



FOOT AND ANKLE CASE 3

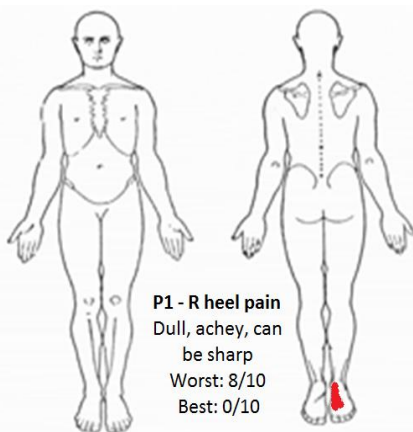
Dhinu Jayaseelan, DPT, OCS, FAAOMPT

Orthopaedic Manual Physical Therapy Series
Charlottesville 2017-2018



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John Doe, 28 y/o male



Initial Hypotheses

- Plantar fasciitis
- Tarsal tunnel syndrome
- Insertional Achilles tendinopathy
- Calcaneal stress fracture
- Post tib tendinopathy
- Ankylosing spondylitis

FAAM

- ADL: 81%, Sports: 59%




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Outcome Measure Psychometrics

	Foot and Ankle Ability Measure (FAAM)	Foot Function Index (FFI)	Foot Health Status Questionnaire (FHSQ)
Items	21 ADL scale 8 sports subscale	23 items, 3 subscales: pain, disability, activity limitation	13 items, 4 subscales: pain, function, footwear, general foot health
Scoring	Higher scores = greater self-reported function	Higher scores = greater disability	Higher scores = greater self-reported function
Reliability	0.89 (ADL) 0.87 (sports)	0.69 – 0.87	0.74 – 0.92
MDC	5.7 (ADL) 12.3 (sports)	n/a	n/a
MCID	8 (ADL) 9 (sports)	n/a	13 (pain) 7 (function) 2 (footwear) (General foot health unresponsive to change)

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Subjective Exam Asterisks

(Aggravating/easing factors, description/location of symptoms, behavior, mechanisms of injury)

28 y/o male, 1.5 yr history of plantar heel pain

MOI After running first ½ marathon; notes no specific training program or history of running


Aggravating activities First steps in am, after prolonged sitting at desk (1 hr), prolonged standing (> 1 hr), running

Alleviating activities Stretching, not doing above

Prior treatment MD prescribed OTC inserts and stretches after initial onset, reported min/mod benefit

PMHx 2 inversion ankle sprains in high school (same side)

Structure(s) at fault

Joints in/refer to painful region	Myofascial tissue in/refer to painful region	Non-contractile tissue in/refer to painful region	Neural tissue in/refer to painful region	Other structures to be examined (non-MSK)
Talocrural Subtalar Distal tib-fib Talonavicular Calcaneocuboid TMT joints Hip, SIJ, L-spine	Achilles tendon Post tib tendon FHL, FDL Trigger point referral	Plantar fascia Fat pad Retrocalcaneal bursa Deltoid, spring ligaments	Tibial n. (medial calcaneal/plantar) L5,S1	Calcaneal fx? Ankylosing spondylitis?
<ul style="list-style-type: none"> • Primary hypothesis after subjective: chronic plantar fasciitis • Differential (rank order): tarsal tunnel, post tib tendinopathy, insertional AT, myofascial pain syndrome, lumbar radic 				
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Physical Exam Asterisks

(Special tests, movement/joint dysfunction, posture, palpation, etc)

28 y/o male, 1.5 yr history of plantar heel pain	
Posture	Pes cavus bilaterally
ROM	Decr DF (worse with knee straight) and pronation
Single leg heel raises	L: 26 reps; R: 15 reps*
Special tests	(+) windlass test, (-) SLR/slump, Tinel's
Stability tests	(-)
Palpation	TTP (+) R medial calcaneal tubercle and proximal ½ plantar fascia (thickness also noted)*
Joint accessory motion	Hypomobile R TCJ AP, STJ medial glide, midfoot throughout, 1 st MTP AP and PA glides



Rate your assessment of severity/irritability

Justify your assessment with examples from the subjective and/or objective exam

- Severity: None Min **Mod** Max
 - Impacts ability to run or WB for durations, not disabling in functional tasks
- Irritability: None **Min** Mod Max
 - Symptoms brought on with prolonged activity reduced fairly rapidly

Stage and stability?

- Acute Subacute **Chronic** Acute on chronic
 - 1.5 yr history, no recent mechanism or indicators of inflammatory processes
- **Stable** Improving Worsening Fluctuating Red flags?
 - Symptoms generally the same, not better or worse, appears mechanical/MSK



- Are the relationships between the areas on the body chart, the interview, and physical exam consistent?
“Do the features fit” a recognizable clinical pattern? If YES, what?

Chronic plantar fasciitis

(plantar fasciosis, plantar fasciopathy)

- Identify any potential risk factors (yellow, red flags, non-MSK involvement, biopsychosocial)

Frustration with lack of improvement?



ROBROY L. MARTIN, PT, PhD • TODD E. DAVENPORT, DPT • STEPHEN F. REISCHL, DPT • THOMAS G. MCPHILL, PT, PhD
 JAMES W. MATHESON, DPT • DANE K. WUKICH, MD • CHRISTINE M. MCDONOUGH, PT, PhD

Heel Pain—Plantar Fasciitis: Revision 2014

Clinical Practice Guidelines Linked to the International Classification of Functioning, Disability and Health From the Orthopaedic Section of the American Physical Therapy Association

J Orthop Sports Phys Ther. 2014;44(11):A1-A23. doi:10.2519/jospt.2014.0303



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Summary of Recommendations*

RISK FACTORS

B Clinicians should assess the presence of limited ankle dorsiflexion range of motion, high body mass index in nonathletic individuals, running and work-related weight-bearing activities—particularly under conditions with poor shock absorption—as risk factors for the development of heel pain/plantar fasciitis.

DIAGNOSIS/CLASSIFICATION

B Physical therapists should diagnose the International Classification of Diseases (ICD) category of plantar fasciitis and the associated International Classification of Functioning, Disability and Health (ICF) impairment-based category of heel pain (b20015) Pain in lower limb, b2004 Radiating pain in a segment or region) using the following history and physical examination findings:

- Plantar medial heel pain most noticeable with initial steps after a period of inactivity but also worse following prolonged weight bearing.
- Heel pain precipitated by a recent increase in weight-bearing activity.
- Pain with palpation of the proximal insertion of the plantar fascia.
- Positive windlass test.
- Negative tarsal tunnel tests.
- Limited active and passive lateral joint dorsiflexion range of motion.
- Abnormal Foot Posture Index score.
- High body mass index in nonathletic individuals.

DIFFERENTIAL DIAGNOSIS

C Clinicians should assess for diagnostic classifications other than heel pain/plantar fasciitis, including spondylarthritis, tarsal tunnel syndrome, and proximal plantar fibroma, when the individual's reported activity limitations or impairments of body function and structure are not consistent with those presented in the Diagnosis/Classification section of this guideline, or when the individual's symptoms are not resolving with interventions aimed at normalization of the individual's impairments of body function.

EXAMINATION – OUTCOME MEASURES

A Clinicians should use the Foot and Ankle Ability Measure (FAAM), Foot Health Status Questionnaire (FHSQ), or the Foot Function Index (FFI) and may use the computer-adaptive version of the Lower Extremity Functional Scale (LEFS) as validated self-report questionnaires before and after interventions intended to alleviate the physical impairments, activity limitations, and participation restrictions associated with heel pain/plantar fasciitis.

EXAMINATION – ACTIVITY LIMITATION AND PARTICIPATION RESTRICTION MEASURES

F Clinicians should utilize easily reproducible performance-based measures of activity limitation and participation restriction measures to assess changes in the patient's level of function associated with heel pain/plantar fasciitis over the episode of care.

EXAMINATION – PHYSICAL IMPAIRMENT MEASURES

B When evaluating a patient with heel pain/plantar fasciitis over an episode of care, assessment of impairment of body function should include measures of pain with initial steps after a period of inactivity and pain with palpation of the proximal insertion of the plantar fascia, and may include measures of active and passive ankle dorsiflexion range of motion and body mass index in nonathletic individuals.

INTERVENTIONS – MANUAL THERAPY

A Clinicians should use manual therapy, consisting of joint and soft tissue mobilizations, procedures to treat relevant lower extremity joint mobility and calf flexibility deficits and to decrease pain and improve function in individuals with heel pain/plantar fasciitis.

INTERVENTIONS – STRETCHING

A Clinicians should use plantar fascia-specific and gastrocnemius/soleus stretching to provide short-term (1 week to 4 months) pain relief for individuals with heel pain/plantar fasciitis. Heel pads may be used to increase the benefits of stretching.

INTERVENTIONS – TAPING

A Clinicians should use antipronation taping for immediate (up to 3 weeks) pain reduction and improved function for individuals with heel pain/plantar fasciitis. Additionally, clinicians may use elastic therapeutic tape applied to the gastrocnemius and plantar fascia for short-term (1 week) pain reduction.

INTERVENTIONS – FOOT ORTHOSES

A Clinicians should use foot orthoses, either prefabricated or custom fabricated, to support the medial longitudinal arch and cushion the heel in individuals with heel pain/plantar fasciitis to reduce pain and improve function for short- (2 weeks) to long-term (1 year) periods, especially in those individuals who respond positively to antipronation taping techniques.

INTERVENTIONS – NIGHT SPLINTS

A Clinicians should prescribe a 1- to 3-month program of night splints for individuals with heel pain/plantar fasciitis who consistently have pain with the first step in the morning.

Summary of Recommendations* (continued)

INTERVENTIONS – PHYSICAL AGENTS

D Electrotherapy, clinicians should use manual therapy, stretching, and foot orthoses instead of electrotherapeutic modalities, to promote intermediate and long-term (4-6 months) improvements in clinical outcomes for individuals with heel pain/plantar fasciitis. Clinicians may or may not use iontophoresis with desmethylazuric or acetic acid to provide short-term (2-4 weeks) pain relief and improved function.

C Low-level laser: clinicians may use low-level laser therapy to reduce pain and activity limitations in individuals with heel pain/plantar fasciitis.

C Phonophoresis: clinicians may use phonophoresis with ketoprofen gel to reduce pain in individuals with heel pain/plantar fasciitis.

C Ultrasound: the use of ultrasound cannot be recommended for individuals with heel pain/plantar fasciitis.

INTERVENTIONS – FOOTWEAR

C To reduce pain in individuals with heel pain/plantar fasciitis, clinicians may prescribe (1) a rocker-bottom shoe construction in conjunction with a foot orthosis, and (2) shoe rotation during the work week for those who stand for long periods.

*In conjunction with a foot orthosis, and (2) shoe rotation during the work week for those who stand for long periods.

INTERVENTIONS – EDUCATION AND COUNSELING FOR WEIGHT LOSS

F Clinicians may provide education and counseling on exercise strategies to gain or maintain optimal lean body mass in individuals with heel pain/plantar fasciitis. Clinicians may also refer individuals to an appropriate health care practitioner to address nutrition issues.

INTERVENTIONS – THERAPEUTIC EXERCISE AND NEUROMUSCULAR RE-EDUCATION

F Clinicians may prescribe strengthening exercises and movement training for muscles that control pronation and attenuate forces during weight-bearing activities.

INTERVENTIONS – DRY NEEDLING

F The use of trigger point dry needling cannot be recommended for individuals with heel pain/plantar fasciitis.

These recommendations and clinical practice guidelines are based on the scientific literature published prior to January 2013.

Recommendations based on evidence published before Jan 2013



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Plantar Fasciitis

- Background/Demographics
 - Most common foot condition treated in health care, up to 2 million Americans / year
 - Affects athletic and non-athletic populations
 - Mean symptom duration: 13.3 – 14.1 months
- Risk Factors:
 - Limited ankle DF ROM (Odds Ratio: 23.3)
 - High BMI in non-athletic patients (OR: 5.6)
 - Work-related WB activities (OR: 3.6)
 - Running
 - Cavus foot, high arch

JBJS 2003 Riddle
JOSPT 2014 CPG



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Plantar Fasciitis

- Subjective Report
 - Pain in plantar aspect of heel
 - Worse with initial steps after prolonged inactivity or prolonged weight bearing
 - Precipitated by recent increase in WB activity
- Objective Examination
 - Tenderness at plantar fascia (medial calcaneal tubercle)
 - (+) Windlass test
 - (-) Tarsal tunnel/neurodynamic tests
 - Decr A/PROM ankle DF; 1st ray extension mobility

JOSPT 2014 CPG



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Additional Considerations

- Patients with chronic PF demonstrate the following: (Fernandez-Lao, et al. 2016)
 - Widespread and bilateral hypersensitivity
 - Lower Q of L
 - Increased thickness of the plantar fascia in the affected foot (+ correlation to symptoms Mahowald S 2011)
 - Increased fascial vascularity (+ correlation to symptoms Chen H 2013)
- Imaging not typically necessary, unless ruling out other conditions

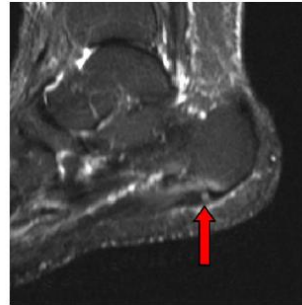


Figure 3 Sagittal STIR sequences showing features of plantar fasciitis. The red arrow shows high signal within the proximal thickened plantar fascia with adjacent soft tissue and bony oedema. Clinical Radiology (2009) 64, 931–939



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Treatment Planning

Impairments	Functional Limitations	Goals
Pain Foot/ankle hypomobility Decr gastroc length Plantarflexion weakness Altered gait	Inability to run Limited standing tolerance	Normalize joint mobility No walking or running gait deviations Pain free return to run

- What is your primary objective after intial eval?
 - Education: anatomy, pathology, prognosis
 - Manual therapy: calf/PF STM, rearfoot mobilizations gr III-IV
 - Exercise prescription: self-stretching, neuro re-ed (load dispersion, facilitate mid/medial foot loading)



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Anatomy / Pathophysiology

- 3 dense bands of connective tissue
- O: medial calcaneal tubercle
- I: fans distally into base of proximal phalanx
- Usually chronic/degenerative process related to repetitive microtrauma
- Histologic analysis: marked thickening/fibrosis of PF, collagen necrosis, chondroid metaplasia, calcification

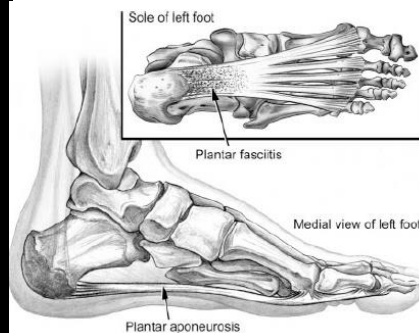


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Plantar Fasciitis and the Windlass Mechanism: A Biomechanical Link to Clinical Practice

Lori A. Bolgla; Terry R. Malone



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Journal of Athletic Training 2004;39(1):77-82

Abnormalities Resulting from the Underpronated Foot:

- Related to joint stiffness, decreased plantar fascia extensibility, muscle tightness
- Unable to dissipate forces or absorb shock (lacks pronation)
- Decreased distance between met heads and calcaneus
- Plantarflexed 1st ray



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Journal of Athletic Training 2004;39(1):77-82

Gait Implications

(Cavus foot, midfoot stiffness)

- Plantar heel pain associated with: lower maximum force beneath heel and medial forefoot, greater mid/forefoot contact time (Sullivan et al, Gait Posture 2015)
- Gait cycle breakdown/ plantar fascia considerations:
 - IC and LR: shock absorption
 - More lateral loading = less dampening of GRFs
 - MS: pronation
 - Midfoot stiffness prevents ‘unlocking’ of transverse tarsal segments
 - TS, PS: supinate, become rigid for toe off
 - PF 1st ray doesn’t extend as well



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Clinical Practice Guideline

The Diagnosis and Treatment of Heel Pain: A Clinical Practice Guideline—Revision 2010

James L. Thomas, DPM¹, Jeffrey C. Christensen, DPM², Steven R. Kravitz, DPM³, Robert W. Mendicino, DPM⁴, John M. Schuberth, DPM⁵, John V. Vanore, DPM⁶, Lowell Scott Weil Sr, DPM⁷, Howard J. Zlotoff, DPM⁸, Richard Bouché, DPM⁹, Jeffrey Baker, DPM¹⁰

Plantar Heel Pain Treatment Ladder

1st Tier

- Padding & Strapping
- Stretching Exercises
- OTC Arch Support / Heel Cup
- Shoe Recommendations
- Oral Anti-inflammatories
- Home Physical Therapy
- Corticosteroid Injection

6 weeks

2nd Tier

- Corticosteroid Injection
- Custom Orthotics
- Night Splint
- Immobilization
- Rx Physical Therapy

6 months

3rd Tier*

- ESWT
- Fasciotomy
- +/- Nerve Release

* Patients should possess chronic symptoms & undergo treatment for at least 6 months prior to consideration for Tier 3 treatment options.

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J.L. Thomas et al. / The Journal of Foot & Ankle Surgery 49 (2010) 51–59

Physical Therapy Treatment

- A lot of options...
 - Joint mobilization/manipulation, soft tissue
 - Gastroc, soleus, plantar fascia stretching
 - Exercise
 - Pes planus – strengthen intrinsics, proximal segments; mid/lateral loading v. medial overloading
 - Pes cavus – exercise emphasizes load dispersion, medial loading v. lateral overloading
 - Education
 - Orthotics/Inserts, Night splints?
 - Modalities: TDN? Ionto? LLLT? ESWT? Taping? Ultrasound?



Predictors of Response to Physical Therapy Intervention for Plantar Heel Pain

Foot & Ankle International
2015, Vol. 36(4) 408-416
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DOI: 10.1177/1071100714558508
fai.sagepub.com

Shane M. McClinton, DPT, FAAOMPT^{1,2}, Joshua A. Cleland, PT, PhD³,
and Timothy W. Flynn, PT, PhD⁴

- 6 visits over 4 weeks: MT + exercise v. electrophysiological agents + exercise
- Individuals with symptoms < 7.2 months were 4.2-8.5 times more likely to respond (depending on success criteria)
- Age and BMI not significant predictors to success



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The symptomatic and functional effects of manual physical therapy on plantar heel pain: a systematic review

John J. Mischke¹, Dhinu J. Jayaseelan², Josiah D. Sault³, Alicia J. Emerson Kavchak³

¹Department of Physical Therapy, University of Montana, Missoula, MT, USA, ²Department of Physical Therapy and Health Care Sciences, The George Washington University, Washington, DC, USA, ³Department of Physical Therapy, University of Illinois at Chicago, Chicago IL, USA

- 1248 articles screened, 8 RCTs included in analysis
- 4 scored 6/10 or more on PEDro, others low quality
- *Manual therapy associated with improved outcomes in pain and function compared to comparative group/control*
- MT: joint treatment, soft tissue, neural mobilization



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Journal of Manual & Manipulative Therapy 2016

TCJ Distraction (thrust/non-thrust)



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Talocrural AP Glide



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Subtalar Glides

(Lateral)



(Medial)



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Non-specific Midfoot Pronation/Supination Mobilization

(Neutral)



(Pronation)



(Supination)



Plantar Glides with M→L Rotation

**Navicular on Talus,
Cuboid on Calcaneus**



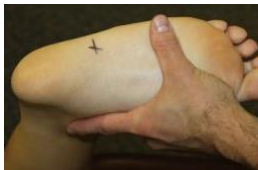
**Medial Cuneiform on
Navicular**



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Dorsal Cuboid Whip Manipulation



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1st MTP Plantar Glide

(indicated for limited extension)



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Soft Tissue Mobilization

B. Saban et al. / Manual Therapy 19 (2014) 102–108

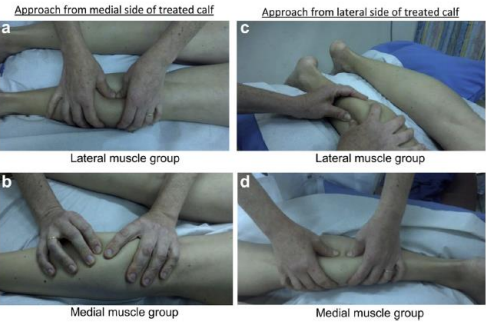


Fig. 1. Technique of deep muscle massage.



Fig. 2. Deep massage to calf muscles using elbow.



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“The angle of your hands guides your depth” – Jim B.



(Superficial)



(Deep)



TrP Release



Flexibility for Runners

Jeffrey Jenkins, MD^{a,*}, James Beazell, PT, DPT, OCCS, ATC^b



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Clin Sports Med 29 (2010) 365-377

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PLANTAR FASCIA-SPECIFIC STRETCHING EXERCISE IMPROVES OUTCOMES IN PATIENTS WITH CHRONIC PLANTAR FASCIITIS

A PROSPECTIVE CLINICAL TRIAL WITH TWO-YEAR FOLLOW-UP

BY BENEDICT F. DIGIOVANNI, MD, DEBORAH A. NAWOCZENSKI, PhD, PT, DANIEL P. MALAY, MSPT, PETRA A. GRACI, DPT, TARYN T. WILLIAMS, MSPT, GREGORY E. WILDING, PhD, AND JUDITH F. BAUMHAUER, MD

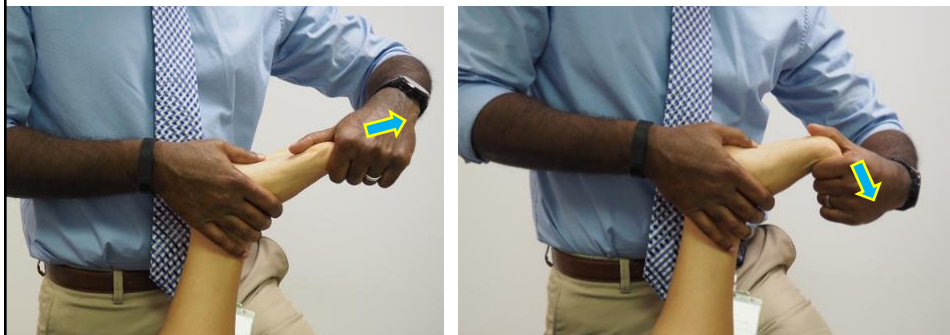
- n = 82, mean symptom duration > 10 months
- All subjects received pre-fab soft insoles (Spenco), 3 wk course of Celebrex, and an educational video on PF
- PF stretching v. Achilles tendon stretching
- At 8 weeks, PF stretching superior to WB achilles stretching for pain, activity limitations, pt satisfaction
- No sig. difference at 2 yr f/u



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1st MTP Extension and Ankle DF Mobilization with PF STM



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Scand J Med Sci Sports 2015; 25: e292–e300
doi: 10.1111/sms.12313

High-load strength training improves outcome in patients with plantar fasciitis: A randomized controlled trial with 12-month follow-up

M. S. Rathleff¹, C. M. Mølgaard², U. Fredberg³, S. Kaalund⁴, K. B. Andersen³, T. T. Jensen⁴, S. Aaskov⁵, J. L. Olesen^{6,7}


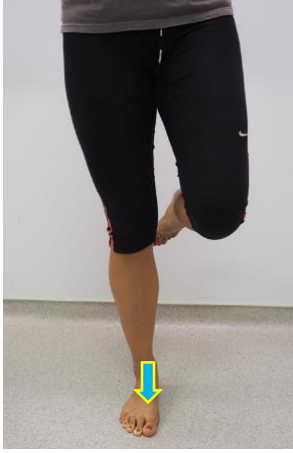
- Plantar fascia specific stretching v. strengthening (single leg heel raises with towel under toes)
- 3x12 rep max progression → 10 rep max → 8 rep max every other day
- FFI 29 points lower at 3 mo in strength group
- No difference at 1, 6, 12 months




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Motor Control

(WB Through Medial Column)



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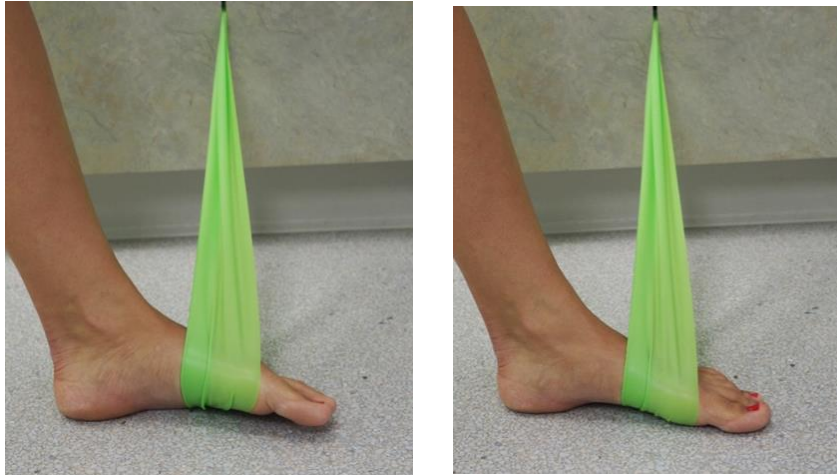
Controlled Pronation/Supination

(Unstable Surface)



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Concentric Pronation, Eccentric Supination (with resistance)



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- What are you going to reassess at subsequent visits?
 - VAS, pain with am steps, standing tolerance

PROGNOSIS/EXPECTATIONS

- How do you expect to progress your treatment over subsequent visits?
 - Motor control to become more dynamic, higher grade mobilization/manip, self-mobilization HEP

Associated factors for expected outcome:

- Favorable
 - Typical clinical presentation, low symptom irritability
- Unfavorable
 - Chronicity of symptoms

Possible referrals:

- Orthotist for custom inserts? Ortho for injection?



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'Gap' in Knowledge

Patient or Population	Intervention	Comparison	Outcomes
Patients with plantar fasciitis	Manual therapy & exercise	Injection	Pain relief, functional status

- **Article reviewed:** Celik D, et al. Joint mobilization and stretching exercise vs steroid injection in the treatment of plantar fasciitis: a randomized controlled trial. *Foot Ankle Int.* 2016;37(2):150-6.
- **Relevance to the clinical case:** Both groups had significant improvement in FAAM and VAS in short term (3, 6, 12 wk) with greater improvement noted in injection group. Improvements continued from wk 12 through 1 yr for MT group only.



Clinical Pattern

Subjective	Objective
<ul style="list-style-type: none"> - Plantar heel pain - Overuse/insidious mechanism - Pain worse with first steps in am - Functional limitations: prolonged standing, running 	<ul style="list-style-type: none"> - TTP at medial calcaneal tubercle - (+) Windlass test - Pes cavus - Joint stiffness and muscle length impairments - (-) neurodynamics

