Options in the Treatment of Achilles Tendon Ruptures

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Disclosures

I have no industry or financial relationships to disclose.

Learning Objectives

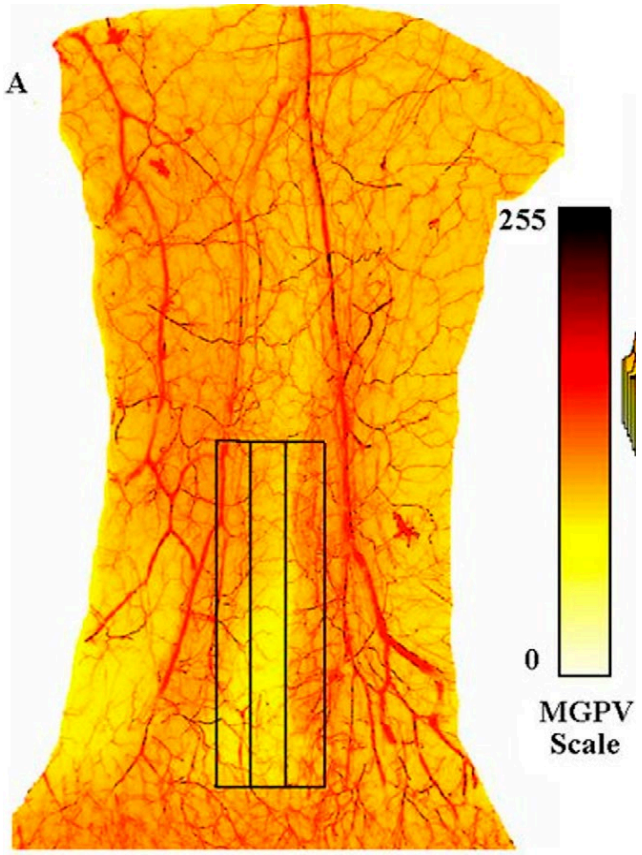
- Review anatomy, physiology and function
- Discuss etiology
- Review clinical findings
- Outline treatment and management options
- Discuss complications

Achilles Tendon

- The largest tendon in the body
- Formed by the tendinous portion of the gastrocnemius and soleus muscles
- Achilles tendon progresses from round to flat as it travels distally to insert on calcaneal tuberosity
- Fibers of tendon rotate 90° distally with medial fibers terminating posteriorly
- Plantaris lies medial and is distinct tendon
    - Absent in 7.3% of people

Blood Supply

- Peroneal artery – middle section
- Posterial tibial artery – proximal and distal sections
- Midsection is markedly hypovascular
  - *Chen et al. (Clin Anat 2009)*
- Cadaveric vascular mapping
  - Limited blood supply in the middle third
  - *Yepes et al. (JBJB 2010)*



Biomechanics

- Peak force of 2233 Newtons within achilles (in vivo)
  - Strongest tendon in the body
- Force builds just before heel strike, then released
- Force builds again and peaks at the end of toe off

Fukashiro et al. (Euro J Appl Phys. 1995)

Epidemiology

- Incidence 18 per 100,000
- Most ruptures occur during athletic activity
  - US – Basketball (48%), tennis, football, pickleball
  - Europe/Canada – Soccer and volleyball activities
- More common in males in third and fourth decade of life
  - 12:1 ratio male to female
  - Mean age 39.8 years old
- **<u>“Weekend Warriors”</u>**

Who is at risk of a rupture?

- 18 year-old football player
- 40 year-old with a desk job and an intramural basketball team

- 65 year-old pickleball champion
- And everyone in between

Medication adverse effects

- Corticosteroid injections into/around achilles tendon
- Fluoroquinolone antibiotics

How do we care for these patients?

First step is always to make the right diagnosis!

Up to 25% of ruptures are missed.

Clinical Presentation

- Report a sensation of being “struck in back of leg”

- “Felt a pop”

- Weakness and difficulty walking

- Edema and bruising

Examination

Always examine patient in prone position on an exam table

Exam Findings

- Palpable gap within the rupture site
- Positive Matles test (increased resting dorsiflexion)
- Positive Thompson test

Exam Findings

Exam Findings

- Combination of these 3 exam findings is 100% sensitive for making the diagnosis
  1. Palpable gap in tendon
  2. Positive Thompson test
  3. Positive Matles test

- Must also consider the location of the rupture within the tendon (proximal vs mid substance vs distal)

Imaging

- Radiographs – never a bad idea to make sure there is not an avulsion fracture.
- MRI – only if the diagnosis is not definitive based on exam.
- US – may be helpful in identifying incomplete ruptures.

Now what?

- We’ve made the diagnosis, but how should we treat it?
- Operative vs. Non-operative management

Operative vs Non-operative Management

- Many factors that play a role in making this decision
  - Age
  - Comorbidities
  - Expectations
  - Compliance
  - Location of rupture
  - Time since rupture
  - Size of rupture gap

Do we need to be fixing all of these?

- Can non-operative treatment work?
- Who is a good candidate for this?

Non-operative Management

- Splinting/Casting/Boot in equinas position followed by early functional rehabilitation protocol

- Indications:
  - Well approximated tendon ends
  - Acute injuries (mus start functional rehab protocol early)
  - Proximal (myotendinous) ruptures
  - Sedentary patients
  - Medically frail patients

Non-operative Management

- Outcomes
  - Equivalent plantar flexion strength
  - Equivalent rates of re-rupture
  - No surgical complications
  - Long road to recovery (6-12 months)

So what about casting?

- Balb-C mice with ruptured achilles treated either with mobilization or immobilization
- More rapid restoration of load to failure in mobilized group
- 112 days mobilized group regained original tendon stiffness
- Mobilization leads to increased inflammatory cells at rupture site

Palmes et al. (J of Orthop Research. 2002)

- **So casting for long periods of time is not necessary**

Traditional Non-operative treatment

- Immobilization
  - 2-3 months of plantarflexed casting
  - No risk of wound issues!!
  - Miserable experience
  - Stiff and weak

Modern Non-operative treatment

- Functional Rehabilitation Program
  - Get the tendon ends close
  - Allow early motion
  - Requires lots of therapy and compliance
  - Fewer complications

Our practice guidelines…

- Non-operative Functional Rehab Protocol
  - Weeks 0-2 – NWB cast in plantarflexion
  - Weeks 2-4 – NWB boot with 3 layer heel lift
  - Weeks 4-6 – WBAT, remove one layer per week
  - Weeks 6-8 – WBAT in flat boot
  - Weeks 8-10 – wean from boot
  - 3 months – jog
  - 4 months – jump/plyometrics
  - 6 months – unrestricted activity

****Trust the Therapists****

Surgical Management

- Indications
  - Mid-substance and distal avulsions
  - Acute ruptures (less than 4-6 weeks, prefer less than 2 weeks)
  - Gapped ruptures
  - Patient/surgeon preference

Surgical Management

- Outcomes
  - Equivalent plantar flexion strength
  - Equivalent rates of re-rupture
  - Early weight bearing
  - Surgical complications (wound dehiscence, nerve injury)

What have we learned:
Big incisions are bad!

Open vs Minimally invasive techniques

- Clanton et al AJSM 2015
- Cadeveric biomechanical study looking at open vs. 3 different minimally invasive (MIS) techniques
  - Open had less tendon elongation, with most elongation occurring in the first 10 cycles
  - No difference in cycles to failure
  - Most failures occurred at the tendon-suture interface

MIS can be just as strong!

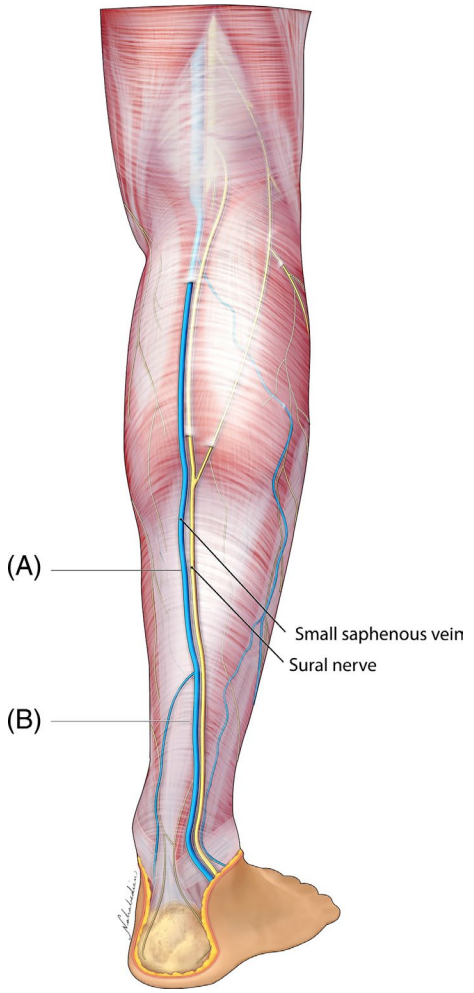
Open vs Minimally invasive techniques

- Hsu et al, FAI 2015
- Open (189 patients) vs. PARs (101)
  - No difference in infections rate
  - Sural neuritis – 0 PARS, 3% open

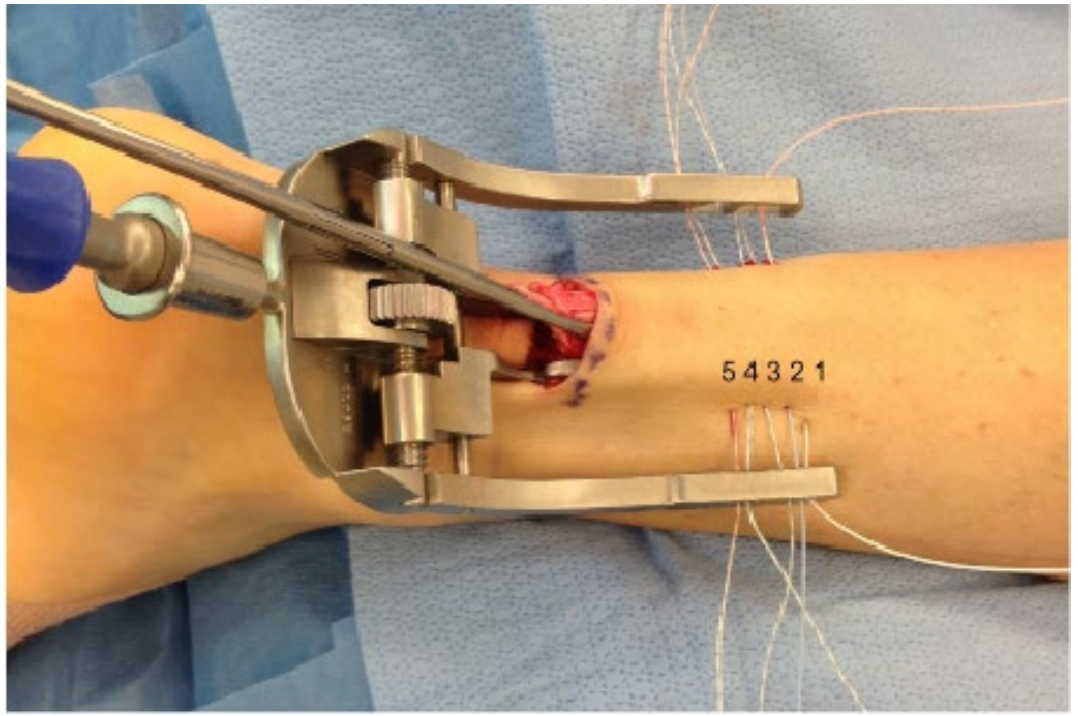
MIS can minimize some of the surgical complications!

Percutaneous Achilles Repair

- Developed by Ma and Griffith 1977
  - Many variations since then
- Small punctures to pass sutures
- Faster return to normal strength than cast
- Risk of sural nerve entrapment ----------→
- Higher re-rupture rate vs. open repair?



PARs device



Our practice guidelines…

- Post-operative protocol
  - Weeks 0-2 – NWB splint in plantarflexion
  - Weeks 2-6 – WBAT boot with 2-layer heel lift, remove one layer per week at weeks 4 and 5.
  - Weeks 6-8 – wean from boot
  - 3 months – jog
  - 4 months – jump/plyometrics
  - 6 months – unrestricted activity

****Trust the Therapists****

To Fix or Not to Fix?

Summary:

- Early motion is good
- Avoid casting for long periods of time
- Functional rehab program can achieve similar results to surgery, but longer process
- Re-rupture rates are not significant if a functional rehabilitation program is used
- Must have a small tendon gap and initiate treatment early for non-op protocol to work well
- Surgery does have a 10-15% overall complication rate

To Fix or Not to Fix?

- Many factors to consider
- It’s not always an easy decision

Those that should avoid surgery….

- Prone to complications
  - Diabetics, smokers, vasculopathy, immunocompromised
- Only desire non-impact activity
  - Walking, biking, elliptical
- Older….but how old?

Those who can choose….

- Recreational athletes
  - Enjoy running and impact sports
    - But not their livelihood
  - Will not be the same as “normal”

- Age Cutoff?
  - Everyone is different, so there is no clear cutoff
    - <45, higher satisfaction with surgery
    - >65, think twice about whether it is necessary

Our practice guidelines…

- The typical patient's preconceived opinion is that all of these need to be fixed.
- Educating them to the contrary can take lots of time and discussion, so quite a bit of the time in clinic is spent on that.
- We try to give them all of the information and let them help make the decision on what is best for them.

Our practice guidelines…

- Non-operative treatment for…
  - Over 65 (ish)
  - Significant comorbities
  - Proximal third ruptures
  - Early presentation with small tendon gap

- Surgery for…
  - Young and active
  - Delayed presentation
  - Non-compliant

Questions?