Evidence Based Management of Acute Achilles Tendon Ruptures

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Disclosures

- None
Clinical Question

- What is the optimal treatment for a recreational athlete with an acute Achilles rupture?
Achilles---Legendary Greek hero of Trojan war fame

- Defeated Hector
- Central character in Homer’s *The Iliad*
- Said to be invulnerable due to coat of armor
- As an infant his mother, Thetis, tried to make Achilles immortal, and dipped him in the river Styx, holding him by the heel
- Achilles eventually mortally wounded by an arrow to the heel
Calf - Gastroc / Soleus
Achilles Tendon Rupture

- Relatively common injury in adult male athletes
- Recreational athletes
- 4th and 5th decade
- Males ~10:1

- Typically a non-contact injury
- “Pop” and pain and cannot RTP
- Usually can walk off the court/field
Achilles Rupture

- Usually 2-6cm from heel cord insertion
- Blood flow watershed area?
- Pre-existing tendon degeneration?
- Injury can also occur proximally (MT jxn or muscle belly) or distally (at calcaneus).....
Achilles Rupture: Diagnosis

- **History**
  - Age, mechanism, RTP?
  - **Timeframe**

- **Exam**
  - Swelling, Ecchymosis, Tendon gap
  - Motor fxn may be +/- normal!
  - Abnormal Thompson test

- **Imaging**
  - Xray to r/o boney avulsion, calcific tendonitis
  - MRI: not necessary, but good tool if diagnosis or location of tear in doubt
Thompson Test
Achilles Rupture: Treatment Options

- **Non-operative**
  - Cast vs. Boot
  - NWB vs Early weight bearing
  - Immobilization vs Early functional rehab

- **Operative**
  - Open repair
    - Post operative casting vs. boot
    - Post operative NWB vs. Early weight bearing
    - Post operative immobilization vs Early functional rehab
  - Percutaneous repair
Achilles Rupture Treatment

• Considerations:
  – Healing rate
  – Re-rupture
  – Return to function
    • ADLs, Work
    • Sport
  – Timeframe
  – Complications
Achilles Rupture Treatment

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Figure 3. Photograph of the patient’s heel, two weeks postop showing superficial sepsis
Operative vs Non-operative

- Historically:
  - Non-operative treatment = short-leg cast, NWB for 4-12 weeks
    - Risk: Re-rupture (8%-21%)
  - Operative treatment = open repair, then short leg cast, NWB for 4-8 weeks
    - Re-rupture rate 2%-5%
    - Risk: Infection/wound complications (0%-5%)

Cetti AJSM 1993, Moller JBJS 2001
Operative vs Non-operative: EBM

• What does the evidence tell us regarding operative vs non-operative treatment of Achilles tendon ruptures?

• *PUBMED SEARCH OF RELEVANT LEVEL 1-3 STUDIES*
### Levels of Evidence

<table>
<thead>
<tr>
<th>Level of Evidence</th>
<th>Grading Criteria</th>
<th>Grade of Recommendation</th>
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<tbody>
<tr>
<td>1a</td>
<td>Systematic review of RCTs including meta-analysis</td>
<td>A</td>
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<tr>
<td>1b</td>
<td>Individual RCT with narrow confidence interval</td>
<td>A</td>
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<tr>
<td>1c</td>
<td>All and none studies</td>
<td>B</td>
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<tr>
<td>2a</td>
<td>Systematic review of cohort studies</td>
<td>B</td>
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<tr>
<td>2b</td>
<td>Individual cohort study and low quality RCT</td>
<td>B</td>
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<tr>
<td>2c</td>
<td>Outcome research study</td>
<td>C</td>
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<tr>
<td>3a</td>
<td>Systematic review of case-control studies</td>
<td>C</td>
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<tr>
<td>3b</td>
<td>Individual case-control study</td>
<td>C</td>
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<td>4</td>
<td>Case-series, poor quality cohort and case-control studies</td>
<td>C</td>
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<td>5</td>
<td>Expert opinion</td>
<td>D</td>
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Source: Ann Surg © 2004 Lippincott Williams & Wilkins
Operative vs Non-operative

- Meta-analysis, 6 studies, ~450 patients
- Operative
  - ~6-8wks cast
  - Re-rupture 3.1%
  - Infection 4.7%
- Non Operative
  - ~8wks cast
  - Re-rupture 13%
- “Surgery generally recommended”
- ***WB status and ROM not well defined***
Op vs Non-Op

• Moller, *JBJS (Br)*, 2001
• Level 2 Prospective study
• Non-op
  – 8 wks cast, 4wks NWB
  – 21% re-rupture (11pts, 10 just while walking!)
  – ~50% abnormal function at 2 years
• Op
  – 2 wks plaster, then **WBAT in boot, functional rehab**
  – 1.7% re-rupture
  – Better functional outcome, earlier return to work

• Recommendations: Surgery for Achilles Rupture to prevent re-rupture
Early Motion after Achilles Injury

- Twaddle, *AJSM*, 2007
- RCT, Level 1
- Operative and Non-operative patients treated with early ROM after 2 wks in equinus plaster
  - Active DF to neutral, Passive (gravity) PF
- NWB for 6 wks, both groups
- 42 pts total, 1 year f/u
- Results: No difference in re-rupture rate (3 total), no difference in functional scores, no infx
Twaddle, 2007

• Conclusions:

  • “…..Controlled early motion is the most important part of treatment of ruptured Achilles tendon”

  • Controlled early motion found to be safe
Early Motion after Tendon Repair


- Conclusions: Early protected passive mobilization augments the physiologic processes that determine the strength and excursion of repaired flexor tendons
Collagen arrangement
Early Range of Motion Makes Sense!

.....and, it appears to be safe
Early Weight Bearing after Repair of Achilles Rupture

- Suchak *JBJS (Am)*, 2008
- Level 1 study
- Early WB (2 weeks) vs Delayed WB (6 weeks) after surgical repair
  - No difference in re-ruptures (None!)
  - No wound issues**
  - Better early recovery in early WB group (socially, ADLs)
  - Only 6 month f/u
- Early WB after repair is safe
Op vs Non-Op, Early WB/PT

- Willits, JBJS (Am), 2010
- Multicenter RCT, Level 1, 2 yr f/u
- 144 patients
- Operative vs Non operative
  - Both groups early WB (2 weeks) and early ROM
- Re-rupture ~4.6%; no difference b/t/t groups
  - Operative (2), Non Op (3)
- No clinically important difference b/t/t groups
- Non-op, early WB, early ROM a good option
Op vs Non-Op with early WB

- Olsson, *AJSM*, 2013 [Sweden]
- Level 1, RCT, Op vs Non-Op, 1 yr f/u
- Non-Op
  - WBAT, boot x 8 weeks
    - ***No ROM exercises for first 8 weeks!
  - 10% re-rupture rate
- Op
  - WBAT, boot x 6 weeks, gentle AROM to -15* starting wk 2
  - 0% re-rupture rate, 12% superficial infections (Abx only)
- Functional recovery NOT 100% at a year (either group), 46% did not RTP by 12mos
- Fxnl testing (hopping, CMJ) worse at 12mos in non-op group vs op
Non-Operative treatment of Achilles Ruptures with Early ROM and Early WB appears to be as safe and effective as Operative treatment.
Non-operative Treatment...???

- Barfod, *JBJS (Am)*, 2014  [Denmark]
- RCT, Level 1, 1 yr f/u
- Non Op, WBAT (day #1) vs NWB (6 weeks)
- Early ROM* both groups at 2 weeks
  - *PF to neutral, 5x/day
- No difference in outcomes
- **9% re-rupture** (3/26 WB, 2/25 NWB)!!!
- **40-50% strength deficit c/l limb at 1 year**
- Only 16% had returned to pre-injury level of play at 1 year
- Better early Quality of Life in the early WB group
Non-Op, Early WB, Cast

• Young, *JBJS (Am)*, 2014  [New Zealand]
• Level 1 RCT, 2 year f/u
• 2 groups both Non-Op, equinus cast for 8 wks
  – NWB x 8 wks
  – Early WB (Immediate?)
• Re-rupture 3% early WB, 5% NWB, NO DIFF
• Maybe early range of motion DOESN’T matter!
• *Patients excluded (and operated upon) if presented >72hrs after injury*
• Evidence is not clear if it is the early WB or the early ROM that gives modern day non-operative treatment good results

• Regardless, Non-operative treatment (with early ROM and/or early WB) appears to be a very good option
Post-op Protocol

- Brumann, Injury, 2014
- Systematic review of RCT, post-op protocols

- “Immediate FWB leads to higher pt satisfaction, early RTW and RTP”
- “All functional parameters favor FWB, but not to statistical significance”
- “No increased re-rupture in early WB group”

- “Early ROM (at 2 weeks) superior to [cast] immobilization with earlier RTP and RTW and does not lead to higher re-rupture rate”
Achilles Rupture Non-Operative Protocol

<table>
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<th>Post Op Time</th>
<th>Exercise Progression</th>
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| Day 0-14     | Equinus short leg cast, Non-weight bearing  
Initiate straight-leg raises, quads sets, knee ROM exercise |
| Day 14       | Short leg cast removed  
20° elevated CAM walker placed  
Boot to be worn while sleeping  
Protected WB with crutches  
Pl. to remove CAM for 5 minutes q hour, to perform Active dorsiflexion (to neutral only for 1st 6 weeks), passive plantar flexion from seated position.  
Continue SLRs, quads sets |
| Week 4-6     | Weight-bearing as tolerated (WBAT)  
Maintain heel lift  
Continue AROM DF (to neutral), PROM PF exercises  
Continue SLRs, quads sets |
| Week 6       | D/C heel lift  
No CAM walker at night  
Continue exercises with therapist  
Add gentle dorsiflexion stretches, no range restriction now  
Gentle resistance exercises  
Proprioception and gait training |
| Week 8-12    | Wean from CAM walker (cane prn)  
Over course of 4 weeks add bicycling, walking, elliptical  
Add sports specific re-training at 12 weeks |
| Week 16      | Return to sporting activities at 4-6 months |
# Achilles Tendon Repair Guidelines

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| **Days 1-12** | - First 1.5 weeks NWB, splint  
- Suture removal at 10-14 days, change splint to Cam Walker boot with 10 degree heel lift  
- Initiate QS/SLR’s, Abd/Add, knee AROM |
| **Week 2-4**  | - Initiate early, gentle AROM ankle dorsiflexion, gravity plantar flexion (boot removed, 3x/day)  
- PWB, crutches, CAM Walker with heel lift |
| **Week 4-6**  | - Begin WBAT after 4 wks, Cam Walker with 10 degree heel lift  
- Remove Cam Walker daily for AROM exercises  
- **NO RESISTENCE EXERCISES** |
| **Week 6-7**  | - Remove heel lift  
- May begin to wean from Cam Walker at about 7 weeks  
- Begin PT for gentle ROM, scar massage, modalities, edema control. GO SLOWLY. |
| **Week 8**    | - Progress PT to gentle A/A/PROM, theraband, proprioceptive exercises, knee and foot AROM, home exercise program |
| **Week 16**   | - If full strength, begin jogging |
| **5-6 Months**| - Begin agilities |
| **6-8 Months**| - Return to sports |
Anecdotal Evidence (Level ∞)

- Med School Roommate #1 (Ortho MD, USC)
  - “Athletes need restoration of the tension, so I fix them all!”
  - In L.A. it’s harder to talk people out of surgery....

- Med School Roommate #2 (Ortho MD, Flagstaff)
  - Recreational outdoor athlete, tore his Achilles 1 yr ago
  - Treated it non-op, early WB, early ROM
  - “no pain, no problems, I have jogged, but not yet sprinted or jumped.....”
  - “recommend Non op for recreational athletes. Pros??”
Summary Based on EBM Review

- Achilles ruptures may be treated non-operatively.
- Operative treatment an option, but wound infection risk.
- Re-rupture risk is diminished with early ROM and early WB in non-operative patients.
- Operative and Non-operative treatment should include early WB and early ROM.
- Early ROM and early WB are safe.
- Regardless of treatment, a large # of athletes never return to prior level of play....
Clinical Question

• What is the optimal treatment for a recreational athlete with an acute Achilles rupture?

Non-operative treatment* with early protected weightbearing and early ROM

*If operative treatment chosen, early WB and early ROM should be utilized
Achilles References

Early Weight Bearing after Achilles Rupture

- Costa, *JBJS* (Br), 2006
- Level 1; 1 yr f/u
- 2 studies:
  - Op(46 pts), with immediate WB, boot vs Delayed WB (8wks), cast
  - Non-Op(40 pts), with immediate WB, boot vs Delayed WB (12 wks), cast
- No Early ROM
- Op group: 2 re-ruptures in early WB group, 1 in delayed WB
- Non op group: 1 re-rupture in each group
- No difference in strength or stiffness b/t groups

“EARLY WB IS SAFE FOR BOTH OPERATIVE AND NON OPERATIVE TREATMENT”
Surgery and Functional Outcome?

- Keating, *JBJS (Br)*, 2011
- PRCT, 1 year f/u
- Primary Outcome: FUNCTIONAL OUTCOME
- Op: 6 wks, NWB, cast
  - 5.4% re-rupture rate
  - 8.1% infx rate
- Non-Op: 10wks, NWB, cast
  - 10% re-rupture rate
- Plantar flexion peak torque ~25% less than c/l limb in both groups at 1 year; no difference SMFA scores Op vs Non-Op
- Conclusions: Unable to recommend surgery for functional recovery