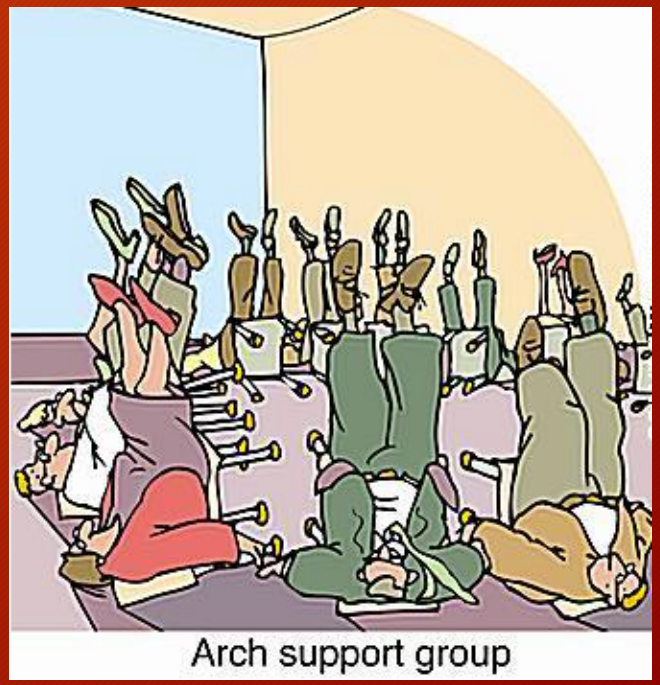
Conflict of Interest statement

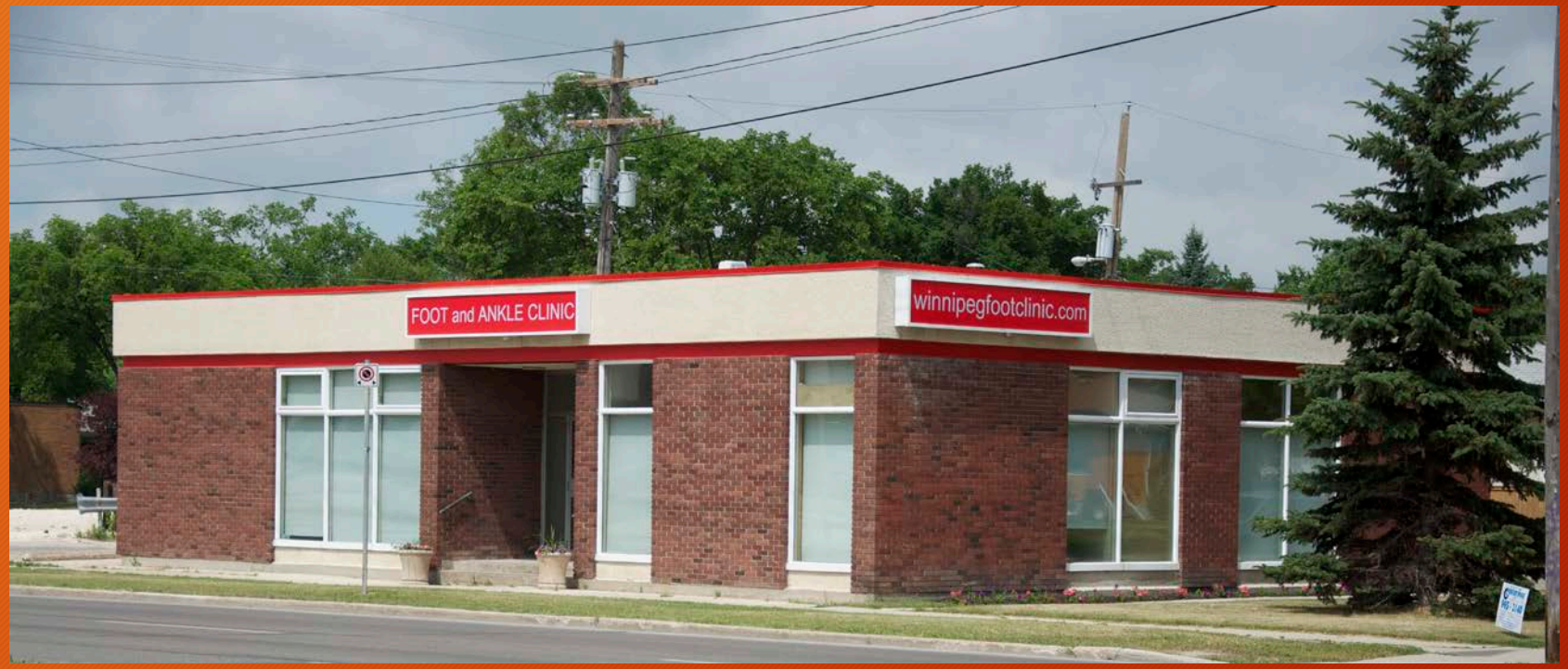
- Have no conflict of interest to disclose

Objective

- Overview of the foot and ankle.
- Anatomy.
- Surface Anatomy.
- Physical Examination.
- Plantar fasciitis.
- Metatarsalgia
- Hallux limitus/rigidus.
- Morton's Neuroma
- Plantar Plate
- Single Limb Stance Heel Raise test
- On a foot note…
- Q&A


Arch support group

Common Podiatric Foot Problems



Dr. Amar Gupta, Podiatrist BSc. (Hons) Pod. Med., PgCert. Theory Podiatric Surgery

The Foot and Ankle Clinic. www.winnipegfootclinic.com

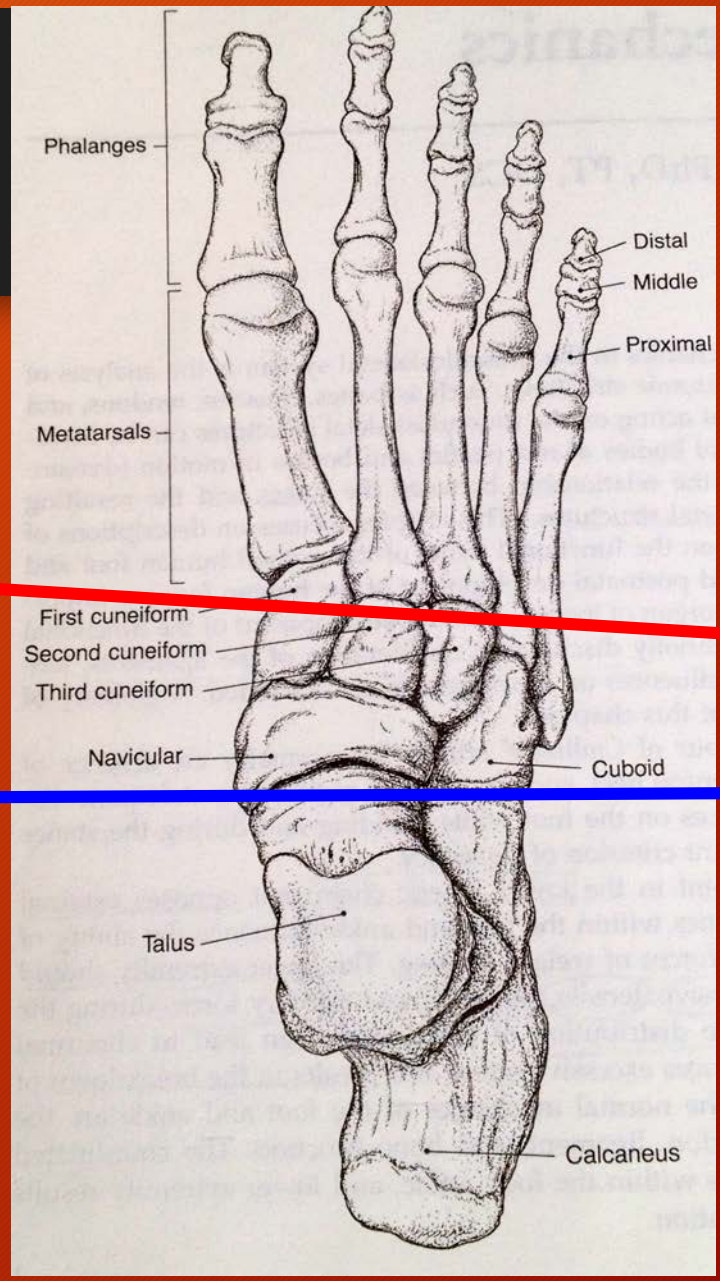
Overview of the foot and ankle

- The ankle and foot is a complex structure comprising of 28 Bones (including 2 sesamoid bones), 55 articulations (including 30 synovial joints), interconnected with ligaments and muscles

- Foot and ankle serves to convert the rotational movements that occur with WB activities into sagittal, frontal and transverse movements

ANATOMY

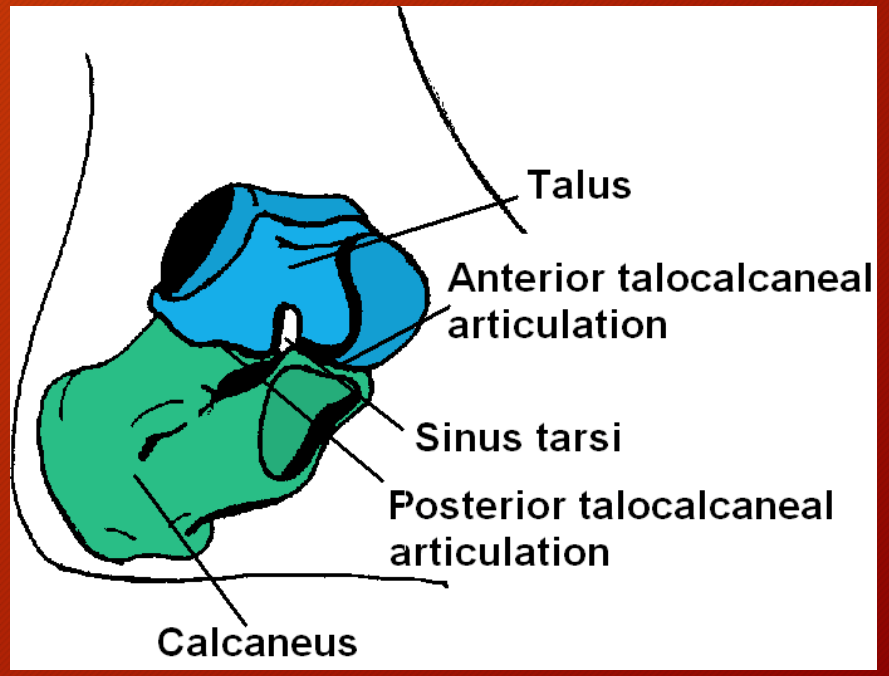
- Anatomically and biomechanically the foot is divided into:
  - -Rearfoot/Hindfoot: Talus & calcaneus
  - -Midfoot: Navicular, cuboid, 3 cunieforms (medial, Intermediate, Lateral)
  - -Forefoot: 14 bones of phalanges, 5 metatarsals, 2 sesamoid bones



Donatelli, R. A. (1996). The Biomechanics of the the Foot and Ankle, 2nd Edition. Philadelphia. P.4

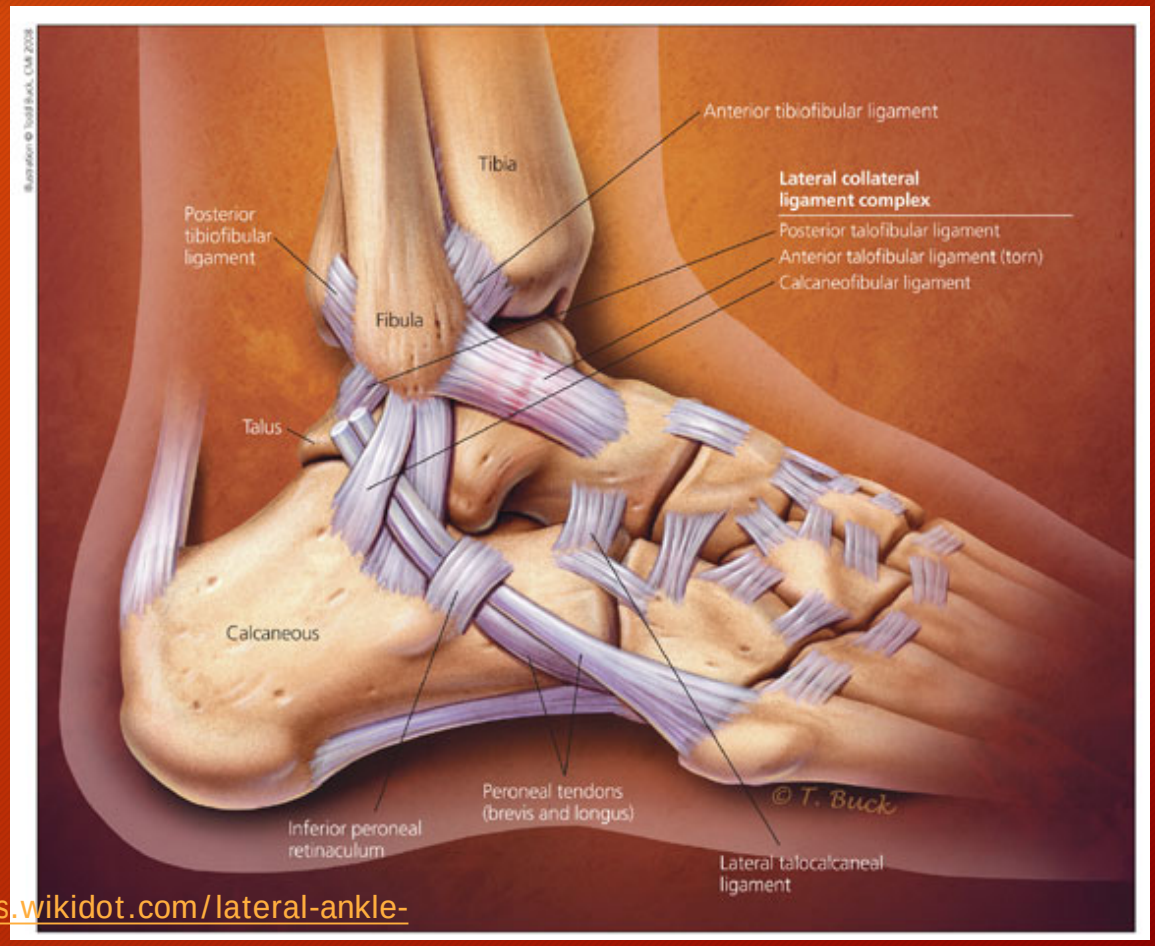
ANATOMY: Ankle Joint

- Also called Talocrural Articulation, is a synovial hinge joint.
- Ankle joint is made up of 3 joints:
  1. Talocrural (Connects the distal ends of the tibia & fibula to the proximal end of the talus). Function: D/P
  2. Subtalar joint (Talocalcaneal joint). Function: I/E
  3. Inferior tibiofibular joint (tibiofibular syndesmosis)



ANATOMY: Lateral ankle ligaments

- The lateral complex of the ankle is made up of 3 ligaments.
- Importance is to resist Inversion & Plantar flexion



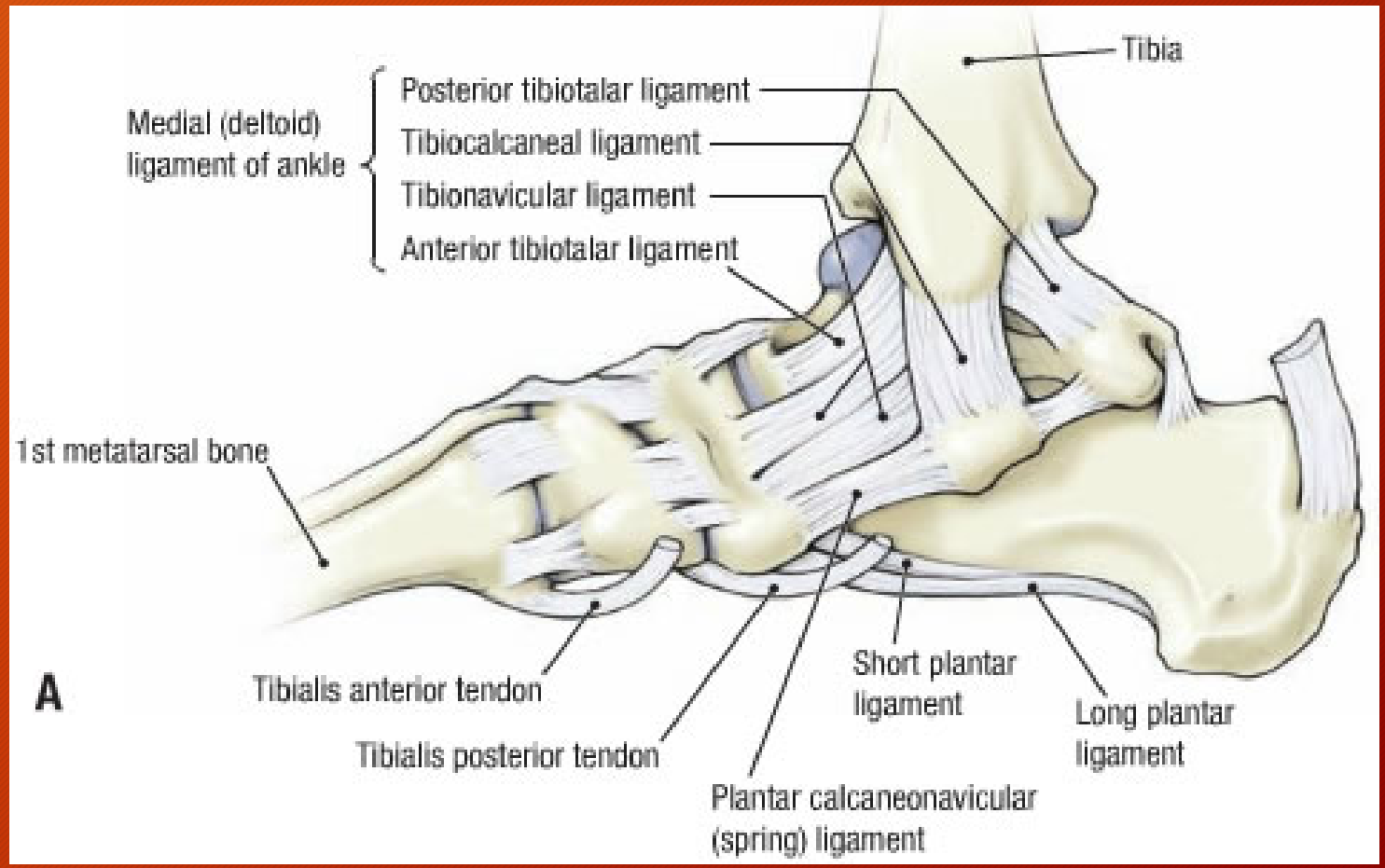
- Eli Rodriguez. Lateral Ankle Sprain [onliine image] Available from: http://morphopedics.wikidot.com/lateral-ankle-sprain. [Accessed on June 10 2017]

ANATOMY: Lateral ankle ligaments

LIGAMENT	DESCRIPTION	PROXIMAL ATTACHMENT	DISTAL ATTACHMENT	ROLE
Anterior Talofibular Ligament (ATFL)	Flat Weak Band that extends Anteriomedially. Most commonly damaged ligament of the ankle.	Lateral Malleolus	Neck of Talus	Restrain anterior displacement of the talus in respect to the fibula and tibia. Resists Inversion in planterflexion.
Posterior Talofibular Ligament (PTFL)	Thick, fairly strong band that runs horizontally medially. This ligament is under greater strain in full dorsiflexion of ankle. Rarely injured because bony stability protects ligaments when ankle in dorsiflexion.	Malleolar Fossa of Fibula	Lateral Tubercle of Talus	Forms the back wall of the recipient socket for the talus' trochlea. Resists posterior displacement of the talus.
Calcaneofibular Ligament (CFL)	Round cord that passes posterioinferiorly	Tip of Lateral Malleolus	Lateral Surface of Calcaneus	Aids Talofibular stability during Dorsiflexion. Restrain inversion of the calcaneus with respect to the fibula. Prevent Talar tilt into Inversion.

ANATOMY: Medial ankle ligaments

- Known as the Deltoid Ligament, attach proximally into the medial malleolus and fan out to attach distally to the talus, calcaneus, and navicular via 4 adjacent and continuous parts to form a triangular shaped band.
- Has a superficial and deep layers (strongest of all the foot ligaments).
- Functions to stabilize the ankle joint during eversion of the foot & prevents subluxation of the ankle joint.



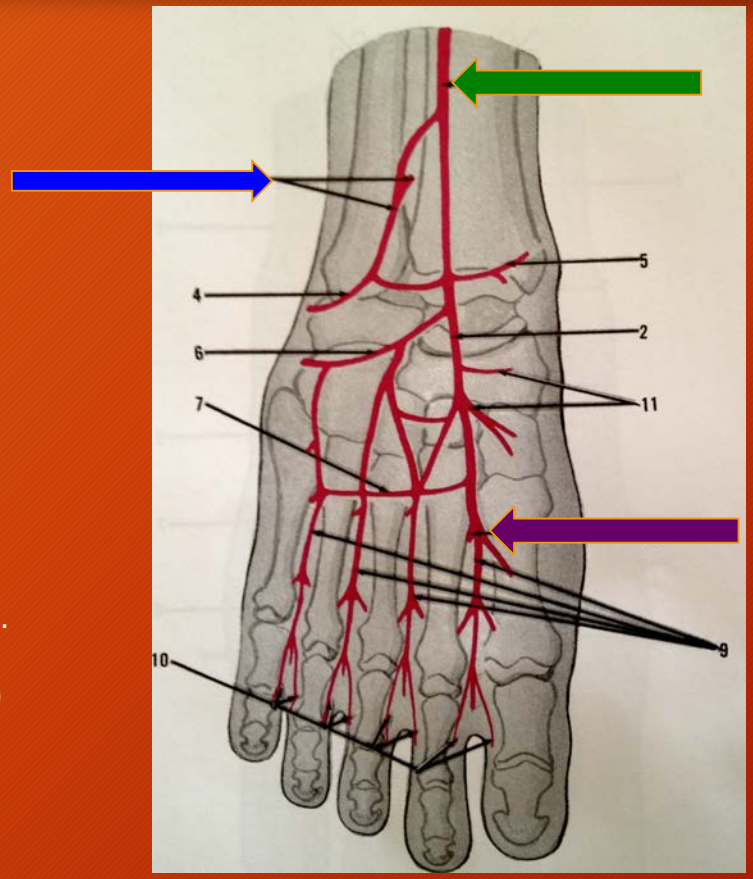
Anatomy: Medial ankle ligaments

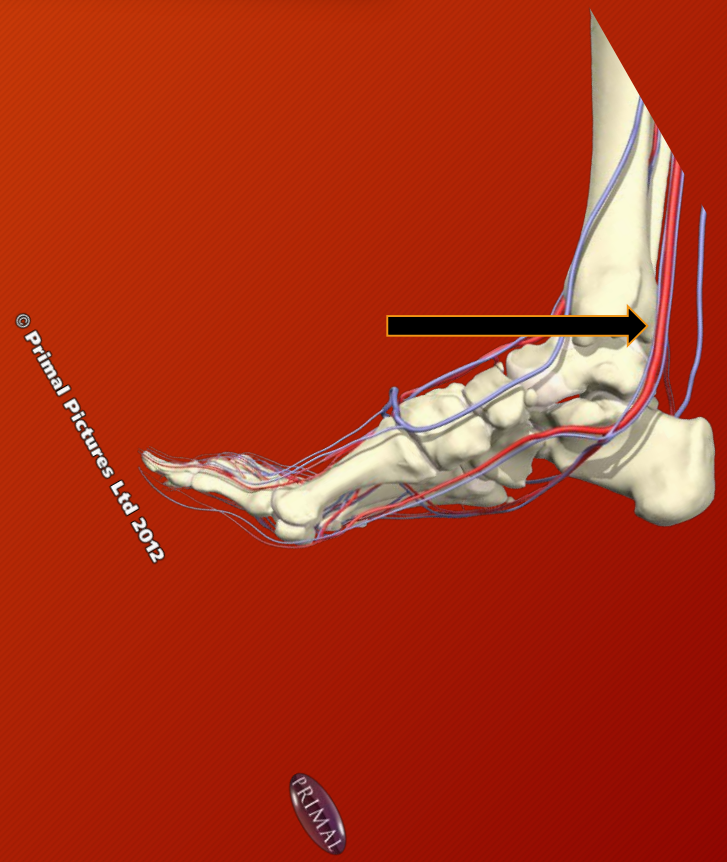
LIGAMENTS	DESCRIPTION	PROXIMAL ATTACHMENT	DISTAL ATTACHMENT	ROLE
Anterior Tibiotalar Ligament		Medial Malleolus	Head of Talus	Reinforces Ankle Joint. Control Plantarflexion & Eversion
Posterior Tibiotalar Ligament			Talus Posteriorly	Control Dorsiflexion
Tibionavicular Ligament	Forms most anterior part of the Deltoid Ligament		Dorsomedial Aspect of Navicular	Reinforces Ankle Joint
Tibiocalcaneal Ligament	Very thin ligament		Sustentaculum Tali	Reinforces Ankle Joint

ANATOMY: Arteries

•Arterial blood supply to the foot & ankle is provided by 3 arteries (Kelikian 2011):

Anterior tibial artery
Peroneal artery
Posterior tibial artery





12% population will have a absent dorsalis pedis artery (Huber 1941).

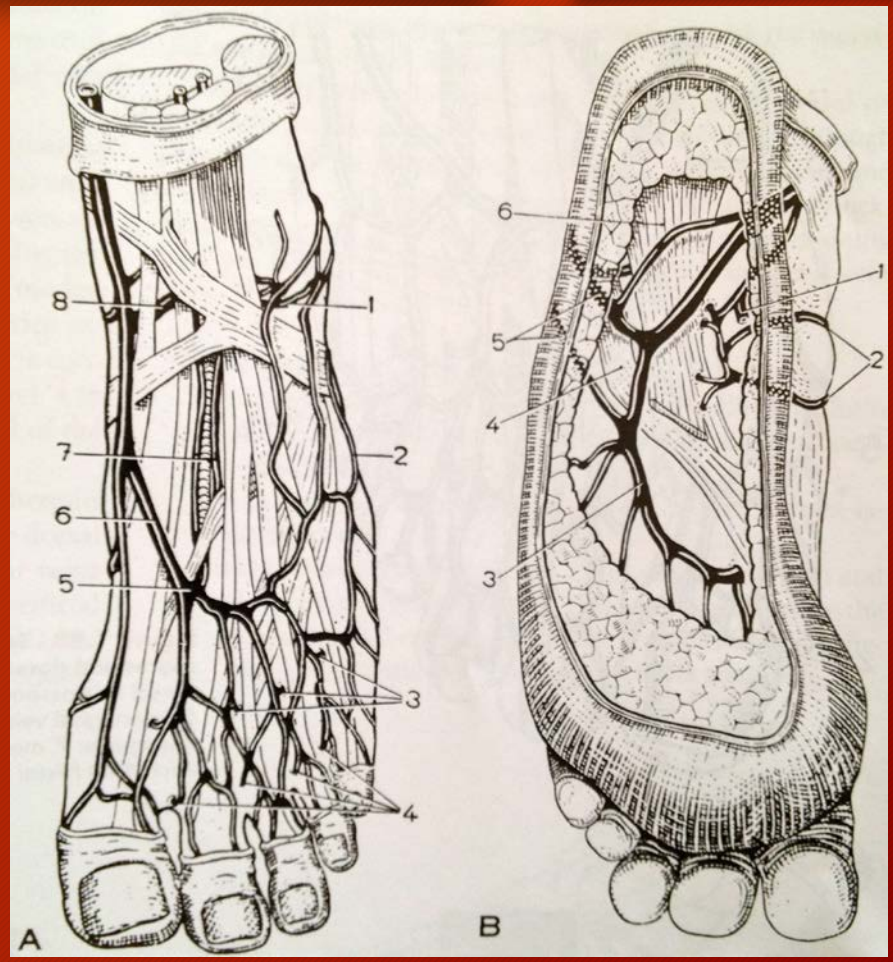
2% population will have a absent posterior tibial artery (Huber 1941)

•Huber, J. F. (1941). The arterial network supplying the dorsum of the foot. *Anat Rec.*, 80:373.
•Kelikian, A. S. (2011). Sarrafian's Anatomy of the Foot and Ankle, 3rd Ed. Lippincott Williams & Wilkins, Philadelphia. P. 333.

ANATOMY: Veins

- Paired dorsal/plantar (D/P) veins each digit →form D/P MT veins.
- The veins drain to D/P venous arches→vena comitantes of dorsal plantar arches.
- Dorsal arch ascend with lateral tarsal D.P. artery → anterior tibial a.
- There are numerous connections→ great long saphenous v. from the medial malleolus with the saphenous n.

- Plantar arch→medial/lateral vessels as vena comitantes → posterior tibial artery.
- There are numerous connections to the short saphenous v.

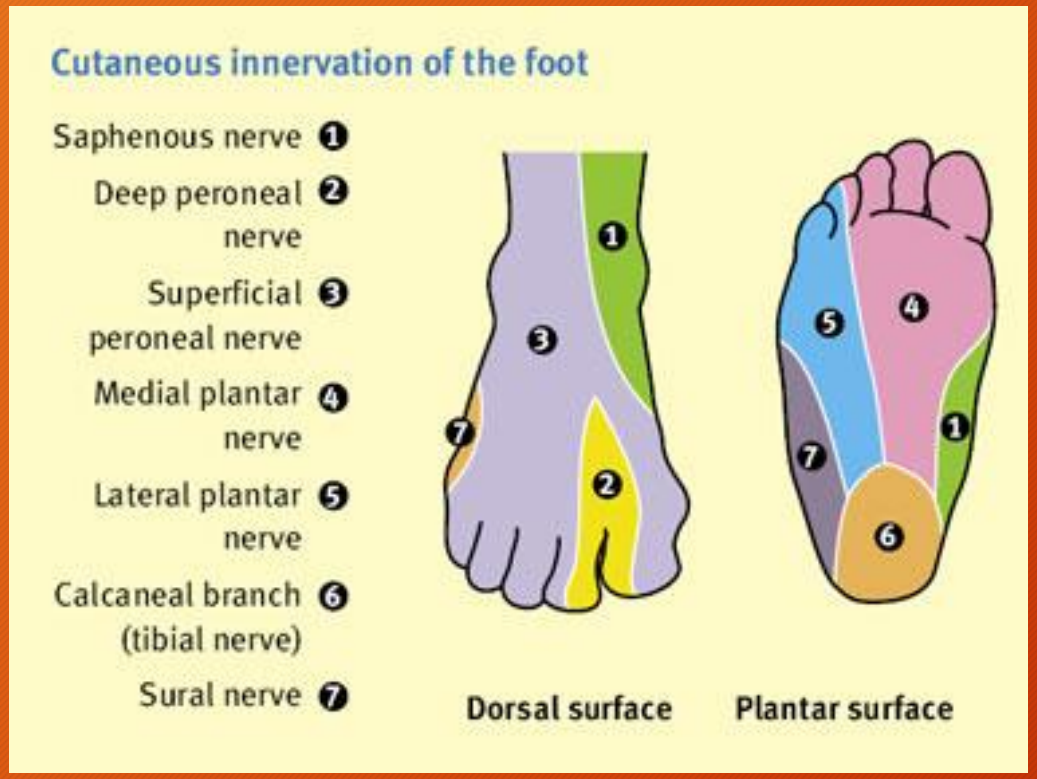


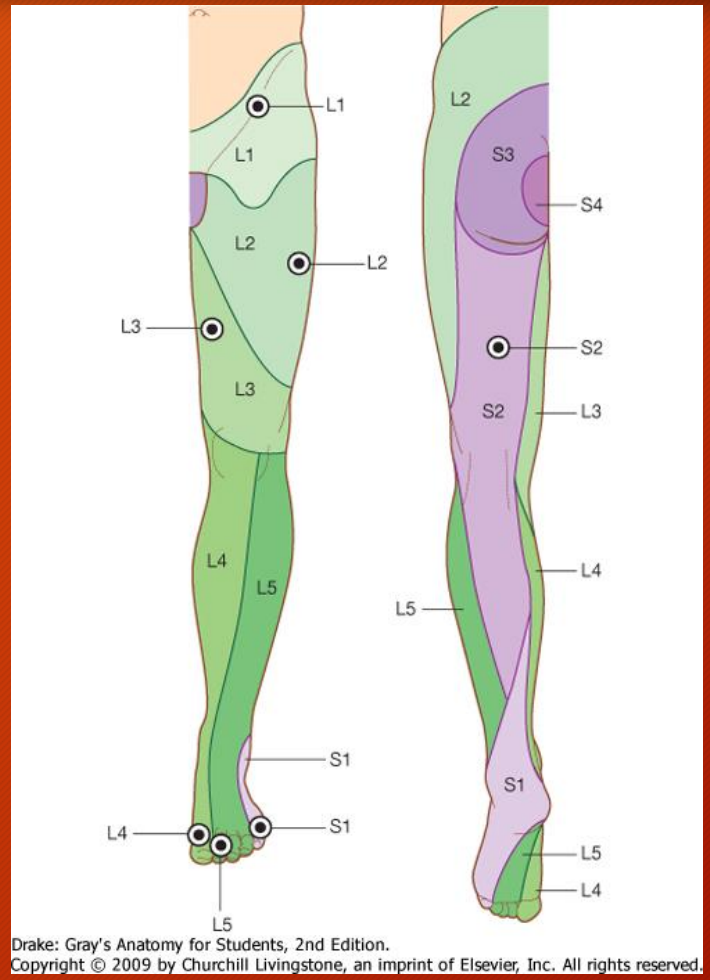
- Kelikian, A. S. (2011). Sarrafian's Anatomy of the Foot and Ankle, 3rd Ed. Lippincott Williams & Wilkins, Philadelphia. P. 371.

ANATOMY: Nerves

- The nerve supply to the foot & ankle is provided by the branches of the sciatic at the popliteal fossa into tibial n. and common peroneal n.
- The branches are: Sural n., Superficial peroneal n., Accessory deep peroneal n., Deep peroneal n., posterior tibal n. (MPN & LPN).
- The Saphenous n., a branch of the femoral n., gives limited contribution.

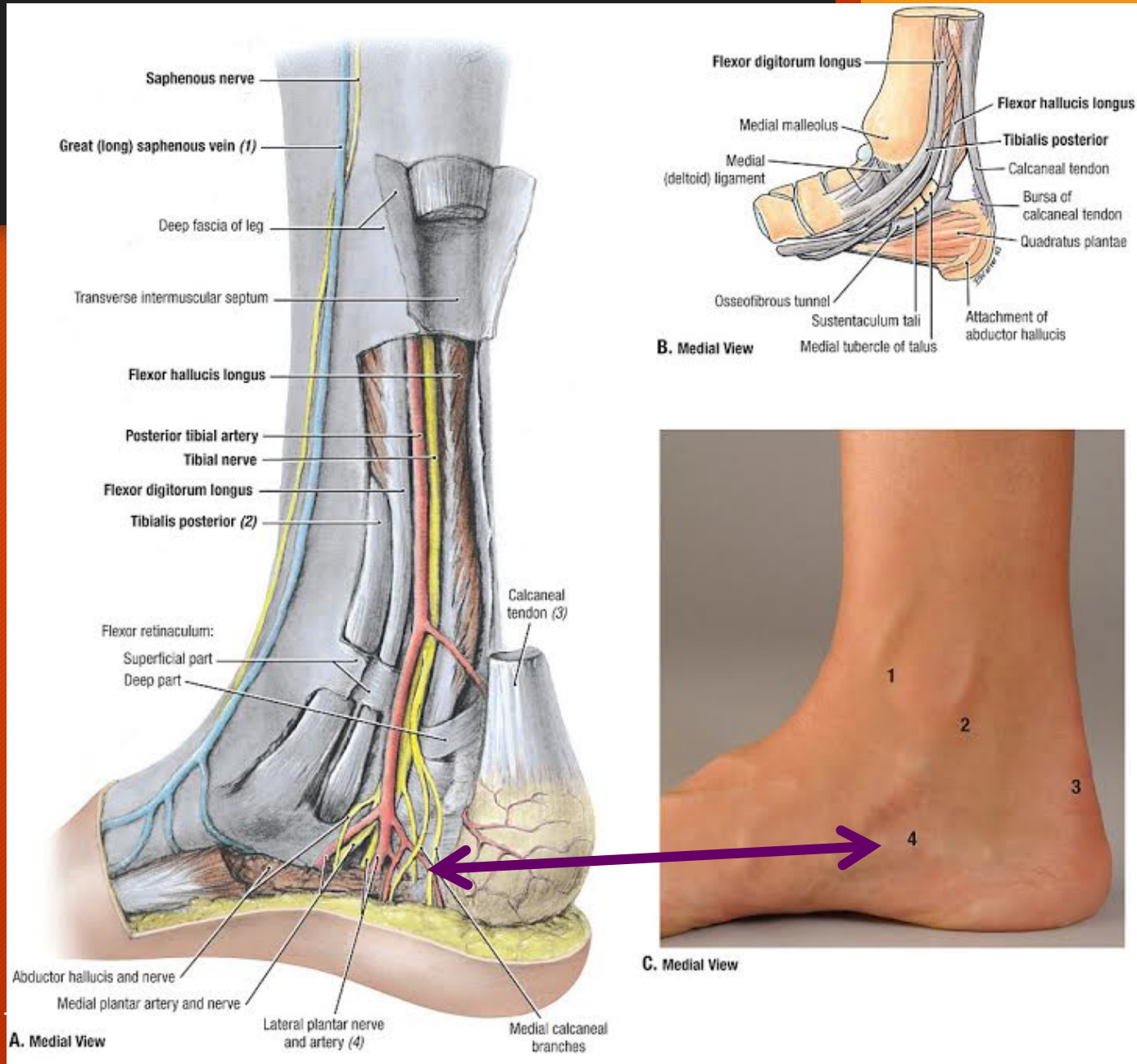
ANATOMY: Dermatones of foot & lower limb.





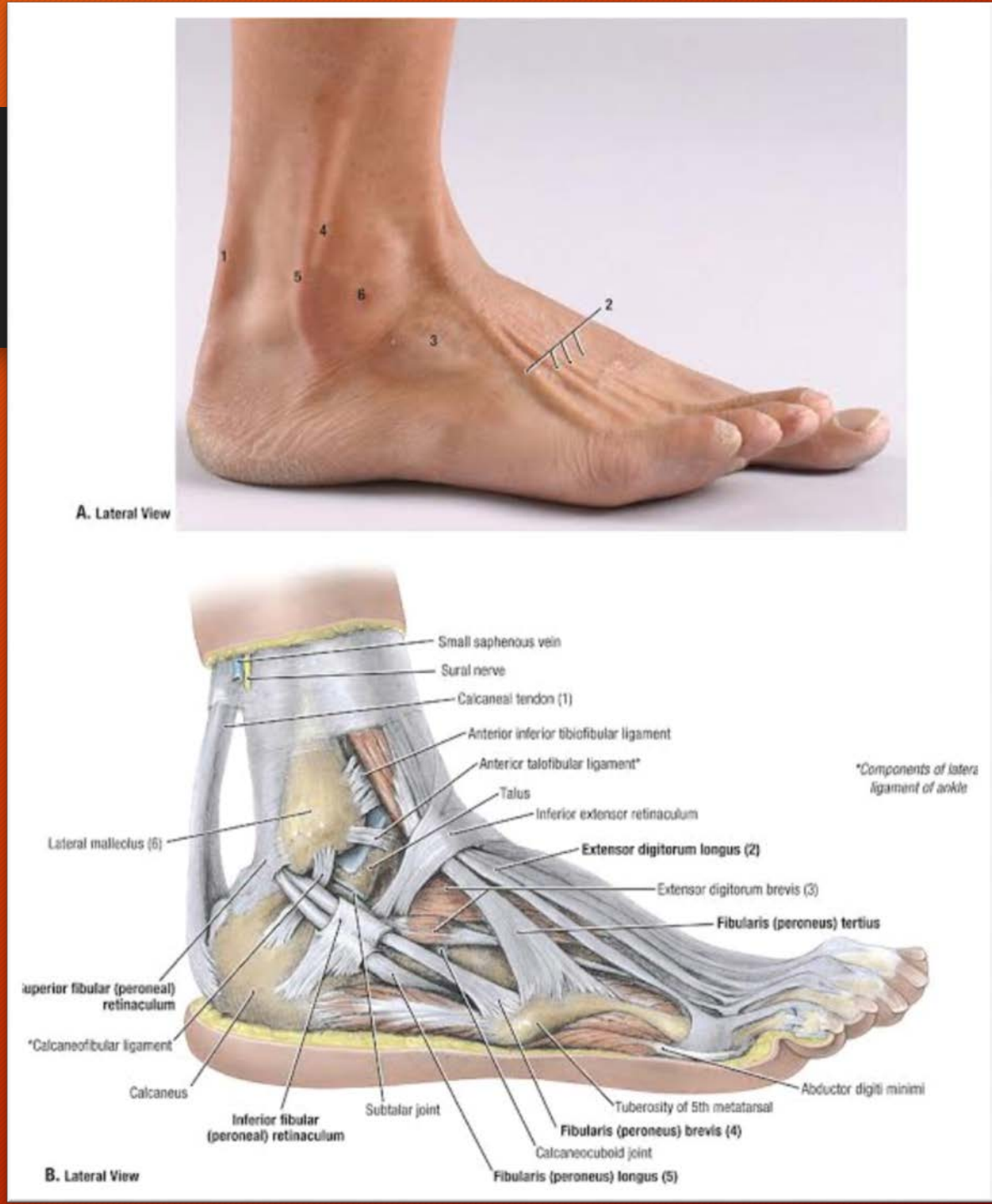
SURFACE ANATOMY: Medial

Tom, Dick and Naughty Harry!



- Anatomy learning resources. Duke University Medical School. [online image] Available from: https://web.duke.edu/anatomy/lab15/images/prelab16_Fig1.jpg [Accessed on June 10 2017].

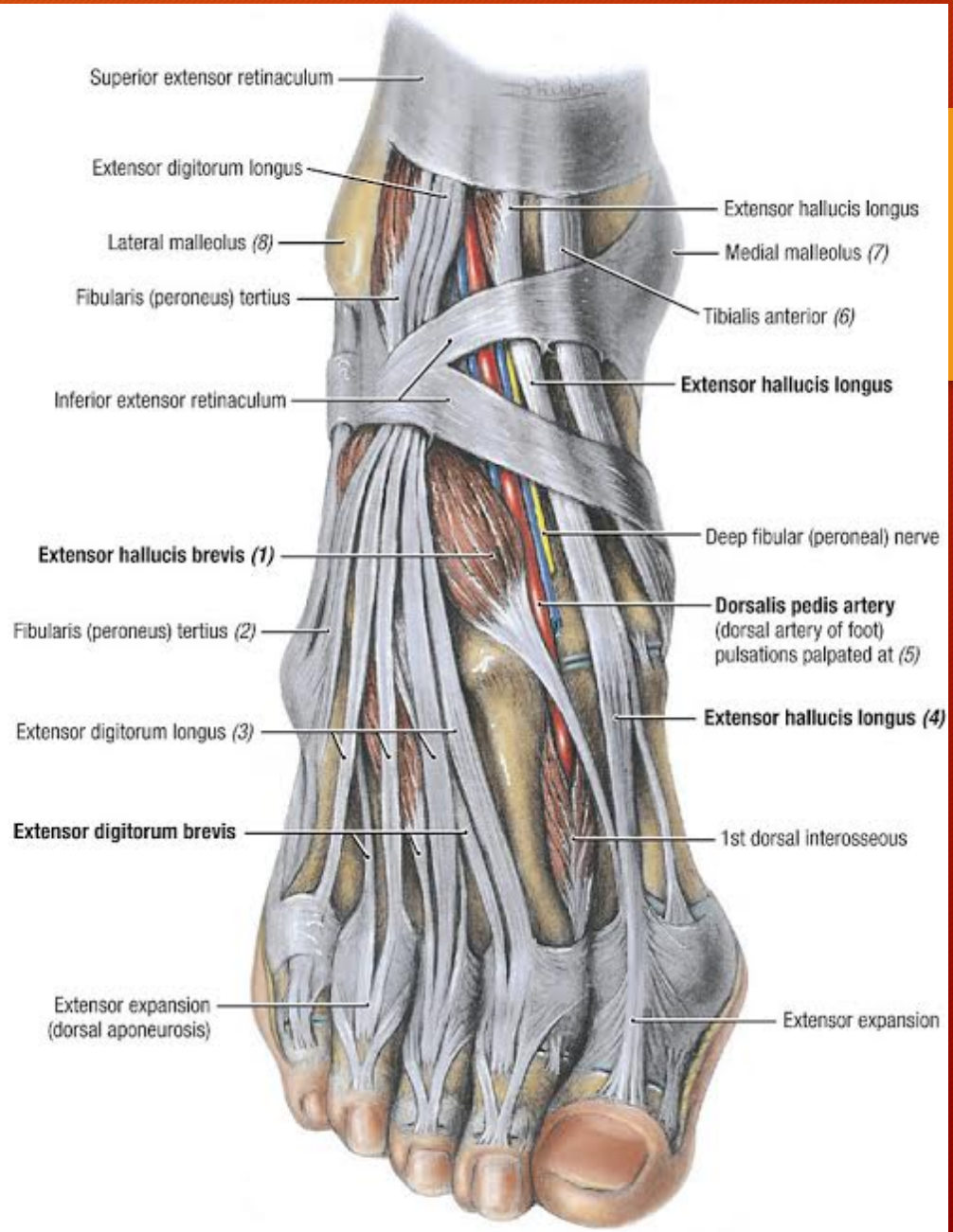
SURFACE ANATOMY: Lateral



- Anatomy learning resources. Duke University Medical School. [online image] Available from: https://web.duke.edu/anatomy/lab15/images/prelab16_Fig2.jpg [Accessed on June 10 2017].

SURFACE ANATOMY: Dorsal

A. Superior View



B. Superior View

- Anatomy learning resources. Duke University Medical School. [online image] Available from: https://web.duke.edu/anatomy/lab15/images/prelab16_Fig3.jpg [Accessed on June 10 2017].

PHYSICAL EXAMINATION (P/E)

- Examine feet in both NWB and WB.

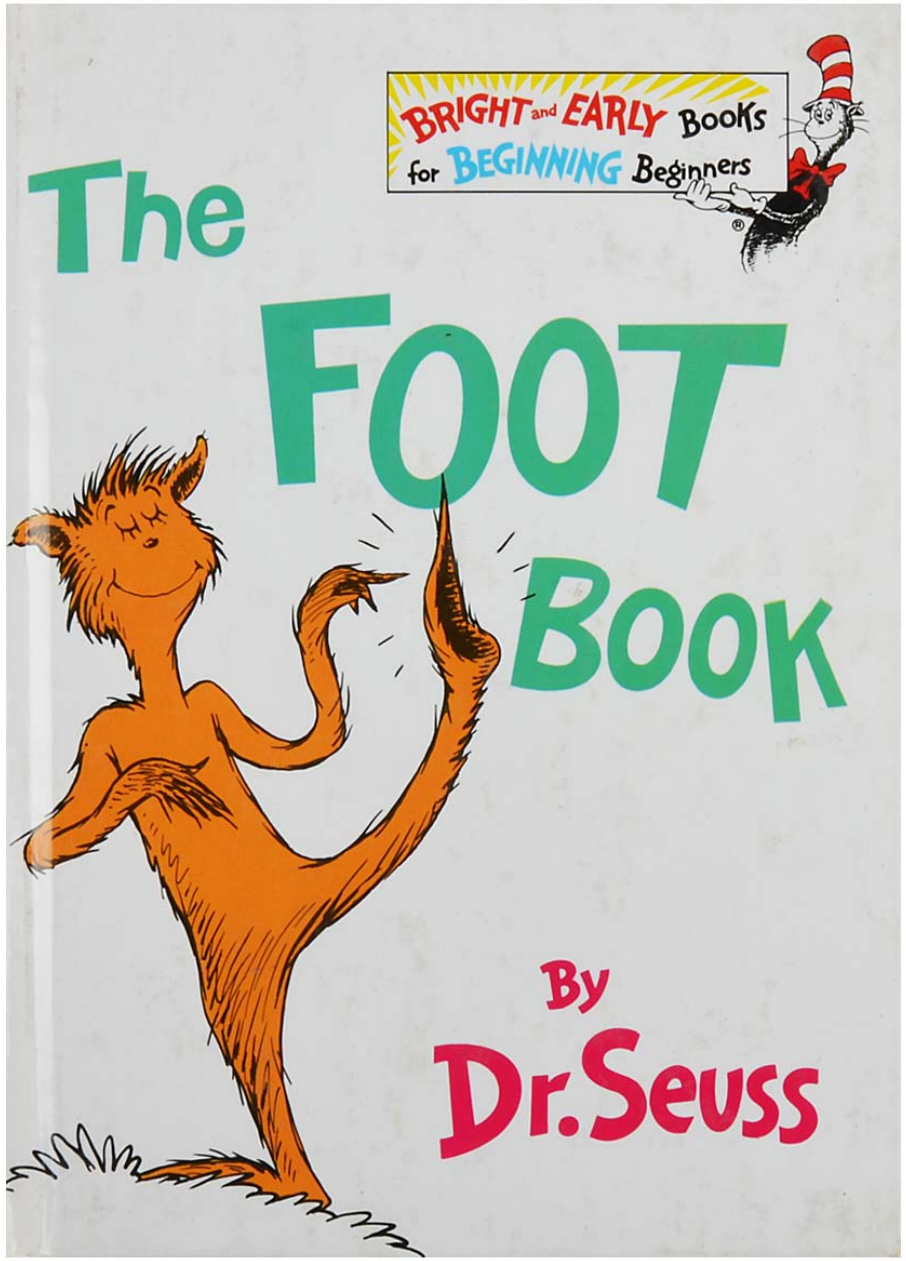
Plantar Fasciitis

- Single most common complaint (10-15%) of all foot problems requiring medical attention.
- Generally self-limiting with symptoms resolving within 10 months.
- The long interval is FRUSTRATING to both patient and practitioner with a severe negative impact on the general quality of life (Irving et al. 2008).

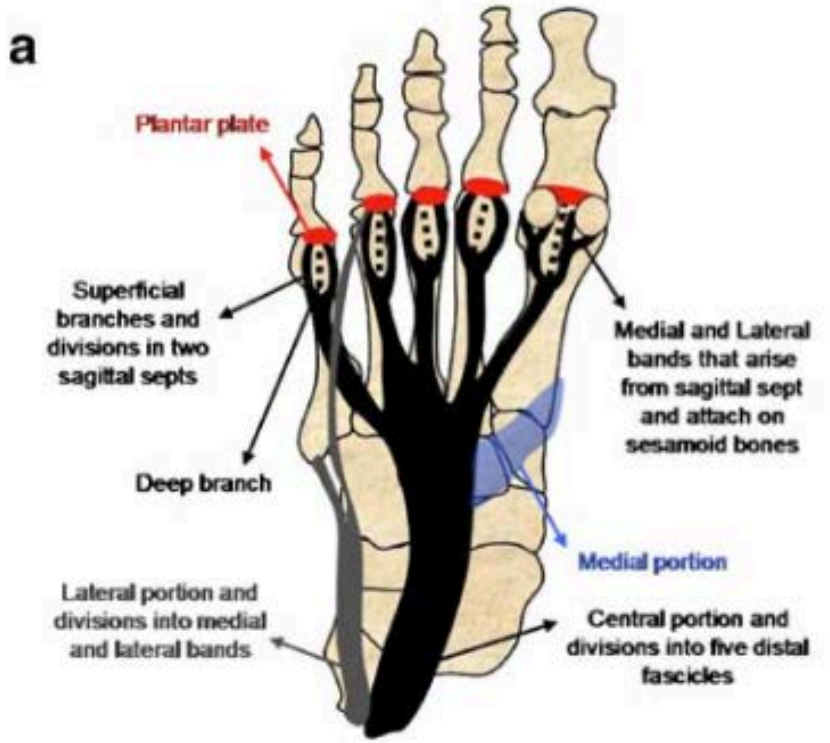
- Consider using the term, Chronic Plantar Heel Pain (CPHP), a generalized term used to describe a range of undifferentiated conditions affecting heel pain

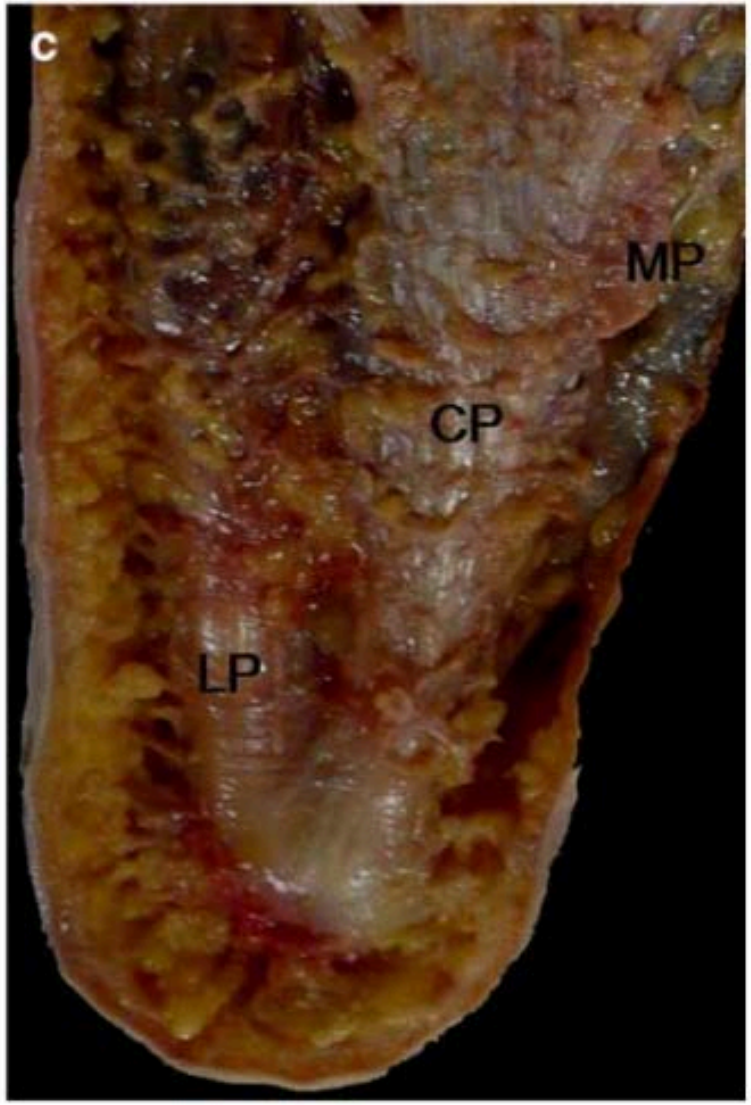
- CPHP is also associated with DDx: Spondyloarthritis (Ankylosing Spondylitis) affecting the entheses.

Irving DB, Cook JL, Young MA, and Menz HB.Impact of chronic plantar heel pain on health-related quality of life. *J Am Podiatr Med Assoc*. Jul-Aug 2008.98(4): 283-289


BRIGHT and EARLY Books
for BEGINNING Beginners
The
FOOT
Book
By
Dr. Seuss

Anatomy of the Plantar Fascia





Moraes do Carmo CC, Fonseca de Almeida Melao LI, Valle de Lemos Weber MF, Trudell, D, Resnick D. (2008) Anatomical features of plantar aponeurosis: cadaveric study using ultrasonography and magnetic resonance imaging. *Skeletal Radiol*, 37(10):929-35.

Anatomy for plantar fasciitis

What is this (X)? RELEVANCE?

Terminology: Fasciitis versus Fasciosis

- While it is still generally and erroneously believed that the plantar fascia becomes chronically inflamed, the process is a degenerative change (Franklyn-Miller et al 2009).
- Lemont et al. (2003) reviewed histologic findings (n=50) upon performing plantar fasciotomy. Concluded that NO histologic mediators of inflammation was present.
- What they found→ myxoid degeneration + disruption collagen fibrils / increase in tenocytes + bone marrow vascular ectasia.

Lemont H, Ammirati KM, and Usen N. Plantar fasciitis: a degenerative process (fasciosis) without inflammation. *J Am Podiatr Med Assoc*. May-Jun 2003. 93(3): 234-237
Franklyn-Miller A, Falvey E, McCrory P. Fasciitis first before tendinopathy: does the anatomy hold the key? *Br J Sports Med*. 2009 Dec;43(12):887-9.

Arch support group

Table 2. Multiple Etiology Heel Pain Syndrome with Scoring
(Each foot is scored separately.)

MEHPS Questionnaire		
Yes = 3 points; Sometimes = 2 points; Rarely = 1 point; No = 0 points	**Right**	**Left**
Is your pain worse after periods of rest or with the first step in the morning?	3 2 1 0	3 2 1 0
Does your heel pain increase in relation to the amount of time you are on your feet?	3 2 1 0	3 2 1 0
Does your pain have a burning nature?	3 2 1 0	3 2 1 0
Do you have pain in your heel(s) at night or when you are not on your feet?	3 2 1 0	3 2 1 0
Does your pain worsen throughout the day?	3 2 1 0	3 2 1 0
Do you have pain in both heels?	3 2 1 0	3 2 1 0
Add 3 points if prior treatment with orthotic devices made the pain feel worse.	3	3
Total		

MEHPS Scoring	
<12 Points	Most likely a single etiology plantar fasciosis
12-15 Points	Probably multiple etiologies with both fasciosis and neurogenic etiology
>15 Points	Nerve entrapment or neurogenic etiology is likely the most significant contributor to the patient's symptoms

MEHPS is more common than many believe, with the most frequent association being entrapment of the medial calcaneal nerve in conjunction with plantar fasciopathy.

In Rose and Malay's study, more than 72% of patients who initially presented with plantar fasciitis also had co-existing nerve entrapment of either the tarsal tunnel or medial calcaneal nerve as confirmed by neurosensory testing*.

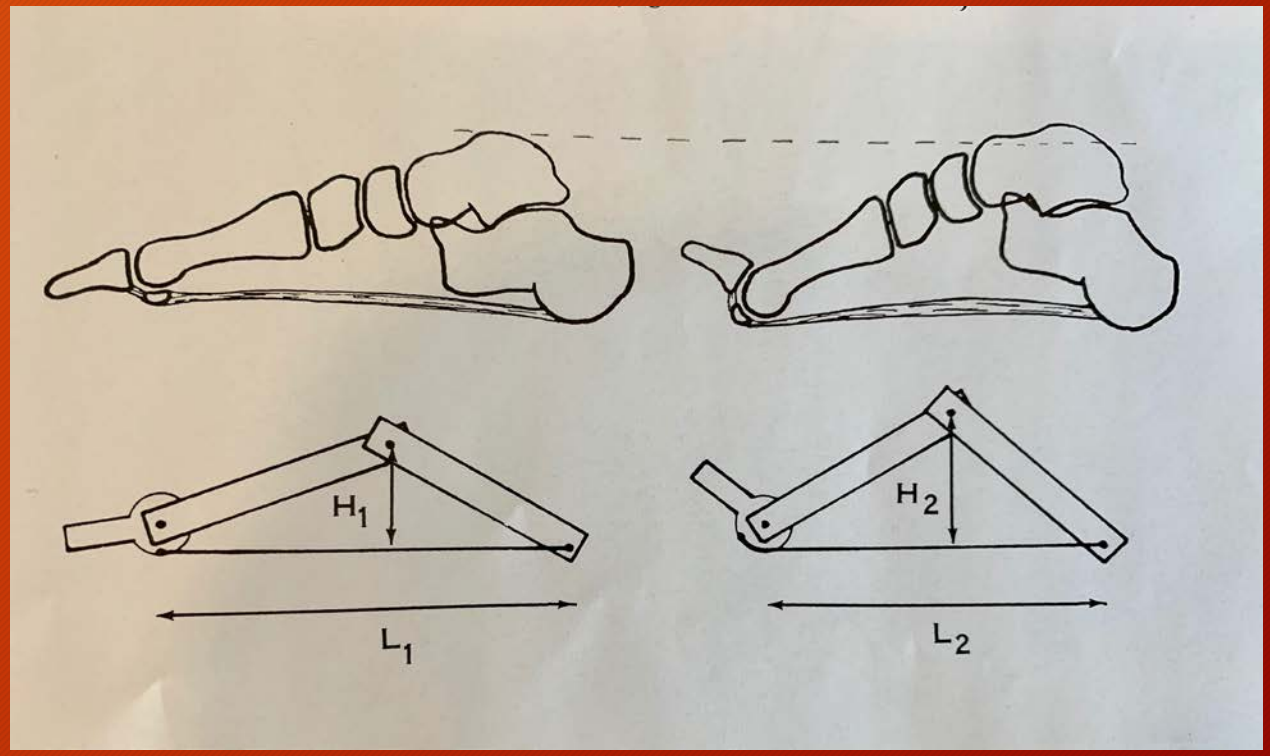
*Rose JD, Malay DS, and Sorrento DL. Neurosensory testing of the medial calcaneal and medial plantar nerves in patients with plantar heel pain. *J Foot Ankle Surg*. Jul-Aug 2003. 42(4): 173-177.

Barrett SL and Woolley ME. Partial fasciectomy with autologous platelet concentrate. Practical Pain Management. Nov/Dec 2010:16-21

Windlass Mechanism

As described by Hicks (1954), the foot and its ligaments as an arch-like triangular structure or truss.

hyperextension [Dorsiflexion] of the toes at the metatarso-phalangeal joints (MTPJ) tenses [winds] the plantar aponeurosis, raises the longitudinal arch of the foot, inverts the hindfoot and externally rotates the leg.



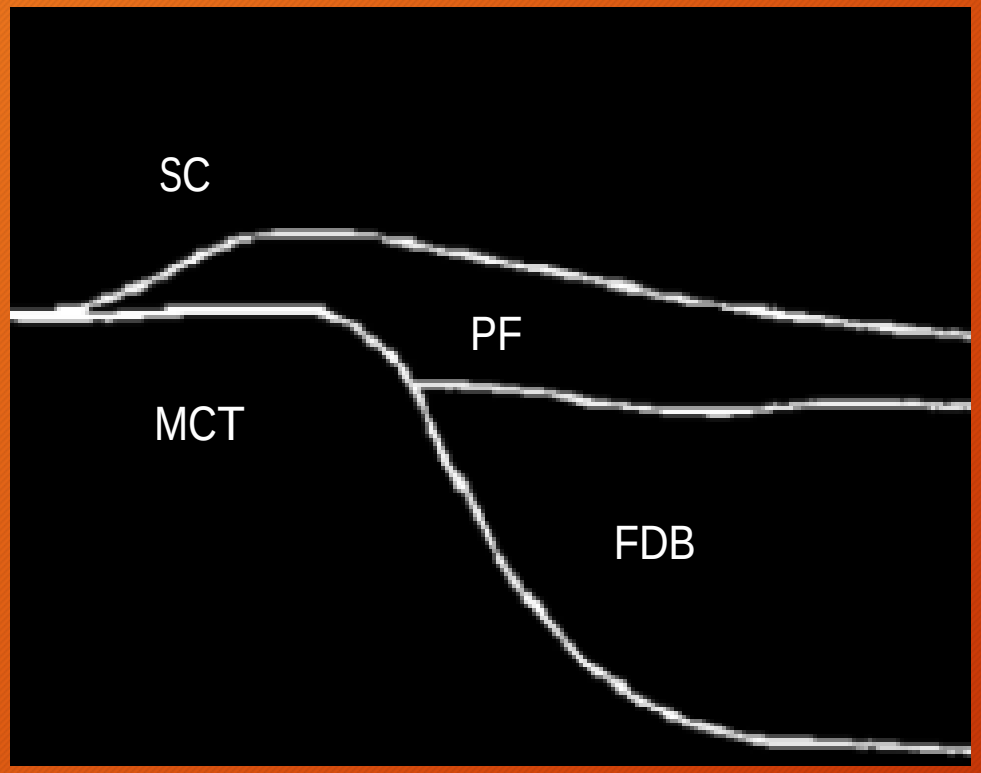
Kelikian, A S. Sarrafian's Anatomy of the Foot and Ankle Descriptive, Topographic, Functional 3rd Edition. 2011.Lippincott Williams & Wilkens, Philadelphia. P591 Chapter 10: Functional Anatomy of the Foot and Ankle.
Hicks JH. The mechanics of the foot, II. The plantar aponeurosis and the arch. J Anat. (1954)88:25.

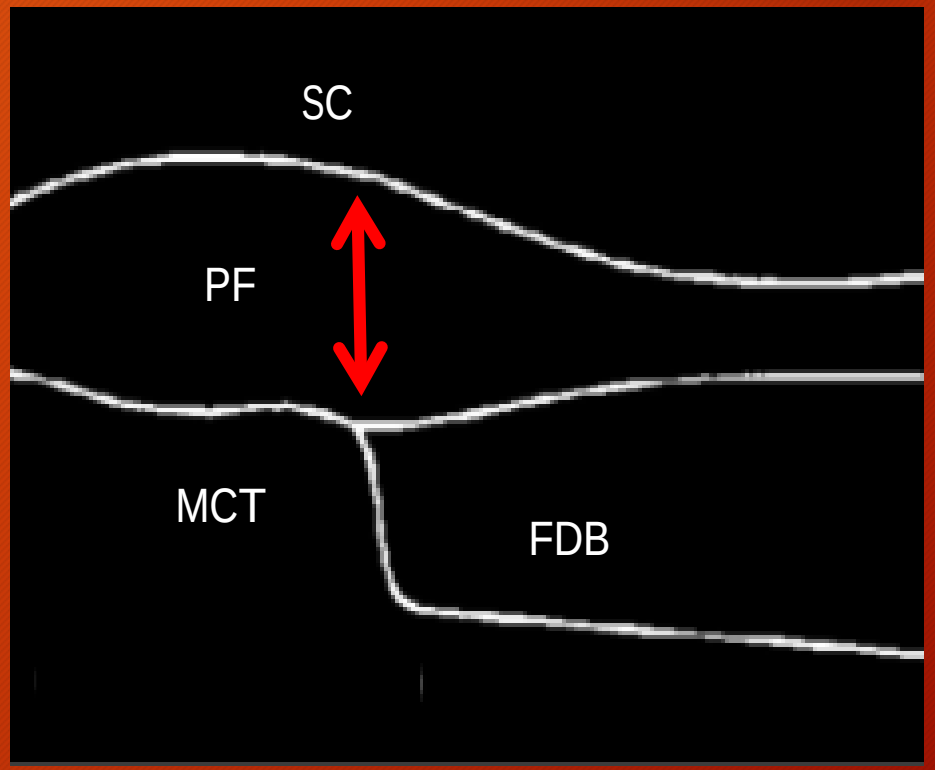
Windlass Test

- This test employs forceful great-toe extension with the person standing; A Positive test will Reproduce pain at the plantar medial calcaneal tubercle (MCT).
- The Association of Dx plantar fasciitis through the Windlass test by Garceau et al. (2003) demonstrated high rate of specificity (100%) but low rate of sensitivity (31.8%) may limit its use in clinical evaluation.

De Garceau D, Dean D, Requejo SM, Thordarson DB. The association between diagnosis of plantar fasciitis and Windlass test results. *Foot Ankle Int.* 2003;24:251–255.

ANATOMY within Sonography

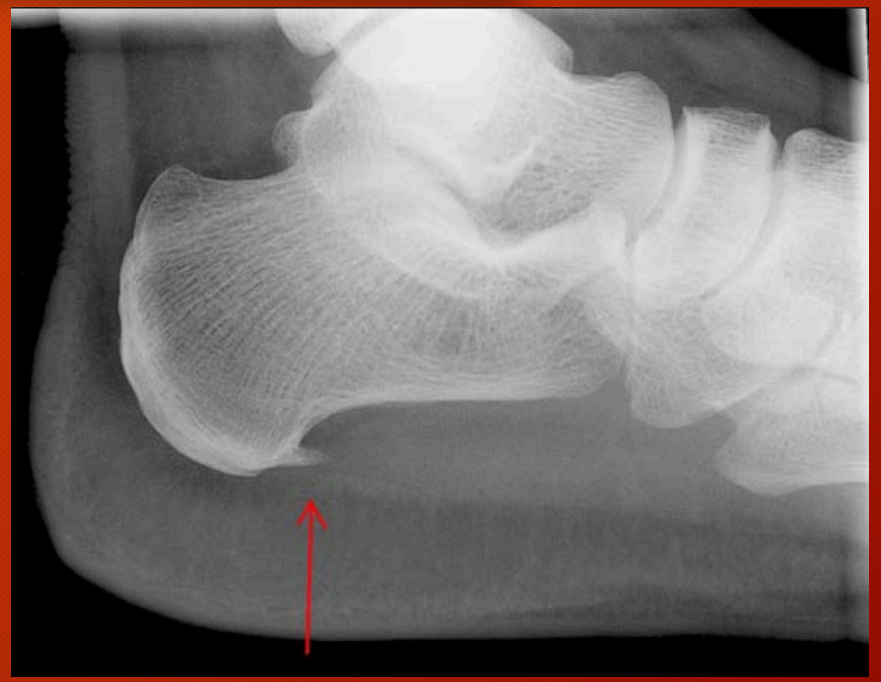




Kane D, Greaney T, Bresnihan B, Gibney R, FitzGerald O.Ultrasound guided injection of recalcitrant plantar fasciitis. *Ann Rheum Dis* 1998;**57**:383–384

Dx Imaging for heel pain

- ARE X-ray's required?

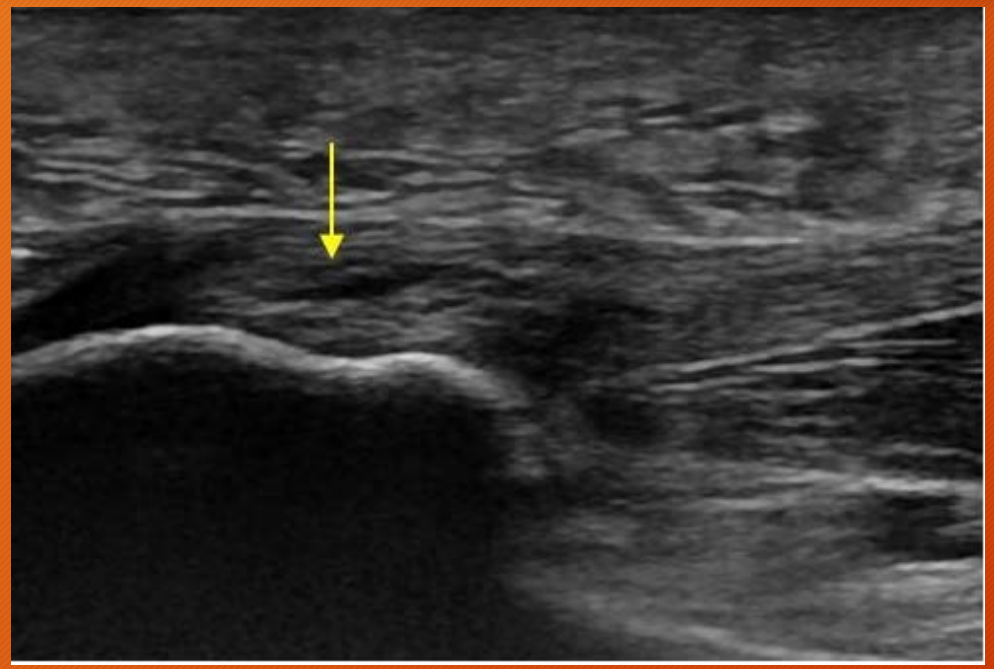


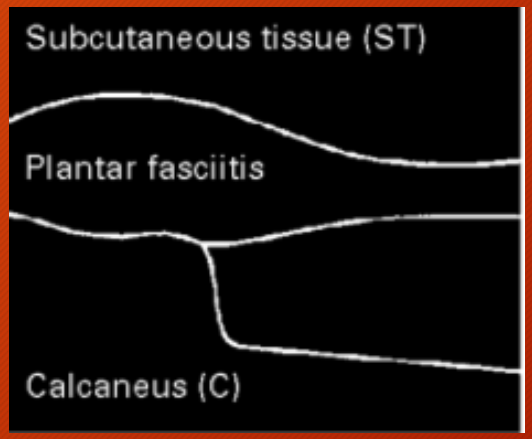
In a review of 1000 plain film radiographs, Shama et al. noted a 13.2% incidence of heel spurs, but only 31% of the patients were symptomatic.

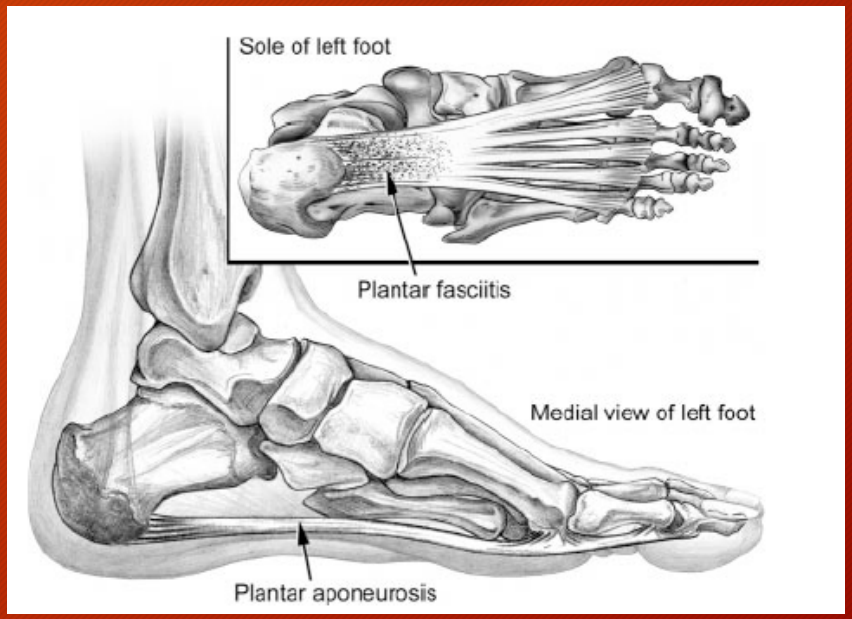
Prichasuk and Subhadrabandhu studied asymptomatic feet (n=400) to patients with CPHP (n=82) and found spurs 15.5% and 65.9%.

Shama SS, Kominsky SJ, Lamont H. (1983) Prevalance of non-painful heel spur and its relation to postural foot position. *J Am Podiatry Assoc* 73:122-123
Prichasuk S, Subhaddrabandu T. (1994) The relationship of pes planus and calcaneal spur to plantar heel pain. *Clin Orthop* 306:192-196.

DIAGNOSTIC ULTRASOUND



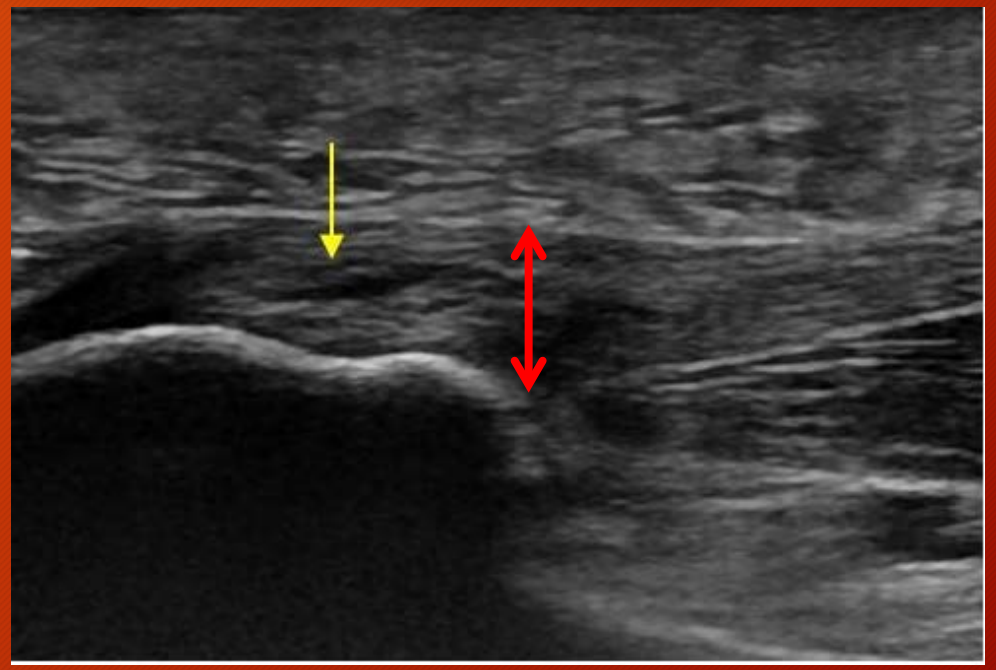




GRADING degeneration of the plantar fascia

PLANTAR FASCIA THICKNESS

< 4.0 mm (NORMAL)
4.0 mm-to-5.0 mm (MILD)
5.0-to-6.2 mm (MODERATE)
>6.5 mm (SEVERE)



McMillan AM, Landorf KB, Barrett JT, Menz HB, Bird AR (2009). **Diagnostic imaging for chronic plantar heel pain: a systematic review and meta-analysis. Journal of Foot and Ankle Research 2:32**

TREATING PLANTAR FASCIITIS: EVIDENCE??

For the most part, there is no single universally accepted way of treating plantar fasciitis.

Crawford F, Thomson C. Interventions for treating plantar heel pain. Cochrane Database of Systematic Reviews 2003, Issue 3. Art. No.: CD000416. DOI: 10.1002/14651858.CD000416

Further discussion

- What about Calcaneal fibro fat pad (CFFP)? Inconsistencies in the literature regarding the relationship of heel pad elasticity and plantar heel pain require further investigations. Key Point with assessment: using index finger and thumb to squeeze the heel → DDx: CFFP, sub-periosteal bone edema. Rx: Heel hole

REMEMBER, combine point of maximum tenderness (PMT) at plantar MCT + Porta pedis + calcaneal heel squeeze.

Metatarsalgia

Metatarsalgia can be viewed as more of a symptom rather than a distinct diagnosis. Timing of forefoot pain during the gait cycle and evaluation of whether the pain is from anatomic abnormalities, indirect overloading, or iatrogenic causes can suggest a specific metatarsalgia etiology.

Charen DA , Markowitz JS, Cheung ZB, Matijakovich DJ, Chan JJ, Vulcano E. Overview of Metatarsalgia. *Orthopedics*, **2019;42(1):e138-e143**

Hallux Limitus/ Hallux Rigidus

- Hallux limitus is a decrease in sagittal plane dorsiflexion of the hallux at the first metatarso-phalangeal joint (MTPJ) when the foot is in a weight-bearing.
- Normal range of motion (ROM) of the first MTPJ should be 65º-to-75º dorsiflexion (Vulcano et al. 2016).
- Hallux limitus can be examined further as functional or structural.

Vulcano E, Tracey JA 3rd, Myerson MS. Accurate Measurement of First Metatarsophalangeal Range of Motion in Patients With Hallux Rigidus. *Foot Ankle Int*. 2016 May;37(5):537-41

Hallux limitus classification

Grade I: limited motion of the first MTPJ, mild pain, no significant degenerative joint disease (DJD), minimal osteophyte
Grade II: limited motion, pain, early DJD, osteophyte
Grade III: limited motion, pain, DJD, osteophyte
Grade IV: joint ankylosis, end stage DJD

Giza E, Sullivan M, Ocel D, Lundeen G, Mitchell M, Frizzell, L. First metatarsophalangeal hemiarthroplasty for hallux rigidus. International Orthopaedics (SICOT) (2010) 34:1193–1198.

Hallux limitus test

A Positive FnHL, When dorsiflexion of the toe is attempted there will be a distinct lack of plantar flexion of the first metatarsal head creating a ‘jamming’ of first MTPJ motion (Hetherington et al 1989).

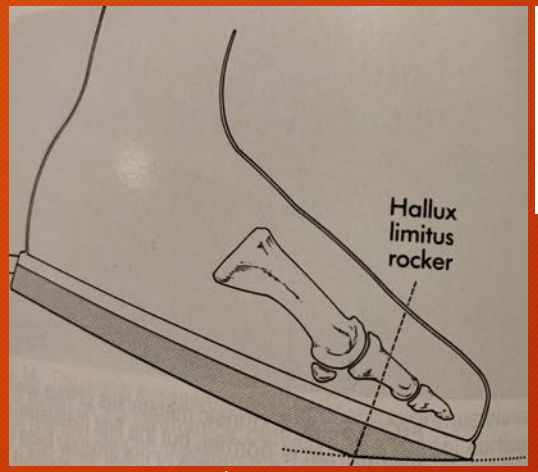
Payne et al (2002) demonstrated sensitivity 72%, specificity 66%.

Hetherington VJ, Carnett J, Patterson BA. Motion of the first metatarsophalangeal joint. *J Foot Surg* 1989;28(1):13-19

Payne C, Chuter V, Miller K. Sensitivity and specificity of the functional hallux limitus test to predict foot function. *J Am Podiatr Med Assoc.* 2002 May;92(5):269-71.

Management of hallux limitus

- FnHL: Create a depression for the first metatarsal to fall into, thereby enhancing first metatarsal plantar flexion. Orthotic prescription terms: reverse Morton's extension, first ray cut-out, plantarflexed 1st ray.
- Structural hallux limitus: To control dorsiflexion moments to the 1st MTPJ, a Morton's extension essentially can immobilize the joint + rocker-bottom orthopedic shoe (Example: New Balance #928v3, NB#1540v2, or Cambrian Genesis).



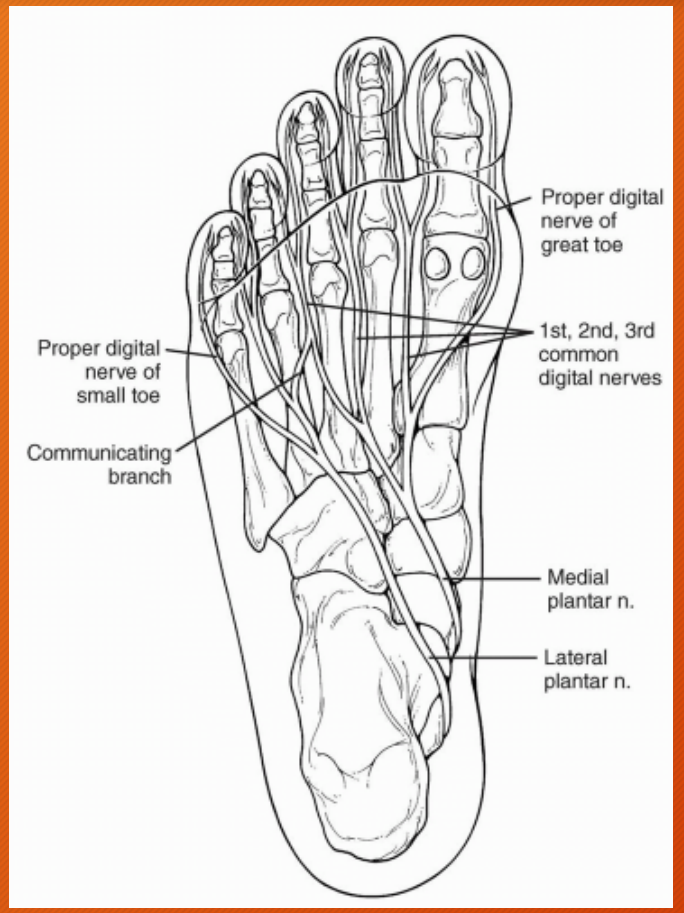
McGlamry's Comprehensive textbook of Foot and Ankle Surgery Volume 1, 3rd Ed. Alan S Banks, Michael S Downey, Dennis E Martin, Stephen J Miller. Lippincott Williams & Wilkins 2001 Philadelphia. P690, Section IV:First ray,Hallux Abducto Valgus, and related deformities.

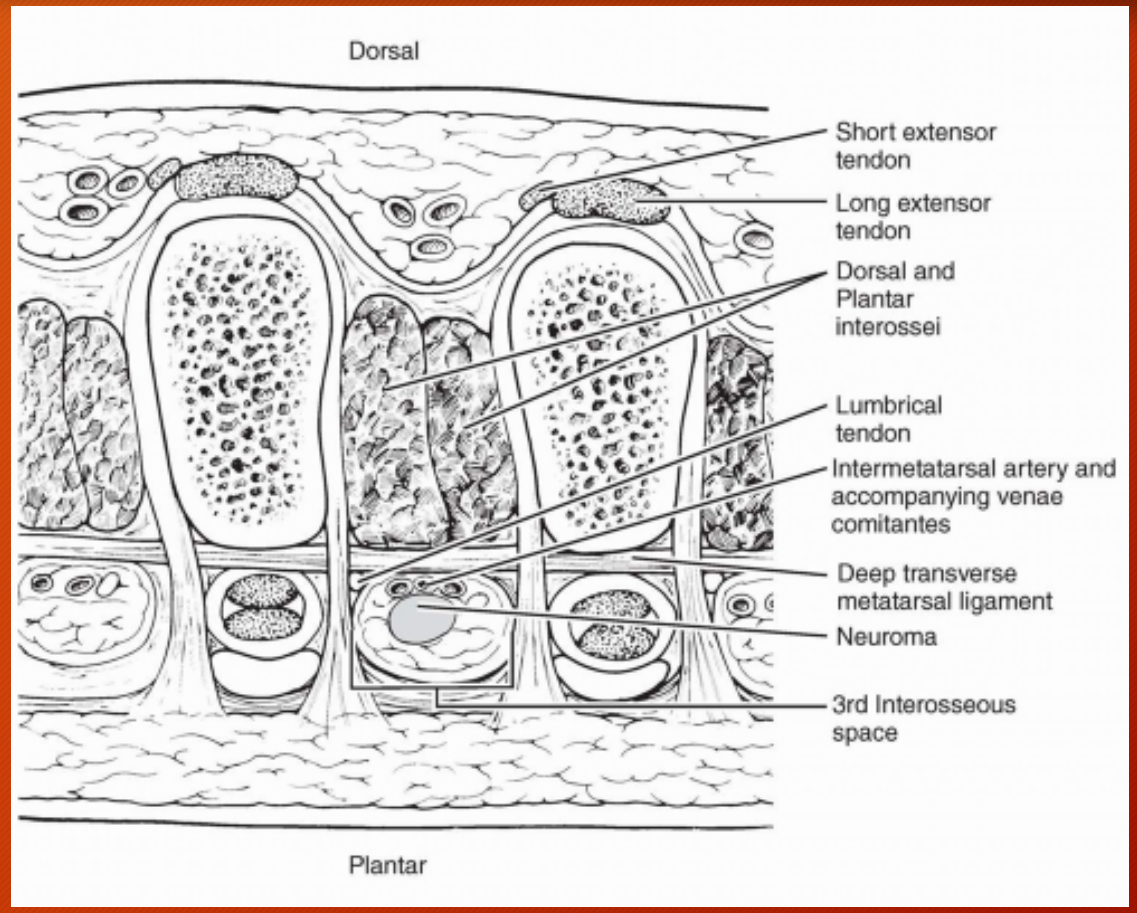
Morton's Neuroma

- Morton's neuroma (MN) is considered a mechanically induced degenerative neuropathy affecting the 3rd inter-metatarsal space (IMS) of the common plantar digital branch formed by the confluence of the medial plantar nerve (MPN) and lateral plantar nerve (LPN).

Morton's neuroma: A clinical versus radiological diagnosis Philip Pastides, Sameh El-Sallakh, Charalambos Charalambides. 2011 Foot and Ankle Society 18 (2012) 22–24

Anatomy of Morton's Neuroma

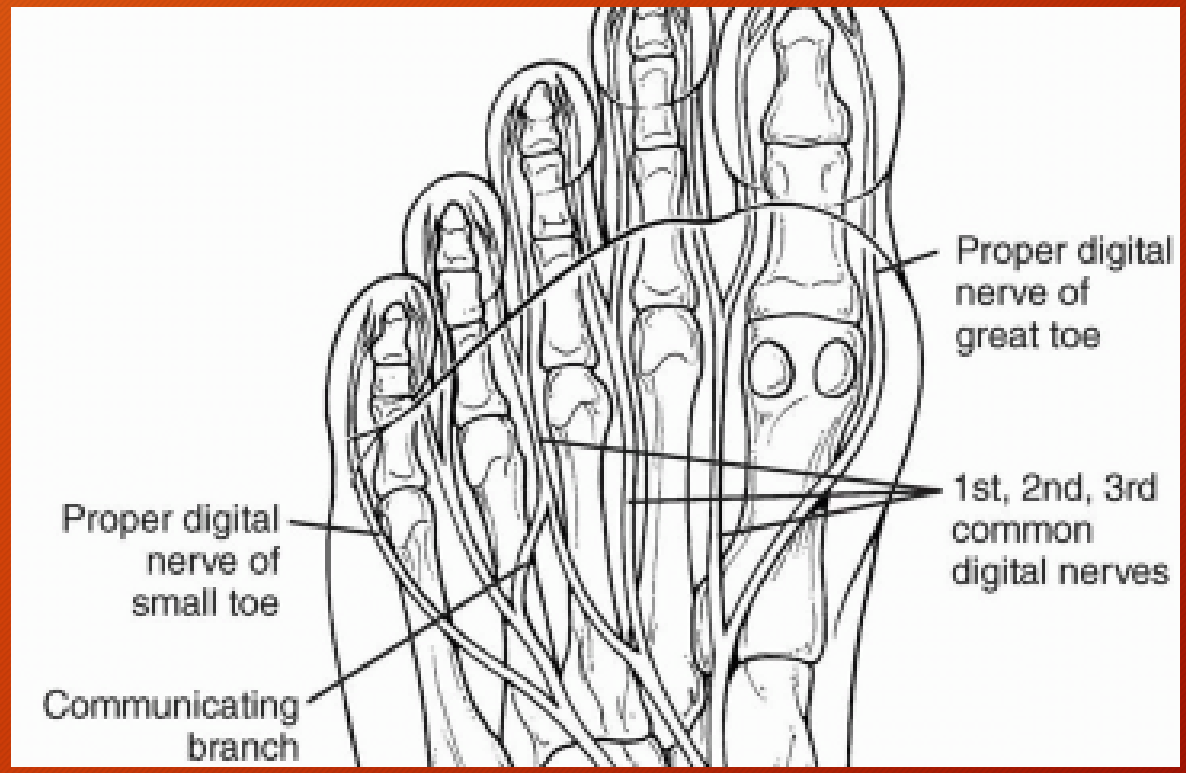




Banks AS, Downey MS, Martin DE, Miller SJ. McGlamry's Comprehensive textbook of Foot and Ankle Surgery Volume 1, 3rd Ed. Lippincott Williams & Wilkins 2001 Philadelphia. Page 232. Chapter 8: Morton's neuroma

Anatomy Pearl

The 3rd commom digital nerve receives anastomotic branch from the superficial branch of the LPN with location and type variable near its bifurcation at the deep transverse inter-metatarsal ligament (DTIML).



Kelikian, A S. Sarrafian's Anatomy of the Foot and Ankle Descriptive, Topographic, Functional 3rd Edition. 2011.Lippincott Williams & Wilkens, Philadelphia. P415 Chapter 8:Nerves.

Incidence

- It has been reported to be more frequent in the 3rd web space (in 68% of cases), followed by the 2nd web space (in 32% of cases)-Kasparek and Mannan 2013.

- Level 4 clinical evidence, retrospective study of 279 feet, 462 inter-digital neuromas were surgically excised and confirmed through histopathology to be found in multiple sites (Valero et al. 2015)
  - -3rd inter-metatarsal space (IMS) present in one foot 74.2% (n=97)
  - -Multiple neuromas, 100% 3rd IMS both feet and 98.9% 2nd IMS (n=182)

- Kasparek M, Schneider W. Surgical treatment of Morton's neuroma: clinical results after open excision. *Int Orthop* 2013; **37.**
- **Valero J, Gallart J, Gonzalez D, Deus J, Lahoz M.** Multiple Interdigital Neuromas: A Retrospective Study of 279 Feet With 462 Neuromas. *J Foot Ankle Surg*. 2015 May-Jun;54(3):320-2.

P/E: Mulder's Sign Test

Clinical tests compared: thumb index finger squeeze (96% sensitivity, 96% accuracy), Mulder's click (61% sensitivity, 62% accuracy), foot squeeze (41% sensitivity, 41% accuracy)

Currently, there is NO pathognomonic diagnostic tests that exist for Morton's neuroma. Therefore, imaging may be required to confirm the Dx and R/O other causes of forefoot pain (Inter-metatarsal bursa)

•Mahadevan D, Venkatesan M, Bhatt R, Bhatia M. (2015) Diagnostic Accuracy of Clinical Tests for Morton's Neuroma Compared With Ultrasonography. *Journal Foot Ankle Surgeons*. July-August;54(4):549-53.

•Owens R, Gougoulias N, Guthrie H, Sakellariou A. Morton's neuroma: clinical testing and imaging in 76 feet, compared to a control group. Foot Ankle Surg. 2011;17:197–200.

DDx to consider

DDx: Inter-metatarsal bursitis,ganglion cyst, synovitis MTPJ, stress Fracture, Frieberg's
Rheumatoid nodule
With significant flow on power Doppler imaging (PDI) or color flow (CF) on B-mode high-resolution diagnostic ultrasound examination, Hemangioma, giant cell tumor tendon sheath, Schwonoma
Synovial Sarcoma

Dynamic compression of R/F-2nd IMS

GE Logiq e high-resolution LA12-8 MHz sag view

Compressible hypoechoic mass

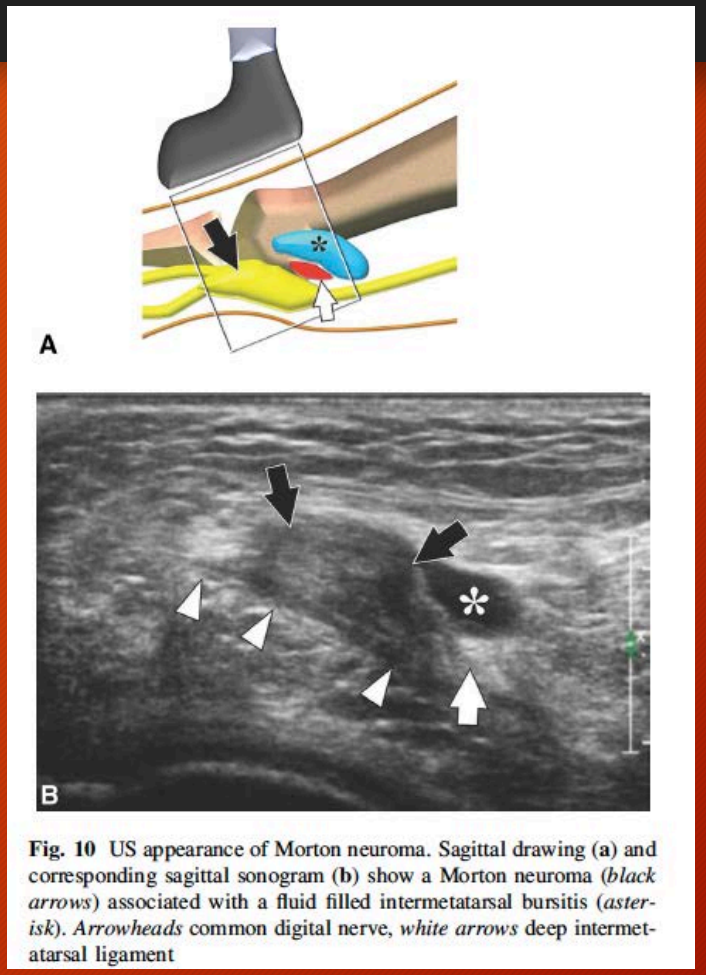
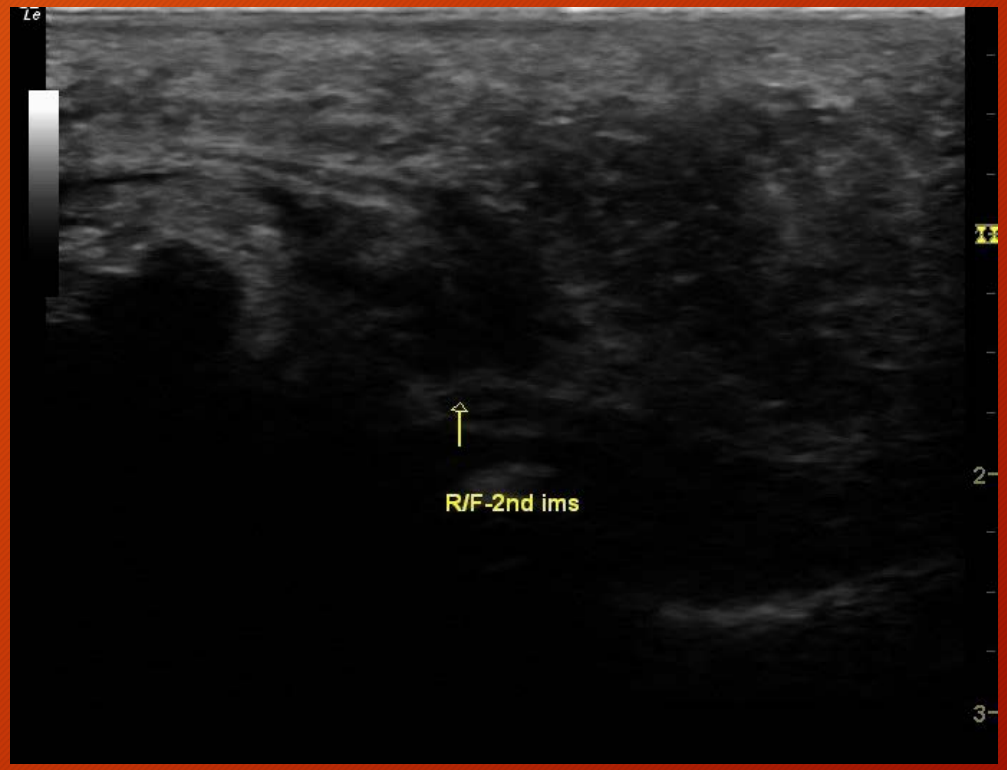


Fig. 10 US appearance of Morton neuroma. Sagittal drawing (**a**) and corresponding sagittal sonogram (**b**) show a Morton neuroma (*black arrows*) associated with a fluid filled intermetatarsal bursitis (*asterisk*). *Arrowheads* common digital nerve, *white arrows* deep intermetatarsal ligament

Bianchi, Stefano (2014) Practical US of the forefoot. *J Ultrasound*, 17:151-164

Sonography sagittal view



Mx for Morton's neuroma

A Cochrane review, Interventions on the treatment of Morton' neuroma by Thomson et al (2009) found no evidence to support the use of pronatory insoles (RR1.10; 95% CI 0.45 to 2.70 [Kilmartin 1994]).

Table 1. Quality assessment of included trials

Study ID	Randomi-sation method	Allocation concealmn	Patient blinding	Assessor blinding	Diagnostic criteria	Outcome criteria	Baseline differences	Complete-ness of f-up
Colgrove 2000	C	A	A	A	C	A	A	A
Kilmartin 1994	C	D	D	D	B	A	D	A
Nashi 1997	C	D	D	D	A	C	B	D

- Treatment of Morton's neuroma: a systematic review (Valisena et al 2017) concluded that a single RCT conservative (versus infiltrative or Surgical) management using orthotics offered 48% satisfaction whereas infiltrative and surgical provided 85% and 89% improvement

Table 2
Primary and secondary outcomes of the included studies.

Study type	Satisfaction	Complication rate	Failure rate
Conservative 1 study (C)	Overall 48%	Not available	47%
Infiltrative 11 studies (A, B)	Overall 85% A 74, B 75%	3% 10 studies	14% 10 studies
Surgical 17 studies (A, B, C)	Overall 89% A 91, B 82, C 92%	21% 14 studies	4% 13 studies

A: retrospective studies, B: prospective studies, C: RCT.

Valisena S, Petri GJ, Ferrero A. Treatment of Morton's neuroma: a systematic review. *Foot Ankle Surg*. 2017 Aug;24(4):271-281

- Shoes is possibly the most important conservative Mx in conjunction with OTC inserts or custom foot orthosis.

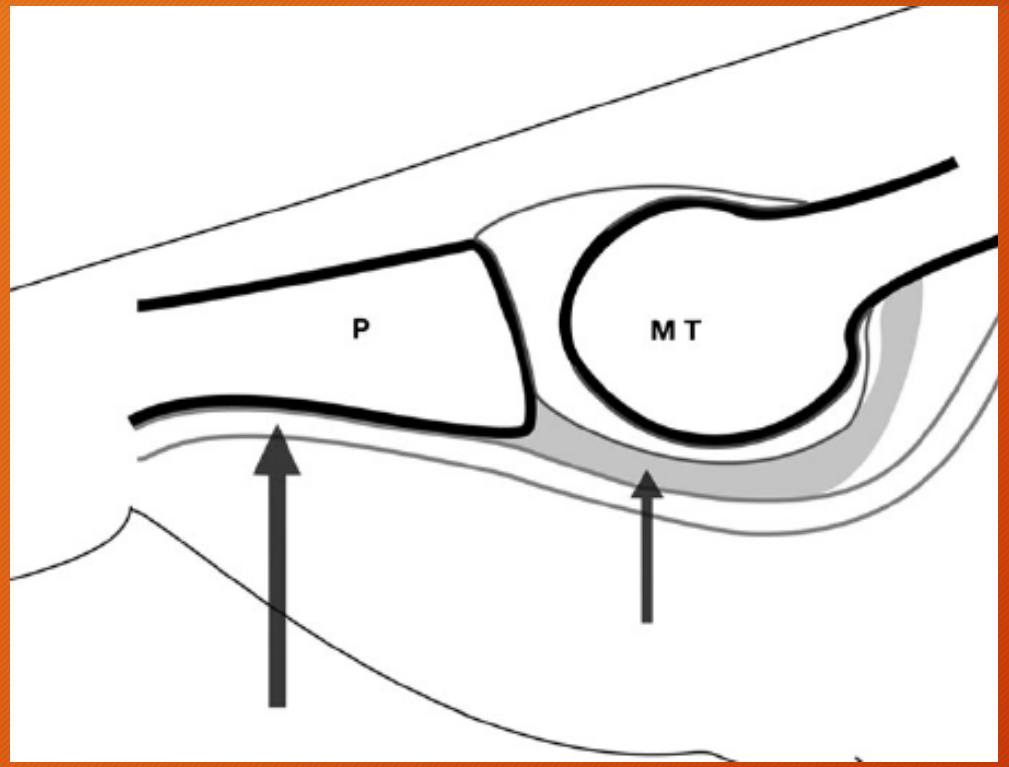
Plantar Plate

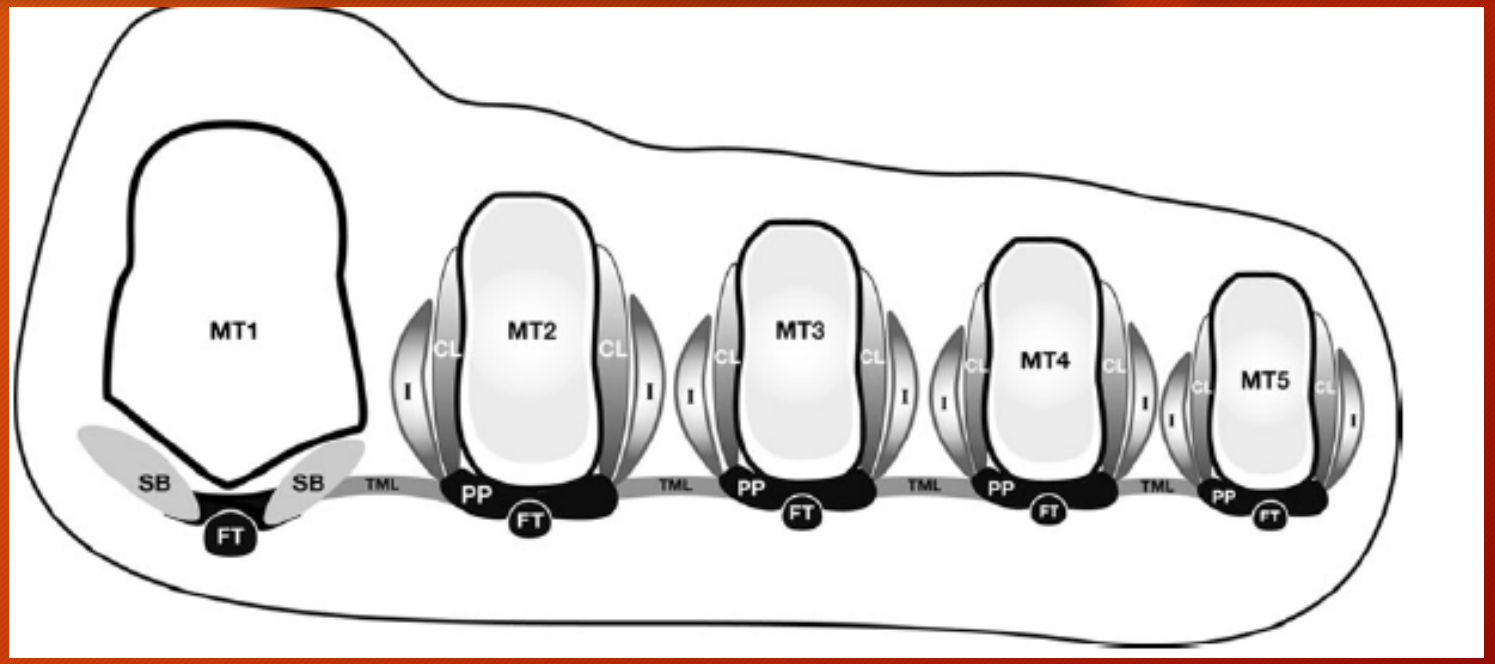
The fibrocartilaginous plantar plate is the most important static stabilizer of the MTPJ; high loading with weight bearing can lead to attritional plantar plate injuries. The most common joint affected was the 2nd MTPJ (Coughlin 1987).

Untreated plantar plate instability can lead to hammer toe and mallet toe deformities. This occurs due to attenuation of the lateral collateral ligament in association with injury to the lateral portion of the plantar plate →dorso-medial subluxation or a crossover toe.

Coughlin MJ. Crossover second toe deformity. Foot Ankle.1987;8(1):29–39.

Anatomy of the plantar plate





Heidi J. Siddle & Richard J. Hodgson & Anthony C. Redmond & Andrew J. Grainger & Richard J. Wakefield & David A. Pickles & Elizabeth M. A. Hensor & Philip S. Helliwell. MRI identifies plantar plate pathology in the forefoot of patients with rheumatoid arthritis. Clin Rheumatol (2012) 31:621–629

Assessment for Plantar plate

In the initial phases, making a diagnosis of plantar plate may be difficult, because the symptoms mimic other common pathological conditions, such as interdigital neuroma or metatarsalgia.

TEST: Positive Drawer sign/ Modified Lachman's test [The "drawer test" on the MTP joint showed a clear and significant difference between the types of plantar plate injury ($p < 0.0001$)]- Nerya et al 2015.

TEST: Touching the ground test / Retracted toe (also demonstrated a significance difference $p < 0.0001$)-Nerya et al 2015.
Sensitivity/specificity

Treatment for plantar plate

Strapping is the most effective

Plantar 2nd U-shape modification to limit dorsiflexion moments on OTC products. RED FLAG, DO NOT use metatarsal pads? Why…

Shoes: stiff forefoot or rocker

Single limb stance heel raise (SLSHR)

Why do we examine SLSHR for?

SLSHR test is used for the assessment of posterior tibialis tendon dysfunction (PTTD).

Despite its common application in the assessment and diagnosis of PTTD, there is little documented evidence surrounding consensus in relation to the purpose of the heel raise test (Durrant et al., 2015).

Weakness of the posterior tibialis muscle is thought to contribute to the inability to perform a heel raise (Raikin et al., 2012).

•Durrant B, Chockalingam N, Richards PJ, Morriss-Roberts C. (2015). Posterior Tibial Tendon Dysfunction: What does the single heel raise test mean in assessment?. *Foot and Ankle On-line Journal.*, 8(2):6.

•Raikin SM, Winters BS, Daniel JN. (2012) The RAM Classification: A Novel, Systematic Approach to the Adult-Acquired Flatfoot. *Foot and Ankle Clinics*. June;17(2):169-81.

- An abnormal heel rise test is observed when the individual cannot perform a heel rise or performs the heel rise with hind foot eversion -fails to invert hind foot on rising-(Kohls-Gatzoulis et al., 2004).
- A systematic review investigating SLSHR, found poor concordance to specific test criteria even though this is used in many disciplines (Hébert-Losier et al., 2009).

- Kohls-Gatzoulis J, Angel JC, Singh D, Haddad F, Livingstone J, Berry G. (2004) Tibialis posterior dysfunction: a common and treatable cause of adult acquired flatfoot, *BMJ.*, Dec 329(7478):1328-33.
- Hébert-Losier K, Newsham-West RJ, Schneiders AG, Sullivan SJ. (2009) Raising the standards of the calf-raise test: A systematic review. *Journal of Science and Medicine in Sport*, Nov;12(6):594-602.

On a foot note…

2nd TMTJ injection

Sinus tarsi injection

1st MTPJ injection

4th TMTJ injection

Question & Answer

Acknowledge

- PA. Steven Piotrowski B.Sc., M.Sc., MPAS., CCPA
  Family Medicine/Emergency Medicine Physician Assistant