bicycle: o Short (90mm) crank ergometry (requires knee flexion > 85°) o Standard crank for ROM and/or cycle (requires 115° knee flexion) ▪ Upper extremity ergometry, as tolerated ▪ Gait training WBAT- may still have brace locked at 0° and crutches (see appendix 2) ▪ 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	
Weeks 7-12 Postoperative Phase 3 *Criteria for Advancement:* *-Ability to perform 8" step-down with good control 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*	▪ Do not put a pillow under the operated knee- keep extended when resting and sleeping ▪ Avoid pain with exercises, standing, walking, and other activities o Monitor tolerance to load, frequency, intensity and duration o Avoid too much too soon	▪ Patellar mobilization ▪ AROM knee flexion to tolerance ▪ AAROM knee extension to 0°, long-arc active quads (90-0°) ▪ SLR PRE's in all planes ▪ Isometric knee extension at 60° ▪ Open chain knee extension progression o At week 7 initiate PRE in limited arc 90°-40° o Progress to 90°-30° o Progress to 90°-0° by end of phase ▪ Leg press eccentrically ▪ Functional strengthening o Progress squats to 0°-90°, initiating movement with hips o Continue forward step-up progression o Initiate step-down progression starting with 2"-4" o Lateral step-ups, crossovers, lunges ▪ Continue foundational hip-gluteal PRE's ▪ Continue hamstring and calf strengthening ▪ Flexibility exercises and foam rolling ▪ Core and UE strengthening ▪ BRF program with FDA approved device if qualified therapist ▪ Proprioception training o Continue foundational exercises o Progress to perturbation training ▪ Cardiovascular conditioning o Stationary bicycle o Elliptical when able to perform 6" step-up with good form ▪ Gait training WBAT ▪ Cryotherapy o Ice with passive knee extension with towel under heel ▪ Progressive home exercise program	▪ Address impairments ▪ Functional movement ▪ Functional strength **<u>Assessment</u>** - Balance testing, e.g. Star Excursion Test, Biodex Balance System -Quadriceps isometrics testing with dynamometer at 60° at 12 weeks

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Phase	Precautions	Treatment Recommendations	Emphasize
Weeks 13-26 Postoperative Phase 4 *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* *o Note that uninvolved side may be deconditioned; use pre-injury baseline or normative data for comparison if available*	▪ 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	▪ Open chain knee extension progression ▪ Progress leg press eccentrically ▪ Functional strengthening o Progress squats to 0°-90°, initiating movement with hips o Progress to single leg squats o Forward step-up and step-down progression o Progress lateral step-ups, crossovers o Progress lunges ▪ Initiate running progression (see appendix 3) ▪ Initiate plyometric progression (see appendix 4) ▪ Continue foundational hip-gluteal progressive resistive exercises ▪ Continue hamstring and calf strengthening ▪ Flexibility exercises and foam rolling ▪ Core and UE strengthening ▪ Consider BFR program with FDA approved device if qualified therapist available ▪ Progress proprioception training o Continue foundational exercises o Incorporate agility and controlled sports-specific movements ▪ Progress cardiovascular conditioning o Stationary bicycle o Elliptical ▪ Cryotherapy and/or compression therapy ▪ Progressive home exercise program ▪ Patient education regarding monitoring of response to increase in activity level	▪ Return to normal functional activities **Assessment** -Balance testing, e.g. Star Excursion Test, Biodex Balance System -Quadriceps isometrics or isokinetic testing -QMA – Quality of Movement Testing
Weeks 27-Discharge Postoperative Phase 5 *Criteria for Discharge/Return to Sport:* -Quantitative assessments ≥ 90% of contralateral lower extremity -Movement patterns, strength, flexibility, motion, endurance, power, deceleration fit sport demands	▪ 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	▪ 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	▪ Return to participation ▪ Collaboration with Sports Performance experts **Assessment** -Quadriceps isometrics or isokinetic testing -Balance testing, e.g. Star Excursion Test, Biodex Balance System -Functional tests, e.g. hop testing, QMA – Quality of Movement Testing

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Appendix 1: Modifications due to Graft Type and/or Concomitant Surgeries

ACLR with Hamstring Autograft

- Avoid active knee flexion and isolated loading of hamstrings (e.g. heel slides, leg curls, hamstring strengthening and flexibility exercises) for the first 4-6 weeks

ACLR with Osteochondral Allograft (all graft types)

- Weight Bearing:
  - Week 1: TTWB
  - Week 2-4: PWB (50%)
  - Week 5: WBAT (pending surgeon clearance)

ACLR with Meniscal Repair (all graft types)

- Range of Motion: Without restrictions unless directed by surgeon (generally speaking, do not push flexion)

ACLR with Radial or Root Repair

- Weight Bearing
  o Weeks 0-2 TTWB
  o Weeks 3-4 PWB (50%)
  o Weeks 5-6 progressive WBAT

Appendix 2: Phase 2 – Gait and Assistive Device

- **Begin ambulation TTWB with brace locked in full extension with assistive device at all times.**
  • Encourage slow progression of weight bearing to avoid increased symptoms.
  TTWB x 1 week
  50% WB x 1 week
  Full WBAT at two weeks postoperative
  • WBAT should consider pain, quadriceps control and edema both during gait and after.
  • Any increase in symptoms should indicate a reduction of WB during gait or standing activities, or decrease in overall volume of WB activities.

- **Beginning in phase 2 of rehab (week 3), patient may be evaluated for ambulation with unlocked brace.**
  • Brace may unlocked for gait when full passive and active knee extension is achieved as demonstrated by a straight leg raise without quad lag for 15 repetitions.
  • Brace should not be unlocked unless patient can demonstrate appropriate heel strike and quadriceps control during gait.
  • May consider only partially unlocking brace (e.g. if patient has 95° flexion, consider unlocking brace to 90°).
  • If flexion ROM deficits persist, brace may need to be unlocked to facilitate return to full ROM while decreasing weight bearing.

Brace will be d/c'ed at the discretion of the physician.

Wean from assistive device with symmetrical gait pattern, full extension and full WB during stance phase.
• Begin with no assistive device around home with progression complete discharge of assistive device.

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Appendix 3: Phase 4 – Examples of Running Progression

EXAMPLE 1

Week	Run	Rest/Walk	Reps
1	30 sec	30 sec	3
2	1 min	1 min	3
3	2 min	1 min	2
4	4 min	2 min	1
5	4 min	2 min	2
6	8 min	N/A	1

EXAMPLE 2

1. Retro running 30” on treadmill or Alter-GTM run 30” 80% WB, progressing to 95% WB
2. Treadmill forward running 30”, advancing to 1’ (note: not jogging, not sprinting, but running)

Appendix 4: Phase 4 – Examples of Plyometrics Progression

EXAMPLE 1

Week 1	Onto box
Week 2	In place and jumping rope
Week 3	Drop jumps
Week 4	Broad jumps
Week 5	Side to side hops
Week 6	Hop to opposite

EXAMPLE 2

1. Bilateral plyometrics on leg press
2. Bilateral jumps onto a 6” box
3. Bilateral jumps in a cross pattern, e.g. clockwise and counterclockwise

4. Bilateral jumps on/off box 6” / 8” / 12”
5. Unilateral jumps in a cross pattern, e.g. clockwise and counterclockwise

6. Unilateral jumps on/off box

Protocol adapted from Hospital for Special Surgery Rehabilitation postoperative anterior cruciate ligament reconstruction guidelines

I hereby certify these services as medically necessary for the patient’s plan of care.

_____ Date_____

Physician’s Signature

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