Plantar Fasciitis: Refining A Well-Oiled System

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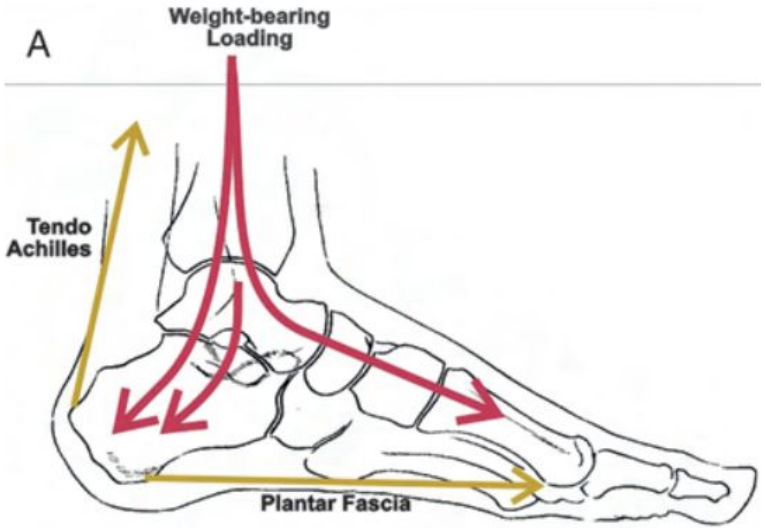
This Lecture

- The algorithm of working up plantar fasciitis
- The importance of obtaining a good HPI
- Physical exam highlights
- Treatment progression for plantar fasciitis
- Research-supported findings of treatment
- Areas for practitioners to tweak/improve
- Treatment takeaways

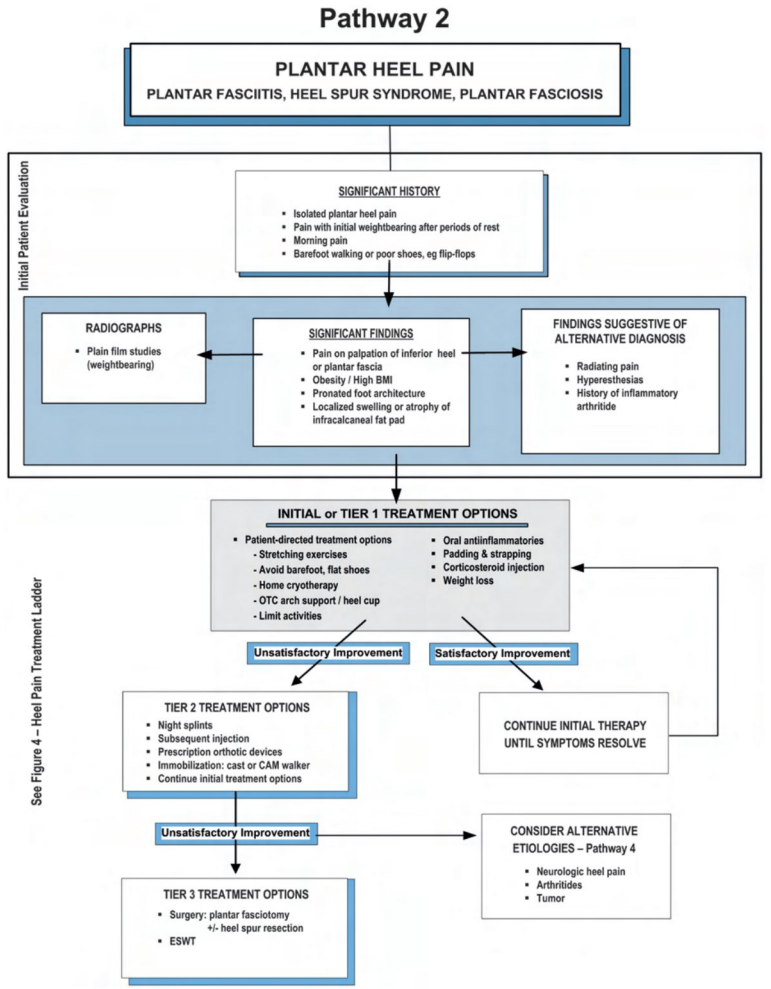
Etiology[1, 2]

- ‘Overuse injury’
- Most common cause is biomechanical stress of the plantar fascia and its enthesis at the calcaneal tuberosity
- Mechanical overload, can result from numerous causes including:
  - Biomechanical faults
  - Obesity
  - Work habits
  - Change in activity too quickly
- Biomechanical etiology usually involves the windlass mechanism and tension of the plantar fascia in stance and gait



Our Algorithm for Plantar Heel Pain[1]

- The Diagnosis And Treatment of Heel Pain: A Clinical Practice Guideline Revision (2010)
  - Journal of Foot and Ankle Surgery



What's The Cause? Getting a Good HPI[1, 2]

- **Duration of Symptoms**
  - Acute = 4-6 weeks
  - Subacute = 6-12 weeks
  - Chronic = > 3 months
- **Any recent injury?**
  - 'Compensation Pain'
  - 'Up-the-chain' influences
- **Any changes in activity?**
  - Changes in terrain (ex: walking on the beach on vacation)
  - Started new workout routine, etc.
- **Any increased activity?**
  - Walking 20k steps/day at Disneyland
  - New job (change in routine)
- **Any changes in shoegear?**
  - Walking in high heels in Vegas
  - What do you wear at work? At home?
- **Lifestyle?**
  - Job?
  - Children?
  - How active are they? → walk the dog, commute to work, like to garden, etc.

Plantar fasciitis is diagnosed, in most cases, by history and physical examination findings alone.[2]

Hallmark Signs

- 'First-step pain' → post-static dyskinesia
  - First thing in the morning
  - After getting up after periods of rest
- Pain improves after 'warming up', gradually progresses throughout the day
- Pain to the bottom or inside of the heel, may or may not extend into the arch
- Generally described as 'sharp' initially, 'aching' throughout the day

Pro Tip: Be sure to get a baseline pain score to track progress! (This includes each foot separately, if bilateral)

Physical Exam[1, 3]

- Dermatology
  - Edema, ecchymosis, erythema
  - Palpable masses
- Musculoskeletal
  - Assess ankle joint ROM
  - Achilles tendon
  - Calcaneal Heel Squeeze
    - Strong positive indicator for possible stress fracture
- Neurologic
  - Radiating pain
  - (+) Tinel's Sign

Radiographs[1, 2]

- Gathers more information, paints a bigger picture
  - Weightbearing foot structure
  - Bone irregularities
    - Tumor
    - Enthesophytes
    - Trabecular/cortical abnormalities
  - Plantar heel spur

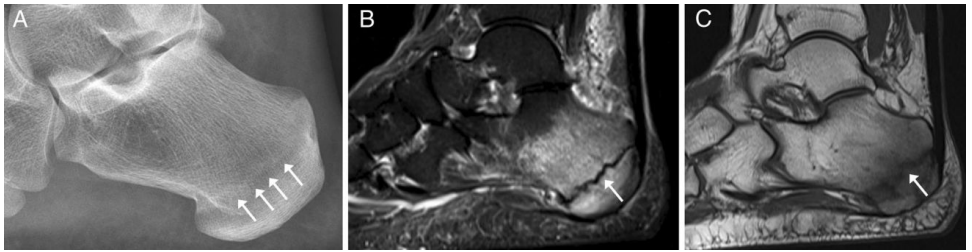
Radiographs are not required in non-traumatic presentation of PF and rarely alter the treatment plan.[2]

presence of an infracalcaneal heel spur

presence of a fractured infracalcaneal heel spur

Calcaneal Stress Fracture: A Must Rule-Out[2, 3, 4]

- Calcaneal stress fractures make up 21-28% of foot/ankle stress fractures
- Considered a Low-Risk stress fracture
  - Low-risk stress fractures tend to heal well with activity modification with continued weight-bearing (vs. high-risk stress fractures may require more aggressive treatment such as restricted weight-bearing or surgery)
- **Radiographic Findings**
  - Sclerotic bands perpendicular to trabecular pattern → can be very subtle
  - Periosteal disruption
  - More rare to see periosteal reaction (usually confined to cancellous bone)



A calcaneal stress fracture via (A) radiographs, (B) MRI: sagittal STIR, (C) MRI: sagittal T1

(+) Calcaneal squeeze Test + Suspicious radiographs = order MRI

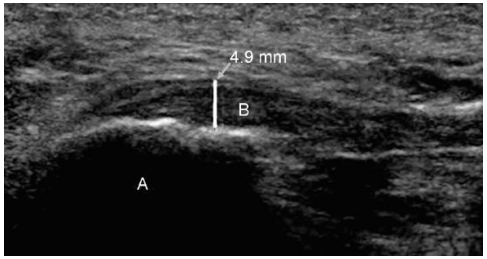
Radiographs: Plantar Calcaneal Heel Spurs (PCS)[1, 2, 5]

- The relationship between the PCS and the PF is *HIGHLY* variable
  - Many people who have a PCS are asymptomatic
- Higher proportions in:
  - The elderly
  - The overweight
  - Those with heel pain (including plantar fasciitis)
  - Arthritides
  - Abnormal foot biomechanics
- Initially thought that PCS were the result of traction from the PF/intrinsic musculature → majority are found deep to the PF, surrounded by fibrocartilage; extensive anatomic variability
- There is a correlation between heel pain and PCS, and although PCS do occur in asymptomatic people, they occur at higher rates in those who are symptomatic
- Current research regarding PCS predicts it is going to become a worsening problem in the future, with an aging population, a corresponding increase in degenerative bone conditions, and a global rise in obesity.

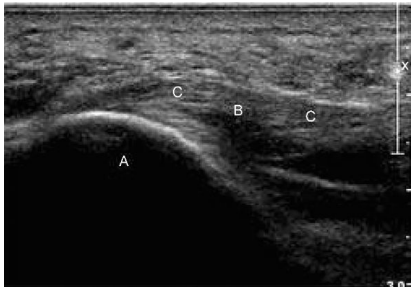
The presence of a infracalcaneal heel spur on radiographs will rarely alter treatment plan.[2]

Ultrasound Evaluation[6, 7]

- Wall et al. concluded that the population mean PF thickness is greater for people with plantar fasciitis than for people without heel pain and that the difference is clinically significant. Plantar fasciitis can be detected noninvasively by ultrasonography.
- Plantar fasciitis diagnosed sonographically as > 4-5mm thickening of the proximal medial band (level of the medial calcaneal tubercle) of the plantar fascia.
    - **Plantar fascial tears** seen as discreetly marginated hypoechoic/anechoic defect in the contour of the plantar fascia causing distortion of the fascia.
    - **Plantar fibroma** identified as a discrete hypoechoic nodule

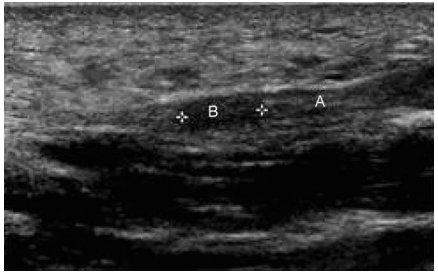


Ultrasound image of the (A) calcaneus and (B) thickened plantar fascia



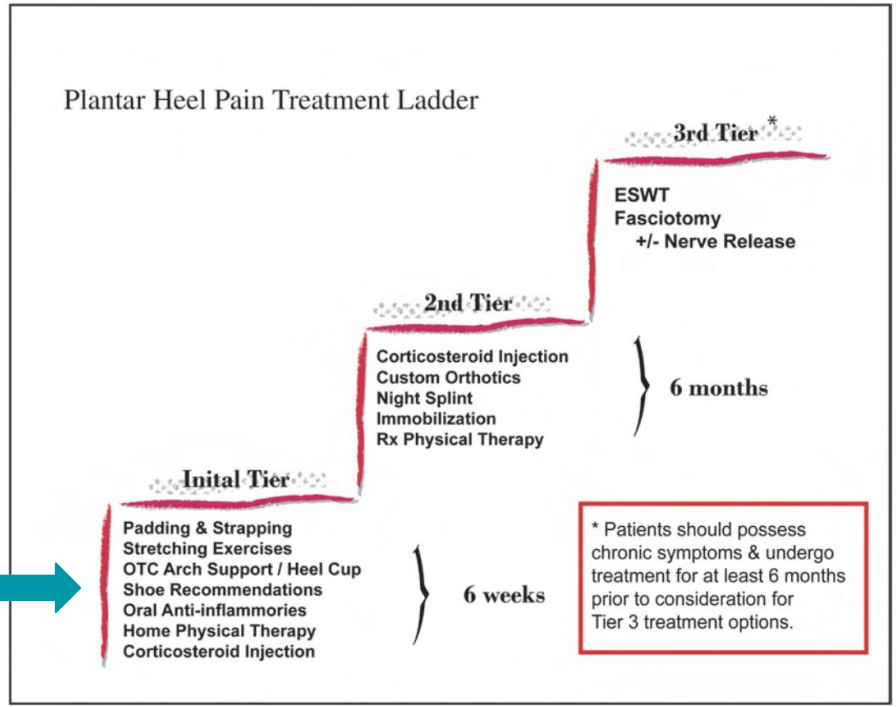
Ultrasound image with a small deep partial-thickness tear. (A) calcaneus; (B) partial-thickness tear in the plantar fascia; (C) surrounding normal plantar fascia

Longitudinal view of a plantar fibroma, appearing as an irregular hypoechoic mass in the plantar fascia. (A) normal plantar fascia; (B) fibroma in the plantar fascia.



Our Treatment Progression[1]

Once you a *confident* in your diagnosis as plantar fasciitis…



Tier 1: Stretching Exercises[1, 2, 8, 9]

- Aka ‘active’ stretching
- Numerous studies have supported the benefit of a stretching program for patients in relieving plantar fascia pain
- Digiovanni et al. found a program of non-weightbearing stretching exercises specific to the plantar fascia is superior to the standard program of weight-bearing Achilles tendon-stretching exercises for the treatment of symptoms of proximal plantar fasciitis.
    - Supported 94% reduction in symptoms over 2 years with maintenance
- *I give both!*

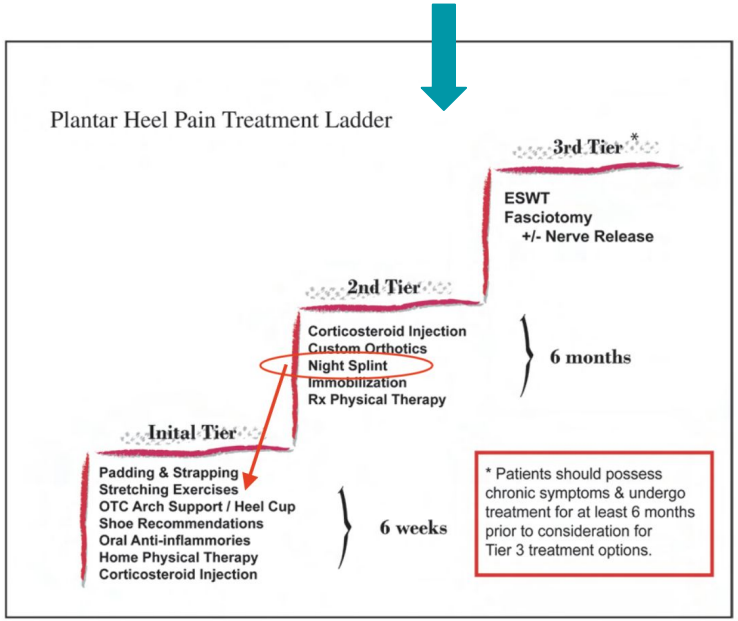
Plantar fascia-stretching exercise. While placing the fingers across the base of the toes, the patient pulled the toes back toward the shin until they felt a stretch in the arch or plantar fascia.

Tier 1: Night Splint[1, 2, 10]

- Aka ‘passive’ stretching
- Barry, et al found adjunctive night splint treatment resulted in
  - Significantly shorter recovery time
  - Fewer additional treatment interventions
  - Fewer follow-up visits

  when compared to adjunctive standing stretching of the gastrocnemius-soleus complex

I find this guideline goes hand-in-hand with stretching exercises and frequently move this to a Tier 1 treatment



Tier 1: Night Splint (cont.)[1, 2, 10]

Room for Improvement

What We Recommend:

- Dispense 1 or 2
- Wear all night for weeks on end until symptoms improve

What Often Ends Up Happening:

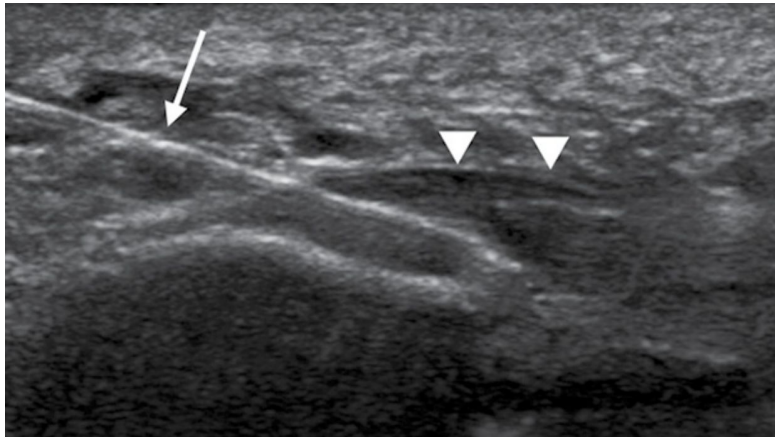
- Interrupts sleep
- Patients hate it
- Stop using it because it 'doesn't work'

How To Improve:

- I dispense 1 at a time
- Have patients alternate side to side
- Recommend they incorporate into their day
  - Wear it while they are working at their desk, watching TV, relaxing, etc.
- If they can wear it at night for a few hours, even better
- *I would rather have them wear a few hours/day then never at all*

Tier 1: Corticosteroid Injection[1, 2, 11]

- David et al's Cochrane review concluded that local steroid injections compared with placebo or no treatment might slightly reduce heel pain for ≤1 month, but not much more than that.
    - Injectable steroids frequently used for acute relief of symptoms, recognizing that these are not disease modifying and have little lasting effect beyond the first 4 weeks.
    - Stress the importance that corticosteroid injections are not a monotherapy for plantar fasciitis



Room for Improvement →

Why aren't we ALL using ultrasound for injection?

Tier 1: Corticosteroid Injection[1, 2, 11]

Room for Improvement

Set the Standard…

- Effects of corticosteroid injections are variable from person-to-person and part of the body. The degree of relief can be dependent on the amount of inflammation present. Some individuals require more than one injection to get adequate pain relief.
    - Helps meet expectations for patients who previously have had PF steroid injections or injections to other joints of the body
- Steroid injections can help provide immediate pain relief, but we also must work on the underlying cause for the pain, as continued steroid injections are not safe as a sole form of treatment

Tier 1: Short Course Oral Steroids[1, 12]

Medrol Dose Pak (Methylprednisolone)

- Short oral course, tapered dosage
- Traditionally 4mg pills, 6 days (24mg, 20mg, 16mg, 12mg, 8mg, 4mg)

Indications

- Bilateral pathology
- Fear of needles
- Concurrent tendonitis

Contraindications/Considerations

- Diabetics
- Anxiety disorders
- Fungal infections
- Osteoporosis

Food for Thought…

- Waljee et al. evaluated over 500k insurance claims showing 21% of individuals aged 18-64 received at least 1 short course of oral steroids (< 30 days) over the course of 3 years. They found that these prescriptions were associated with statistically significantly higher rates of sepsis, venous thromboembolism, and fracture within a 90 day period, despite being used for a relatively brief duration.
  - Most common prescription written for oral corticosteroids was the 6-day methylprednisolone “dosepak,” which accounted for 46.9% of participants

Tier 1: Shoe Assessment with Recommendations[1, 13, 14]

- *Evaluate your patient's shoes!*
- HPI: 'I have no idea what happened, everything has been the same'
  - Frequently the cause of unknown origin → significantly worn out shoes
- Generally speaking, change shoes out every 300-500 miles

- Particularly in jobs that require a lot of walking/standing → need to change out their shoes regularly!
  - Nursing: 4-5mi/12hr shift
  - 12-15mi/week
  - 48-60mi/month
  - 6mo (288-360mi) - 9mo (432-540mi)
- *I recommend 6mo - 1yr* → more financially reasonable for many patients
- 'I have no idea how many steps I take'
  - Every person with a smartphone/watch has an app that tracks it, can use this as a guide

Tier 1: Shoe Assessment with Recommendations[1, 13, 14]

When Should I Change Out My Shoes?

- Within 6mo - 1 year of use (whether the shoe is worn out or not)
- Any signs of unevenness in the midsole when placed on a flat surface
- Noticeable creasing in the midsole
- If the heel counter appears flexible when compressed from side to side
- Loss of plantar tread
- If the heel counter appears deviated to one side when viewing from the rear of the shoe
- HOLES

My own patient, wondering why she had Right foot plantar fasciitis pain

Creasing along the midsole

Tier 1: Shoe Assessment

https://www.youtube.com/shorts/5OvxZmhhDiE

Shoe materials breakdown with time and are influenced by the environment (humidity, heat, moisture, etc.), whether or not they are worn.

Tier 1: Shoe Assessment with Recommendations (cont.)[1, 13, 14]

- *Anybody else see an increase in PF during the pandemic?*

- Avoid going barefoot at home
  - Extra impact on already sensitive heel, reduce walking on tile, hardwood, or concrete
  - Lack of support to the foot
- Need to support the medial longitudinal arch to reduce stress on the plantar fascia
- Shoe recommendations should also extend to what is being worn at home

'I wear slippers at home'

Tier 1: Shoe Assessment with Recommendations (cont.)

Room for Improvement

- ***Be a realist!***
  - Comfortable, accommodating shoes should be worn for the majority of your activity
  - Wearing less accommodating shoes once in awhile or for a special occasion should not debilitate you for weeks on end
- Have a list of brands available for your patients
  - Need help getting started? **APMA Seal of Acceptance and Seal of Approval** → granted to products found to promote good foot health
  - Less is often more

***A Personal Quote**: Shoes are like tires. They are not meant to last forever and need to be replaced regularly to do their job effectively.*

Tier 1: OTC Inserts or Heel Cups[1, 15]

- Landorf et al. found that prefabricated orthoses and customized orthoses produced short-term benefits including improvements in function and reduction in pain compared with sham orthoses that were comparable to one another
- Heel cups can also be dispensed for immediate pain relief to provide extra cushion for shock-absorption

Room for Improvement 

Depending on patient's financial position, I frequently recommend a 'trial' with supportive OTC orthoses.

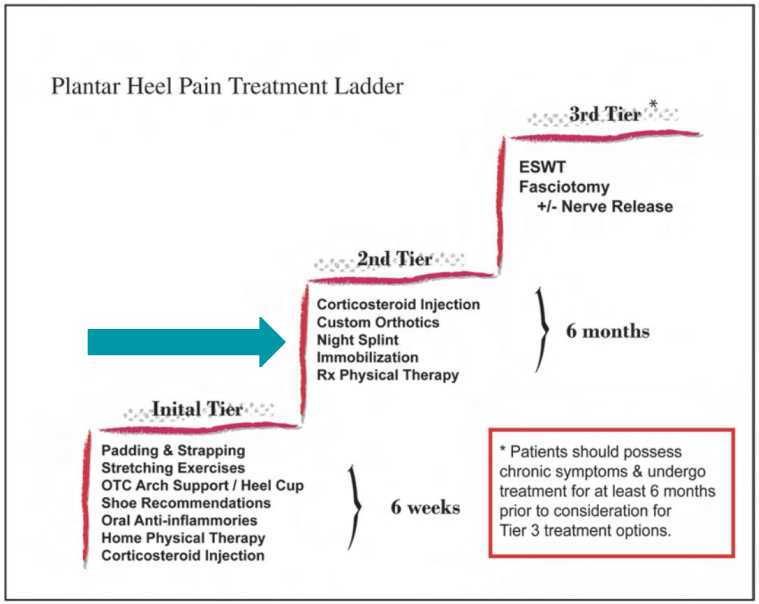
Moving On to Tier 2[1]

- Follow-up visits
- Pain evaluation
  - I often ask % of improvement from previous visit as VAS score can be extremely variable
- Functional evaluation
  - Does pain occur less frequently? for shorter periods of time? resolve more quickly?

Room for Improvement →

Repeat ultrasound imaging of the plantar fascia at subsequent follow-up visits to track progress

Set Realistic Expectations → *As a rule, the longer the duration of heel pain symptoms, the longer will be the period to final resolution of the condition.*[2]



Tier 2: Custom Orthotics[1, 2, 15, 16]

- When comparing soft vs. hard orthoses for plantar fasciitis, Seligman et al. found that there was a reduction in pain intensity and interference with soft orthoses, but no change in function over time between the two types. They also found that soft orthotics were generally less expensive and required fewer visits for fabrication.

- **Are hard orthoses contradictory?**
  - Tell patients not to walk at home barefoot, but put something very rigid in their shoes…

A cork-and-leather custom orthotic

Tier 2: Custom Orthotics

Room for Improvement

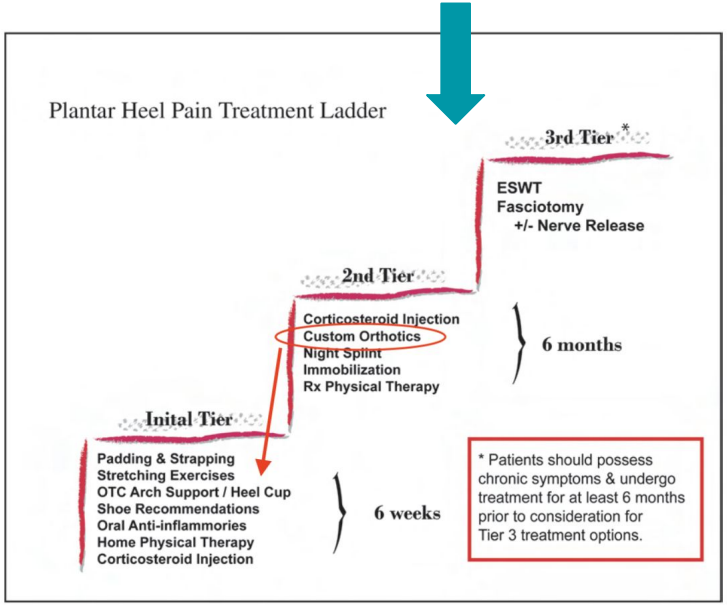
- For patients without significant deformity or BMI, I prefer a less rigid orthotic for heel pain
  - Patients adapt more easily, require less adjustments, particularly when heel is sensitive
  - Particularly for athletes!
- No, they do not last as long (communication!)
- What matters the most is *if patient actually wears them*

***Exception**: If a patient has past/current orthotics that are hard, I try not to mess what worked well for them.*

Tier 2: Custom Orthotics[1, 2]

- Foot taping/padding has been shown by numerous studies to be beneficial in the acute phase of plantar fasciitis to help support the medial longitudinal arch.
  - Practicality is another story…
- Often do a removable taping/padding as a ‘trial’ to see if custom orthotics are beneficial

I find this guideline is transient between Tiers 1 and 2 depending on the patient situation



Tier 2: Physical Therapy[1, 2, 17]

- Consensus that stretching is extremely effective for treatment of plantar fasciitis. The type/extent of stretching protocol varies according to the severity of the equinus and patient factors.

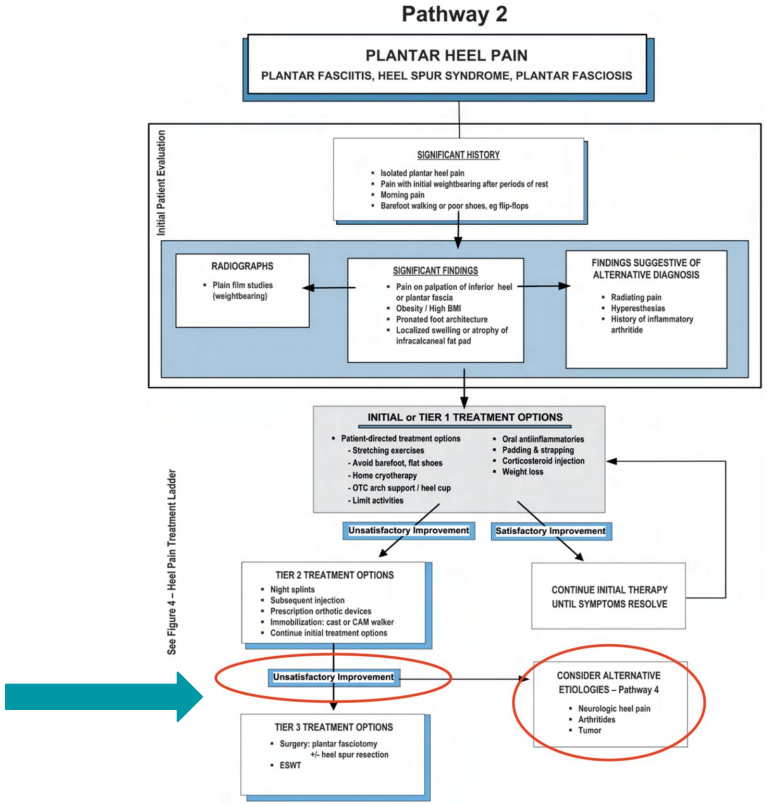
Indications

- Significant equinus not resolved by stretching and night splint therapy alone
- Patient compliance
- Physical abilities/limitations of the patient
- Gait training (esp. in conjunction with ‘up-the-chain’ influences)

- Ajimsha et al. evaluated myofascial release vs. sham ultrasound therapy over the course of 12 weeks, showing the myofascial release group performed better than the control group in weeks 4 and 12.
  - Myofascial release reduces the pain and functional disability associated with plantar heel pain in comparison with a control group receiving sham ultrasound therapy.

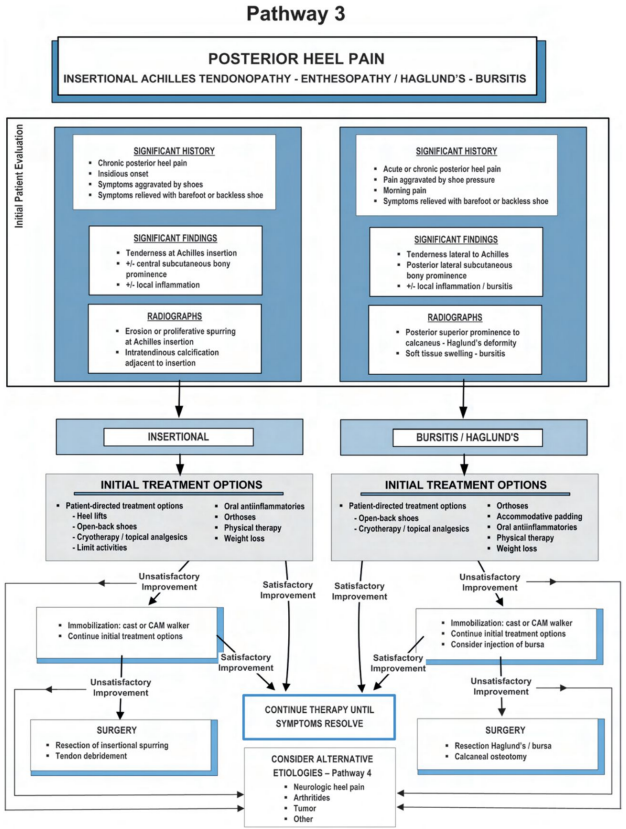
After Everything, It's Still Not Getting Better…

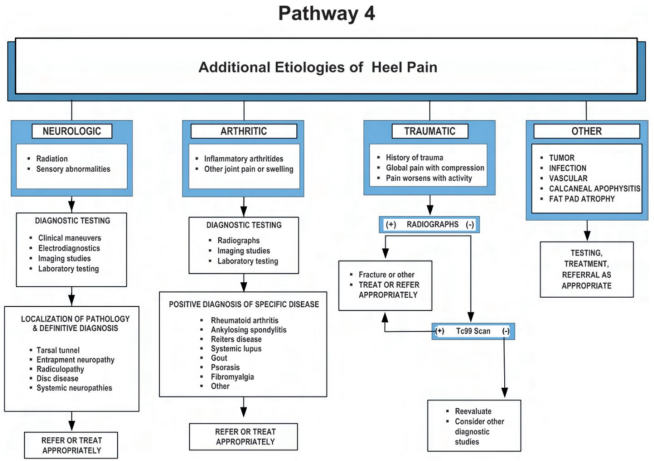
- After following protocol from Treatment Tiers 1 and 2, there is…
  - Lack of improvement
  - Constant recurrence
- **MRI for further evaluation**
  - Can confirm your diagnosis
  - Find sources that you are unable to identify in your office (hidden PF tear, stress fracture of the calcaneus, masses within the plantar fascia, etc.)



After Everything, It's Still Not Getting Better… (cont.)

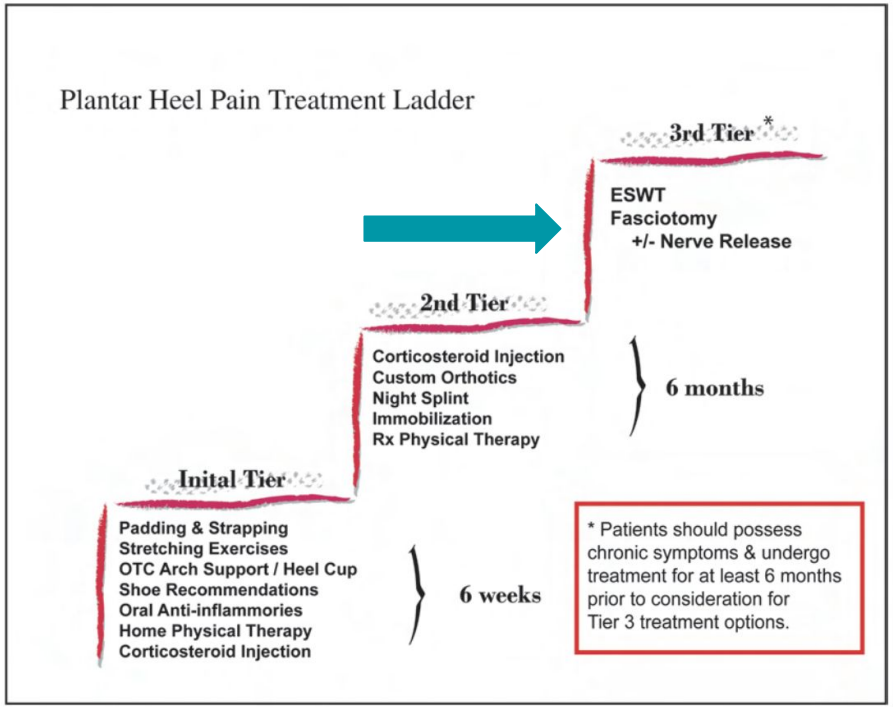
- Revisit your other Heel Pain Pathways
  - Posterior
  - Neurologic
  - Arthritic
  - Traumatic
  - Other





Tier 3: Further Interventions[1, 2]

- 90% of patients get successful resolution of symptoms from treatment Tiers 1 and 2
- Surgical intervention should be reserved for chronic, refractory cases that have failed appropriate conservative treatment for ≥ 6 months



Tier 3: Extracorporeal Shock Wave Therapy[1, 2, 18, 19]

- Rompe et al. found at 2 months after baseline, functional scores showed significantly greater changes for the patients managed with plantar fascia-specific stretching than for those managed with shock-wave therapy
    - A program of plantar fascia-specific manual stretching exercises is superior to repetitive low-energy radial shock-wave therapy for the treatment of acute symptoms
- Bicer et al. evaluated plantar fascia pain and function with corresponding MRI evaluation. They found functional outcome scores and pain showed significant improvements after ESWT. MRI findings of plantar fasciitis before and 3 months after treatment showed statistically significant improvement of MRI findings with ESWT, including decreases in the thickness of plantar fascia, soft-tissue edema, and bone marrow edema.

Less common in the United States due to high cost of treatments and lack of health insurance coverage

Tier 3: Surgical Intervention[1, 2, 20]

Plantar fasciotomy (open or endoscopic) as well as gastrocnemius release (in the presence of equinus) both recognized as safe and effective surgical interventions for recalcitrant plantar fasciitis.[2]

- Gamba et al. compared proximal medial gastrocnemius release (PMGR) vs. open plantar fasciotomy (OPF) for treatment in recalcitrant PF and found no significant differences were found in terms of pain, functional scores, or satisfaction scores, concluding that both options provided good surgical options for RPF.
  - Faster recovery was observed in the PMGR group.
  - Recommend PMGR as the 1st option in surgical management in order to avoid potential biomechanical complications related to OPF

Tier 3: Surgical Intervention[1, 2]

- Other surgical and/or invasive treatment techniques (ex: ultrasonic debridement, bipolar radiofrequency ablation, amniotic tissue, platelet-rich plasma, botulinum toxin, needling, prolotherapy) are not yet recognized in this algorithm due to lack of large, prospective, peer-reviewed research studies with long-term follow-up
    - Numerous smaller, retrospective studies show benefit of these procedures

Takeaways: Multifactorial Treatment Approach

- Despite extensive literature, anatomical influences are surprisingly not cohesively decided upon or completely understood
- A strong HPI and physical exam is the biggest factor to confirm your diagnosis, rule out other pathology, and recognize external factors precipitating the onset of pain
- Treatment of plantar fasciitis is multifaceted and often a cumulative effort of many modalities to treat pain
- Treatment is extremely successful via conservative treatment modalities
- Communication and education with your patients is key
    - Knowledge on shoes is more important than you think…
- ***A patient's worst enemy is themselves***
- Adaptation of your treatment plan for best compliance goes a long way
- More research is needed for additional Tier 3 treatment modalities

Takeaways: Maintenance

Room for Improvement → ***Communication Going Forward***

- Can the plantar fasciitis come back?
  - *LIKELY*
- Going back to your HPI, the pain likely began due to body structure, activity, job, etc. → many of these features are not easily changed
- Explain to your patients that maintenance is required to keep the pain at bay, via all the modalities previously discussed
  - Shoegear modifications (type, regular replacement, etc.)
  - Stretching (active and passive)
  - Consistent use of accomodative shoes and/or orthotics
  - Gradual ease into activity

If you begin to experience early signs of the pain returning, it is your sign to 'tighten the screws' and get back on your preventative routine.

Thank You!

Questions?

1st birthday

I get my good looks from my Mom

nap queen

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