

Overview

OVERVIEW

- 22 year old male, complete rupture on right leg playing basketball
- Got into a splint same day, non-op, got into a full cast five days later
- Cast removed after three weeks and into Aircast boot, full weight-bearing immediately
- Started Achilles exercises 2 days after being in boot (see week 3) and was walking about 5,000-7,500 steps a day since then
 - Exercised every day, some days lighter than others

DISCLAIMER

This exercise and nutrition regimen has had great outcomes for the strength and function of my Achilles during recovery so far (although I'm not fully done with recovery so it could be too soon to say). I am not an expert in exercise/nutrition, this is just what I put together from online research. There is very little information online on nutrition for tendon repair, and exercise varies from person to person, so make sure to discuss these points with your doctor/PT if you're interested in anything on here. I also recommend reading into the resources yourself so you can form your own opinion/regimen. Additionally a lot of these supplements and diet changes can be expensive, so if you try any of these, find what works for you and your budget. I haven't followed the nutrition aspect very strictly aside from the supplements (collagen, protein, vitamin C, and mucopolysaccharides) and eating generally healthy.

If any of you reading this are experts on exercise and nutrition, please correct me if there's any misinformation on here.

Nutrition

NOTE

Nothing will speed up the healing process, but collagen, vitamin C, and mucopolysaccharide supplementation 30-60 minutes before rehab exercise has the most evidence to date for providing the biological and structural components to “build” and organize stronger tendon fibers.

SUPPLEMENTS

- Whey protein
- Hydrolyzed collagen/collagen peptides
- Vitamin C
- Mucopolysaccharide concentrate
- Essential fatty acids EPA, DHA/Omega-3's, GLA
- Trace minerals (zinc, manganese, copper)
- Vitamin D3

NATURAL NUTRIENT SOURCES

Structural amino acids (tendon building blocks)

- **Collagen peptides** (glycine, proline, hydroxyproline)
 - Bone broth, chicken skin
- **Leucine:** primary amino acid for signaling muscle protein synthesis
 - Eggs, lean beef, soy, greek yogurt
- **Arginine and L-Citrulline:** improves blood flow to tendon
 - Lean beef, soy, seeds (pumpkin/sesame), watermelon

Enzymatic cofactors (help cross-link tendon fibers)

- **Vitamin C:** mandatory for enabling collagen stabilization
 - Citrus fruits, bell peppers, strawberries, broccoli
- **Copper and manganese:** Essential for lysyl oxidase, the enzyme that creates the actual cross-links between collagen strands
 - Nuts (cashews/almonds), seeds, shellfish, whole grains
- **Zinc:** vital for DNA synthesis and cell division during early healing stages
 - Lean beef, pumpkin seeds, lentils, eggs

Vascular and oxygenation modulators (helps improve blood flow to Achilles)

- **Inorganic nitrates:** precursors to nitric oxide, which dilates blood vessels to improve oxygen/nutrient delivery
 - Beet juice, arugula, spinach
- **Flavanols and polyphenols:** protects nitric oxide from breaking down
 - Green tea, dark berries, pomegranates

Anti-inflammatory support

- **Omega-3 fatty acids (EPA/DHA):** modulates inflammatory response
 - Fatty fish (salmon/mackerel), flaxseed, walnuts
- **Mucopolysaccharides (GAGs):** supports lubrication of tendon matrix
 - Bone broth and supplementation concentrates
- **Sulfur:** stabilizes connective tissue matrix
 - Eggs, garlic, onions, cruciferous vegetables (broccoli, cauliflower)

- **Monounsaturated fats:** essential for cell membrane health in tendon cells
 - Avocado, olive oil

HYDRATE: keep blood flow moving and increase elasticity of healing fibers

Exercise

NOTE

This exercise regimen is what I put together from online research and some of my own PT sessions. Everyone's progress and timeline is different, but the goal is to move onto the next steps once the current steps are pain-free and you feel comfortable doing them. If you try any of these, I highly recommend watching the linked videos in the resources and looking others up to see how the movements are done, as well as clearing everything with your doctor/PT based on your recovery timeline. If you do these on your own, proceed at your own risk!

I used Claude AI to compile and combine the rehab protocols from Mass General Brigham and Willits/Fowler Kennedy (see resources). Just to note, this is a more accelerated protocol.

PHASE 1

Weeks 1-2 (Splint/cast non weight-bearing)

- Toe wiggles
- Quad sets
- Long arc quads
- Straight leg raises (lying on back, side, and prone)
- Prone hip extension
- Prone hamstring curls
- Hip abduction (side-lying)
- Clamshell
- Abdominal bracing/core engagement

Week 3 (Boot with heel lift, partial to full weight-bearing)

- Continue weeks 1-2 exercises

RANGE OF MOTION:

- Begin active plantar flexion (point toes down gently)
- Ankle inversion and eversion (below neutral)
- Ankle pumps within safe range

STRENGTHENING:

- Foot intrinsic muscle exercises (towel curls, arch doming)
- Gentle isometric plantarflexion pushes against the floor
- Chair scoots
- With uninjured leg elevated to level:
 - Romanian deadlift (unweighted or with light weight/kettlebell)
 - Slow sit-to-stand

CARDIO/CONDITIONING:

- If you have a stationary bike, feel free to use it (with boot on)

PHASE 2

Week 4

- Continue phase 1 exercises (do NOT dorsiflex past 0°)

RANGE OF MOTION:

- Seated heel slides in chair for dorsiflexion ROM (not past neutral)
- Seated heel raise (on wedge/decline)

Weeks 5-6

RANGE OF MOTION:

- Seated heel slides closer toward neutral

STRENGTHENING:

- Seated heel raises (bilateral)
- Depending on weight-bearing status:
 - Single-leg balancing
 - Single-leg step-ups
 - Banded side-steps

PHASE 3 (Remove final heel wedge, full weight bearing)

Week 7

RANGE OF MOTION:

- Seated heel slides for dorsiflexion (no longer restricted)
- Progress to dorsiflexion as tolerated
- No aggressive calf stretching to avoid over-elongating Achilles

STRENGTHENING:

- 4-way ankle resistance band
- Bridges on physioball
- Continue seated calf raises

Week 8

RANGE OF MOTION:

- All previous ROM continued
- Standing quad, and hip flexor stretches

STRENGTHENING:

- Progress intensity and endurance on all lower extremity work as tolerated
- Bridges on physioball with roll-in and alternating legs
- Continue 4-way resistance band ankle exercises

CARDIO/CONDITIONING:

- Stationary bike in boot
- Pool jogging as tolerated

PHASE 4-5 (Transition to shoes with heel lift)

Weeks 9-10

- Continue all mobility/strengthening work

RANGE OF MOTION:

- Standing ankle dorsiflexion stretch on step (controlled)
- Continue all previous mobility work

STRENGTHENING:

- Bilateral standing heel raise: begin at 25% weight through involved leg, progress to 50% equal
- Seated hamstring curl
- Leg press machine (bilateral)
- Single-leg balance, progress to wobble board

- Double-leg balance on uneven surface

CARDIO/CONDITIONING:

- Stationary bike
- Flutter kick swimming or pool jogging

Weeks 11-12 (wean heel lift from shoes)

- Wean heel lift from shoe, normalize gait without lift

RANGE OF MOTION:

- Full range of motion targeted, continue standing dorsiflexion stretch on step

STRENGTHENING:

- Bilateral standing heel raise, equal weight through both legs, full range of motion
 - Progress to bilateral raises at 75% body weight through involved leg
- Progress to single-leg balance on uneven surface

CARDIO/CONDITIONING:

- Stationary bike
- Elliptical
- Swimming

PHASE 6 (Advanced strengthening)

Months 3-4

RANGE OF MOTION:

- Standing ankle dorsiflexion stretch on step

STRENGTHENING:

- Eccentric calf raises: bilateral raise on both legs, lower slowly on involved leg only
- Progress to full single-leg heel raises once bilateral is solid
- Seated, weighted calf raises
- Wall sit with bilateral calf raises
- Forward lunges; start leading with injured leg
- Lateral lunges
- Bilateral squats

CARDIO/CONDITIONING:

- Cycling
- Swimming
- Stair climber

Months 4-5

RANGE OF MOTION:

- Maintain all ROM
- Continue standing dorsiflexion stretch

STRENGTHENING:

- Single leg heel raises (3 sets x 15 reps goal)
- Step-ups and step-downs
- Lateral step-ups
- Single-leg squats (partial depth)
- Single-leg press
- Hip hike exercises

PLYOMETRICS/AGILITY:

- Bilateral standing heel raise rebounds (once 3x15 bilateral raises achieved)
- Bilateral hopping in place (once rebound raises mastered)

CARDIO/CONDITIONING:

- Elliptical
- Stair climber
- Swimming
- Bike

Month 6

- Begin walk/jog intervals ONLY after meeting criteria:
 - Standing heel rise test >90% of uninvolved side; no pain/swelling with 30 min fast walking; good tolerance of beginner plyometrics; doctor's clearance

STRENGTHENING:

- Unilateral rebound heel raises
- Unilateral hopping in place
- Full single-leg squat progression
- Single-leg wall slides

PLYOMETRICS/AGILITY:

- Forward jumps (bilateral)
- Shuttle press: double leg/alternating

CARDIO/CONDITIONING:

- Elliptical
- Stair climber
- 30-min fast-paced walking (pain-free target)

PHASE 7 (Return to running/sport)**Months 6-7****RANGE OF MOTION:**

- Begin gentle standing gastroc stretch at 6 months
- Gentle soleus stretch as indicated

STRENGTHENING:

- Continue single-leg calf raise program
- Full squat and lunge progression
- Continue hip/glute strengthening

PLYOMETRICS/AGILITY:

- Forward and backward run
- Forward lean into a run
- Double-leg box jumps on and off

RETURN TO RUN:

- Days 1-2: walk 5 min/jog 1 min x 5 sets
- Days 3-4: walk 4 min/jog 2 min x 5 sets
- Days 5-6: walk 3 min/jog 3 min x 5 sets

Months 7-8**STRENGTHENING:**

- Maintain and progress all strengthening; add sport-specific loading as indicated

PLYOMETRICS/AGILITY:

- Tuck jumps
- Backward/forward hops over line/cone (bilateral)
- Side shuffle
- Carioca
- Crossover steps
- Lateral jumps over line/cone (bilateral)

RETURN TO RUN:

- Week 2: walk 3 min/jog 3 min x 5 sets; walk 2 min/jog 4 min x 5 sets
- Week 3: walk 2 min/jog 4 min x 5 sets; walk 1 min/jog 5 min x 5 sets; progress to continuous jog

Months 8-9

STRENGTHENING:

- Maintain all strength gains; add single-leg power exercises

PLYOMETRICS/AGILITY:

- Shuttle run
- Zig-zag run
- Lateral track jumps over cone
- Progressive single-leg jump tasks

RETURN TO RUN:

- Week 1: 20 min x 3 sessions
- Week 2: 25 min x 2, then 30 min
- Week 3: 30 min x 2, then 35 min x 2
- Week 4: 35 min, 40 min x 2

Months 9-10

STRENGTHENING:

- Sport-specific loading
- Bounding and power drills
- Plyometric maintenance

PLYOMETRICS/AGILITY:

- Box drill
- Star drill
- Side shuffle with hurdles
- Box jumps with quick direction change
- 90° and 180° jump turns
- Bounding run
- Scissor jumps

RETURN TO RUN:

- Week 5: 40 min x 2, 45 min x 2
- Week 6: 50 min x 3
- Week 7: 55 min x 3, 60 min

Months 10-12 (Return to sport and final milestones)

STRENGTHENING:

- Maintain full calf/Achilles loading program
- Continue eccentric calf raises for tendon health

PLYOMETRICS/AGILITY:

- Sprint with toe-off action
- Single-leg horizontal hop x 3 at full effort
- Single-leg vertical hop x3 at full effort

CARDIO/CONDITIONING:

- Continuous running 60 min
- Sport-specific drills and scrimmages

*Protocols suggest return to competitive sport ONLY when: sprint with toe-off is pain-free; single-leg hop tests >90% of uninvolved side; completion of full return-to-run program; MD clearance

Resources

Nutrition

- (1) Hijlkema, A., Roozenboom, C., Mensink, M., & Zwerver, J. (2022). The impact of nutrition on tendon health and tendinopathy: a systematic review. *Journal of the International Society of Sports Nutrition*, 19(1), 474-504.
- (2) Gemalmaz, H. C., Sarıyılmaz, K., Ozkunt, O., Gorgen, S. G., & Silay, S. (2018). Role of a combination dietary supplement containing mucopolysaccharides, vitamin C, and collagen on tendon healing in rats. *Acta orthopaedica et traumatologica turcica*, 52(6), 452-458.
- (3) Curtis, L. (2016). Nutritional research may be useful in treating tendon injuries. *Nutrition*, 32(6), 617-619.
- (4) Noriega-González, D. C., Drobic, F., Caballero-García, A., Roche, E., Perez-Valdecantos, D., & Córdova, A. (2022). Effect of vitamin C on tendinopathy recovery: A scoping review. *Nutrients*, 14(13), 2663.
- (5) DePhillipo, N. N., Aman, Z. S., Kennedy, M. I., Begley, J. P., Moatshe, G., & LaPrade, R. F. (2018). Efficacy of vitamin C supplementation on collagen synthesis and oxidative stress after musculoskeletal injuries: a systematic review. *Orthopaedic journal of sports medicine*, 6(10), 2325967118804544.

Exercise

- (1) Brumann, M., Baumbach, S. F., Mutschler, W., & Polzer, H. (2014). Accelerated rehabilitation following Achilles tendon repair after acute rupture—development of an evidence-based treatment protocol. *Injury*, 45(11), 1782-1790.
- (2) Kearney, R. S., McGuinness, K. R., Achten, J., & Costa, M. L. (2012). A systematic review of early rehabilitation methods following a rupture of the Achilles tendon. *Physiotherapy*, 98(1), 24-32.
- (3) Treat My Achilles YouTube: <https://youtu.be/uF8d36TDacw?si=Rqt7AvvQhyiAyct6>
- (4) E3 Rehab YouTube: <https://youtu.be/CdHUiKIngtI?si=-d12WMPgBWDjo6Re>
- (5) Rehab protocols
Mass General Brigham:
<https://www.massgeneral.org/assets/mgh/pdf/orthopaedics/sports-medicine/physical-therapy/rehabilitation-protocol-for-achilles-tendon-repair.pdf>

Orthospecialist UK:

<https://www.orthospecialist.co.uk/pdf/foot-ankle-achilles-rupture-protocol-for-physiotherapist.pdf>

Fowler Kennedy:

<https://www.fowlerkennedy.com/wp-content/uploads/2023/03/ACHILLES-TENDON-RUPTURE-Jan-2019.pdf>

(6) Tendinopathy Rehabilitation YouTube:

<https://youtu.be/sn8l6VgTG4U?si=dqX-ItitRSvN0hXm>

(7) Mass General Brigham YouTube channel with a lot of videos on how to perform exercises: <https://youtube.com/@mghorthopaedics?si=uEdCeNVPYybFqD54>