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Rehabilitation Protocol for Achilles Rupture Repair

This protocol is intended to guide clinicians through the post-operative course for Achilles tendon repair. This protocol is time based (dependent on tissue healing) as well as criterion based. Specific intervention should be based on the needs of the individual and should consider exam findings and clinical decision making. The timeframes for expected outcomes contained within this guideline may vary based on surgeon's preference, additional procedures performed, and/or complications. If a clinician requires assistance in the progression of a post-operative patient, they should consult with the referring surgeon.

The interventions included within this protocol are not intended to be an inclusive list. Therapeutic interventions should be included and modified based on the progress of the patient and under the discretion of the clinician.

Considerations for the Post-operative Achilles tendon repair program

Many different factors influence the post-operative Achilles tendon rehabilitation outcomes, including type and location of the Achilles tear and repair. Consider taking a more conservative approach to range of motion, weight bearing, and rehab progression with tendon augmentation, re-rupture after non-surgical management, revision, chronic tendinosis, and co-morbidities, for example, obesity, older age, and steroid use. It is recommended that clinicians collaborate closely with the referring physician regarding intra-operative findings and satisfaction with the strength of the repair.

If the patient develops a fever, unresolving numbness/tingling, excessive drainage from the incision, uncontrolled pain or any other symptoms you have concerns about, the referring physician should be contacted.

PHASE I: IMMEDIATE POST-OP (0-3 WEEKS AFTER SURGERY)

Rehabilitation Goals	• Protect repair • Maintain strength of hip, knee and core • Manage swelling
Weight Bearing	*Walking* • Non-weight bearing (NWB) on crutches in splint and/or Achilles boot.
Intervention	*Range of motion/Mobility (in boot/splint)* • Supine passive hamstring stretch *Strengthening (in boot/splint)* • Quad sets • Straight leg raise • Abdominal bracing • Hip abduction • Side-lying hip external rotation-clamshell • Prone hip extension • Prone hamstring curls
Criteria to Progress	• Pain < 5/10

PHASE II: INTERMEDIATE POST-OP (4-6 WEEKS AFTER SURGERY)

Rehabilitation Goals	• Continue to protect repair • Avoid over-elongation of the Achilles

	• Reduce pain, minimize swelling • Improve scar mobility once incision is healed • Restore ankle plantar flexion, inversion, and eversion • Dorsiflexion to neutral • Normalize gait as much as possible while in boot by utilizing a Shoe Leveler for the uninvolved side to prevent secondary musculoskeletal complaints.
Weight Bearing	*Walking (**Weight-bearing, wedge use/weaning, and boot types may vary by surgeon/practice.)* • Week 4: Begin **partial progressive weight-bearing** on crutches in an **Achilles boot with 3 wedges** (~1" in height each). *Suggest gradually progress weight-bearing by 25% of body weight per week as tolerated until Full Weight-bearing (FWB) through the surgical side without pain.* • Week 5: Wean one heel wedge leaving **2 wedges** remaining in Achilles Boot. • Week 6: Wean 2nd heel wedge, leaving **1 wedge** remaining in Achilles Boot.

Additional Intervention **Continue with Phase I interventions*	*Range of motion/Mobility*
	• Initiate ankle passive range of motion (PROM), active assisted range of motion (AAROM) and active range of motion (AROM) - **DO NOT dorsiflex (DF) ankle past 0 degrees**
	  ○ Ankle pumps (do not DF ankle beyond neutral/0 degrees)
	  ○ Ankle circles (do not DF ankle beyond neutral/0 degrees)
	  ○ Ankle inversion
	  ○ Ankle eversion
	  ○ Seated heel-slides for ankle DF ROM (not past 0 degrees)
	• If stiff from immobilization, initiate great toe DF and PF stretching (by patient or therapist) – *Do not exceed neutral (0 degrees) DF when performing this stretch.*
	• Foot and ankle joint mobilizations: per therapist discretion
	  ○ Modify hand placement to avoid pressure on healing incision
	• May begin gentle scar mobilization once incision is healed - **NO instrument assisted soft tissue mobilization (IASTM) directly on tendon until at least 16 weeks post-op**.
	
	Cardio
	• Upper body ergometer
	
	Strengthening
	• Continue proximal lower extremity strengthening as in Phase I
	• Lumbopelvic Strengthening: planks (in Achilles Boot)
	• Once able sit with foot flat on the floor with ankle close to neutral DF:
	  ○ Seated heel raises
	  ○ Seated arch doming
	  ○ Exercises for foot intrinsic muscles to minimize atrophy while in boot
	
	Proprioception
	• Joint position re-training

Criteria to Progress	• Pain < 3/10 • Minimal swelling (recommend water displacement volumetry or circumference measures such as Figure 8) • Full ROM PF, eversion, inversion • DF to neutral • Optimal gait in Achilles Boot with 1 wedge, crutches and Shoe Leveler on uninvolved side

PHASE III: LATE POST-OP (7-8 WEEKS AFTER SURGERY)

Rehabilitation Goals	• Continue to protect repair • Avoid over-elongation of the Achilles. **No overt stretching of the Achilles.** • Normalize gait in Achilles Boot without wedges using a Shoe Leveler for the uninvolved side. • Restore full range of motion including DF • Safely progress strengthening • Promote proper movement patterns • Avoid post exercise pain/swelling

	• FWB in boot without wedges, without crutches, with good tolerance and normalized gait pattern by week 8
Weight Bearing	*Walking* • Week 7: Remove final heel wedge from Achilles Boot. ○ **WBAT/FWB** with one crutch/no crutches as needed for normalized gait pattern in **Achilles Boot without wedges,** with Shoe Leveler on the uninvolved side **(remove one layer of the Shoe Leveler)** • Week 8: **FWB in Achilles Boot (no wedges)** with Shoe Leveler on uninvolved without crutches
Additional Intervention **Continue with Phase I-II Interventions as indicated.*	*Range of motion/Mobility* • Continue seated heel-slides for DF ROM to tolerance – **DF ROM no longer restricted but continue to gently progress.** • Continue toe stretching as needed • Gentle stretching of proximal muscle groups as indicated: (Examples: standing quad stretch, standing hamstrings stretch, kneeling hip flexor stretch, piriformis stretch) • Ankle/foot mobilizations (talocrural, subtalar, midfoot, MTPs) as indicated • **No overt stretching of the calf in NWB or weight-bearing.** NWB stretches such as calf towel stretch should only be implemented if DF ROM progression is delayed *Cardio* • Stationary bicycle (in Achilles boot) *Strengthening* • 4 way ankle with resistance band • Lumbopelvic strengthening: bridges on physioball, bridge on physioball with roll-in, bridge on physioball alternating • Gym equipment: hip abductor and adductor machine, hip extension machine, roman chair ○ Progress intensity (strength) and duration (endurance) of exercises
Criteria to Progress	• No swelling/pain after exercise • Normal gait in Achilles boot without wedges or need for crutches • ROM equal to contralateral side • Joint position sense symmetrical (<5 degree margin of error)

PHASE IV: TRANSITIONAL (9-10 WEEKS AFTER SURGERY)

Rehabilitation Goals	• Maintain full ROM • Normalize gait in supportive sneaker with 1 cm heel lift • Avoid over-elongation of the Achilles • Safely progress strengthening • Promote proper movement patterns • Avoid post exercise pain/swelling
Weight Bearing	*Walking* • Transition to sneaker with 1 cm heel lift (FWB)

Additional Intervention **Continue with Phase I-III interventions as indicated.*	*Range of motion/Mobility*
	• Ankle/foot mobilizations (talocrural, subtalar, midfoot, MTPs) as indicated
	• Continue Seated ankle heel-slides for DF. Progress to standing ankle dorsiflexion stretch on step.
	
	Cardio
	• Stationary bike, flutter kick swimming/pool jogging (only if incision fully healed)
	
	Strengthening
	• Begin Standing calf raise progression: *(based on tolerance/performance and will extend into the later phases)*
	  ○ Bilateral standing heel raises (25% body weight thru involved leg)
	  ○ Bilateral standing heel raises (50% equal weight through both legs)
	  ○ Bilateral standing heel raises (75% body weight thru the involved leg)

	• Knee Exercises for additional exercises and descriptions • Gym equipment: seated hamstring curl machine and hamstring curl machine, leg press machine *Balance/proprioception* • Double limb standing balance utilizing uneven surface (wobble board) • Single limb balance - progress to uneven surface including perturbation training
Criteria to Progress	• No swelling/pain after exercise • Normal gait in supportive sneaker with 1 cm heel lift

PHASE V: TRANSITIONAL (11-12 WEEKS AFTER SURGERY)

Rehabilitation Goals	• Maintain full ROM • Normalize gait in supportive sneakers **without heel-lift** • Avoid over-elongation of the Achilles • Safely progress strengthening • Promote proper movement patterns • Avoid post exercise pain/swelling
Weight Bearing	*Walking* • Wean heel-lift from sneaker. Normalize gait pattern.
Additional Intervention **Continue with Phase I-IV interventions as indicated.*	• Continue to progress with interventions for ROM, cardio, strengthening, balance and proprioception from previous phases as indicated.
Criteria to Progress	• No swelling/pain after exercise • Full ROM during standing bilateral concentric calf raise with equal weight bearing through both legs • Normal gait in supportive sneakers

PHASE VI: ADVANCED POST-OP (3-6 MONTHS AFTER SURGERY)

Rehabilitation Goals	• Safely progress strengthening • Promote proper movement patterns • Avoid post exercise pain/swelling • Avoid over-elongation of the Achilles • Good tolerance with progression to plyometrics and agility training

Additional Intervention **Continue with Phase II-V interventions as indicated.*	*Range of motion/Mobility*
	• Continue Standing ankle DF mobilization on step
	• If indicated, may initiate gentle IASTM directly to the tendon beginning at 16 weeks.
	
	Cardio
	• Elliptical, stair climber
	
	Strengthening
	• If able to perform bilateral standing heel raises with 75% of body weight through the full range of involved limb, progress to eccentric calf raises (bilateral raises, unilateral lowering on involved) on level surface followed by progression to unilateral heel raises.
	• Seated calf machine or wall sit with bilateral calf raises
	• ***The following exercises are to focus on proper pelvis and lower extremity control with emphasis on good proximal stability:*
	  ○ Hip hike
	  ○ Forward lunges: Begin leading with injured leg only then progress to leading with uninjured leg.
	  ○ Lateral lunges
	  ○ Bilateral squats progressing to single leg progression (below)

	○ Single leg progression: partial weight bearing single leg press, slide board lunges: retro and lateral, step ups and step ups with march, lateral step-ups, step downs, single leg squats, single leg wall slides *Plyometrics* • Initiate Beginner Level plyometrics: ○ Once able to perform 3 sets of 15 of bilateral standing heel-raises with equal weight bearing progress to rebounding heel raises bilateral stance. ○ Once able to perform 3 sets of 15 unilateral heel raises progress to rebounding unilateral heel raises. ○ Once able to demonstrate good performance/tolerance with rebounding heel raises then initiate hopping in place bilateral stance. Progress as able to unilateral hopping in place.
Criteria to Progress	• No swelling/pain after exercise • Standing Heel Rise test ≥ 90% of uninvolved • No swelling/pain with 30 minutes of fast-paced walking • Good tolerance and performance of Beginner Level plyometrics • Achilles Tendon Rupture Score (ATRS) • Psych Readiness to Return to Sport (PRRS)

PHASE VII: EARLY to UNRESTRICTED RETURN TO SPORT (6+ MONTHS AFTER SURGERY)

Rehabilitation Goals	• Continue strengthening and proprioceptive exercises • Safely initiate sport specific training program • Symmetrical performance with sport specific drills • Safely progress to full sport
Additional Intervention **Continue with Phase III-VI interventions as indicated.*	*Range of motion/Mobility* • May initiate gentle standing gastroc stretch and soleus stretch as indicated at 6 months post-op *Running* • Interval walk/jog program (Phase 1 of the Return to Running Program) • Return to Running Program (Phase 2) *Plyometrics and Agility* • Criteria to progress to the Agility and Plyometrics Program: ○ Good tolerance/performance of Beginner Level Plyometrics in Phase VI above ○ Completion of Phase 1 Return to Running Program (walk/jog intervals) with good tolerance.
Criteria to Discharge	• Clearance from MD and ALL milestone criteria below have been met. ○ Completion of both phases of the Return to Running Program without pain/swelling. ○ Functional Assessment ○ Lower Extremity Functional Tests should be ≥90% compared to contralateral side for unilateral tests.
Contact	Please email MGHSportsPhysicalTherapy@partners.org with questions specific to this protocol

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6. Silbernagel KG, Nilsson-Helander K, et al. A new measurement of heel-rise endurance with the ability to detect functional deficits in patients with Achilles tendon rupture. *Knee Surg Sports Traumatol Arthrosc.* 2010. 18:258-264.

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Functional Assessment

Patient Name: _____ MRN: _____

Date of Surgery: _____ Surgeon: _____

Concomitant Injuries/Procedures: _____

	Operative Limb	Non-operative Limb	Limb Symmetry Index
Range of motion (X-0-X)			-
Pain (0-10)			-
Standing Heel Rise test			
Hop Testing			
Single-leg Hop for Distance			
Triple Hop for Distance			
Crossover Hop for Distance			
Vertical Jump			
Y-Balance Test			
Calculated 1 RM (single leg press)			
Psych. Readiness to Return to Sport (PRRS)			

Ready to jog? YES NO

Ready to return to sport? YES NO

Recommendations: _____

Examiner: _____

Range of motion is recorded in X-0-X format: for example, if a patient has 6 degrees of hyperextension and 135 degrees of flexion, ROM would read: 6-0-135. If the patient does not achieve hyperextension, and is lacking full extension by 5 degrees, the ROM would simply read: 5-135.

Pain is recorded as an average value over the past 2 weeks, from 0-10. 0 is absolutely no pain, and 10 is the worst pain ever experienced.

Standing Heel Rise test is performed starting on a box with a 10 degree incline. Patient performs as many single leg heel raises as possible to a 30 beat per minute metronome. The test is terminated if the patient leans or pushes down on the table surface they are using to balance, the knee flexes, the plantar-flexion range of motion decreases by more than 50% of the starting range of motion, or the patient cannot keep up with the metronome/fatigues.

Hop testing is performed per standardized testing guidelines. The average of 3 trials is recorded to the nearest centimeter for each limb.

Return to Running Program

This program is designed as a guide for clinicians and patients through a progressive return-to-run program. Patients should demonstrate > 80% on the Functional Assessment prior to initiating this program (after a knee ligament or meniscus repair). Specific recommendations should be based on the needs of the individual and should consider clinical decision making. If you have questions, contact the referring physician.

PHASE I: WARM UP WALK 15 MINUTES, COOL DOWN WALK 10 MINUTES

Day	1	2	3	4	5	6	7
Week 1	W5/J1x5		W5/J1x5		W4/J2x5		W4/J2x5
Week 2		W3/J3x5		W3/J3x5		W2/J4x5	
Week 3	W2/J4x5		W1/J5x5		W1/J5x5		**Return to Run**

Key: W=walk, J=jog
***Only progress if there is no pain or swelling during or after the run*

PHASE II: WARM UP WALK 15 MINUTES, COOL DOWN WALK 10 MINUTES

Week	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	20 min		20 min		20 min		25 min
2		25 min		25 min		30 min	
3	30 min		30 min		35 min		35 min
4		35 min		40 min		40 min	
5	40 min		45 min		45 min		45 min
6		50 min		50 min		50 min	
7	55 min		55 min		55 min		60 min
8		60 min		60 min			

Recommendations

- Runs should occur on softer surfaces during Phase I
- Non-impact activity on off days
- Goal is to increase mileage and then increase pace; avoid increasing two variables at once
- 10% rule: no more than 10% increase in mileage per week

Agility and Plyometric Program

This program is designed as a guide for clinicians and patients through a progressive series of agility and plyometric exercises to promote successful return to sport and reduce injury risk. Patients should demonstrate > 80% on the Functional Assessment prior to initiating this program. Specific intervention should be based on the needs of the individual and should consider clinical decision making. If you have questions, contact the referring physician.

PHASE I: ANTERIOR PROGRESSION

Rehabilitation Goals	• Safely recondition the knee • Provide a logical sequence of progressive drills for pre-sports conditioning
Agility	• Forward run • Backward run • Forward lean in to a run • Forward run with 3-step deceleration • Figure 8 run • Circle run • Ladder

Plyometrics	• Shuttle press: Double leg→alternating leg→single leg jumps
	• Double leg:
	  ○ Jumps on to a box→ jump off of a box→ jumps on/off box
	  ○ Forward jumps, forward jump to broad jump
	  ○ Tuck jumps
	  ○ Backward/forward hops over line/cone
	• Single leg (these exercises are challenging and should be considered for more advanced athletes):
	  ○ Progressive single leg jump tasks
	  ○ Bounding run
	  ○ Scissor jumps
	  ○ Backward/forward hops over line/cone

Criteria to Progress	• No increase in pain or swelling • Pain-free during loading activities • Demonstrates proper movement patterns

PHASE II: LATERAL PROGRESSION

Rehabilitation Goals	• Safely recondition the knee • Provide a logical sequence of progressive drills for the Level 1 sport athlete
Agility **Continue with Phase I interventions*	• Side shuffle • Carioca • Crossover steps • Shuttle run • Zig-zag run • Ladder

Plyometrics
**Continue with Phase I interventions*
	• Double leg:
	  ○ Lateral jumps over line/cone
	  ○ Lateral tuck jumps over cone
	• Single leg(these exercises are challenging and should be considered for more advanced athletes):
	  ○ Lateral jumps over line/cone
	  ○ Lateral jumps with sport cord

Criteria to Progress	• No increase in pain or swelling • Pain-free during loading activities • Demonstrates proper movement patterns

PHASE III: MULTI-PLANAR PROGRESSION

Rehabilitation Goals	• Challenge the Level 1 sport athlete in preparation for final clearance for return to sport
Agility **Continue with Phase I-II interventions*	• Box drill • Star drill • Side shuffle with hurdles
Plyometrics **Continue with Phase I-II interventions*	• Box jumps with quick change of direction • 90 and 180 degree jumps
Criteria to Progress	• Clearance from MD • Functional Assessment ○ ≥90% contralateral side • Achilles Tendon Rupture Score (ATRS) • Psych Readiness to Return to Sport (PRRS)