Foot and Ankle

with

Pete Garbutt

FICS
INTERNATIONAL FEDERATION OF SPORTS CHIROPRACTIC

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Sprains

- Inversion
- Eversion
- High Ankle/Syndesmosis

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The implications of ankle sprains

- Decreased Hip abductor strength (Friel 2006)
- Ankle range of motion (Friel 2006)
- Increased inversion on foot strike (Moisan 2021)
- Balance (Miklovic 2017)
- Sporting performance (Han 2011)
- Recurrent sprain – time out of sport

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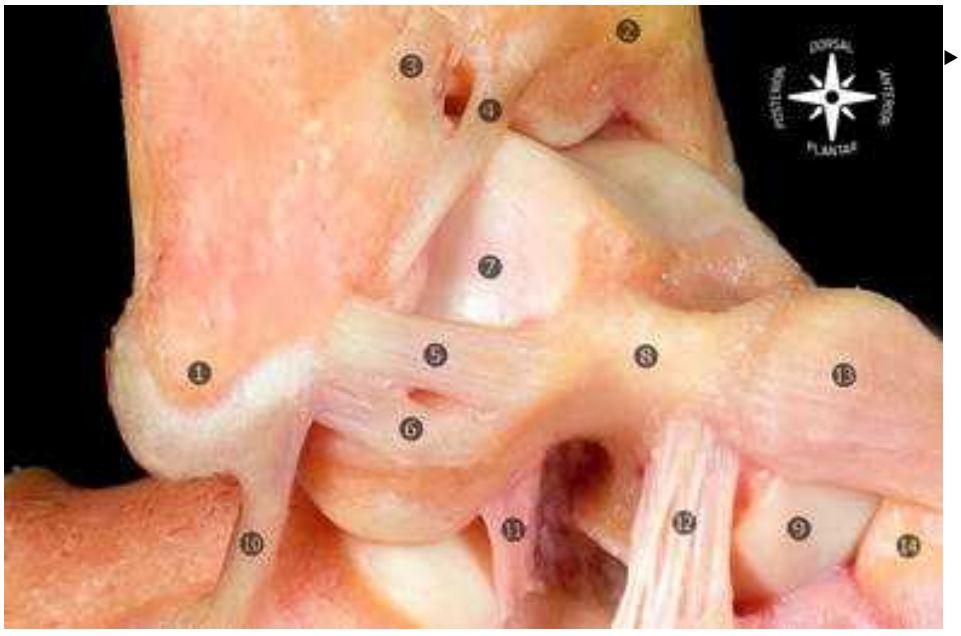

- Osteoarticular anatomic dissection of the lateral ligaments of the foot and ankle joint. The anterior talofibular ligament is typically composed of two separate bands. *1* Tip of the lateral malleolus; *2* tibia; *3* anterior tibiofibular ligament; *4* distal fascicle of the anterior tibiofibular ligament; *5* superior band of the anterior talofibular ligament; *6* inferior band of the anterior talofibular ligament; *7* lateral articular surface of the talus; *8*neck of the talus; *9* head of the talus; *10* calcaneofibular ligament; *11* talocalcaneal interosseous ligament;*12* cervical ligament; *13* talonavicular ligament; *14* navicular

Golanó et.al. 2010 Anatomy of the ankle ligaments: a pictorial essay

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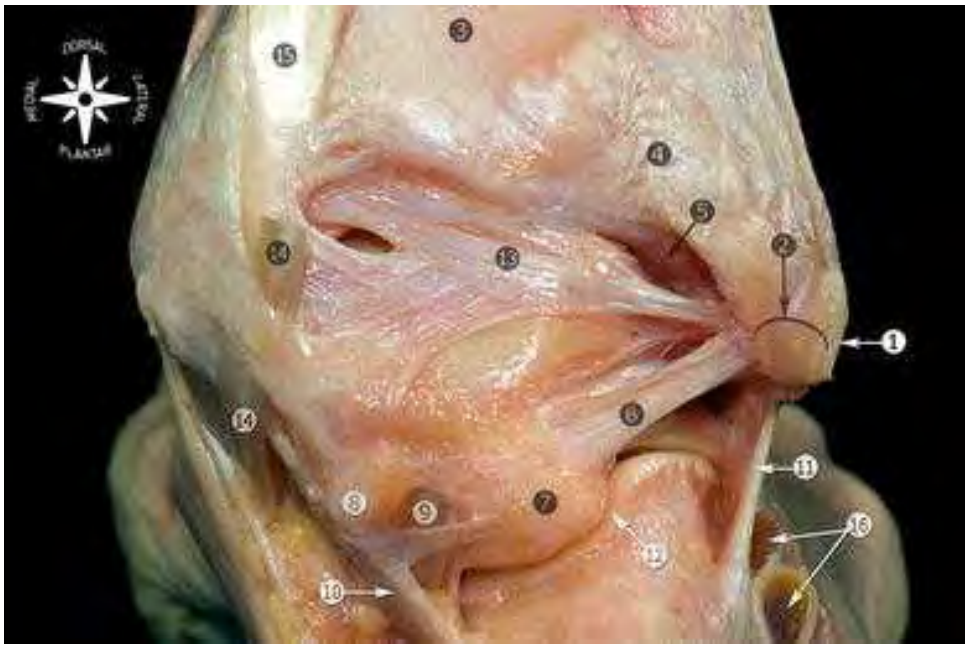

Posterior view of the anatomic dissection of the ankle ligaments. *1* Tip of the fibula; *2* peroneal groove of the fibula; *3* tibia; *4* superficial component of the posterior tibiofibular ligament; *5* deep component of the posterior tibiofibular ligament or transverse ligament; *6* posterior talofibular ligament; *7* lateral talar process; *8*medial talar process; *9* tunnel for flexor hallucis longus tendon; *10* flexor hallucis longus retinaculum; *11*calcaneofibular ligament; *12* subtalar joint; *13* posterior intermalleolar ligament; *14* flexor digitorum longus tendon (cut); *15* tibialis posterior tendon; *16* peroneal tendons

Golanó et.al. 2010 Anatomy of the ankle ligaments: a pictorial essay

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Ankle Sprain assessment – Talar Tilt Test

https://www.youtube.com/watch?v=SDGU7cqxN6s&t=63s

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Ankle Sprain Assessment – Ant. Drawer

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What really happens

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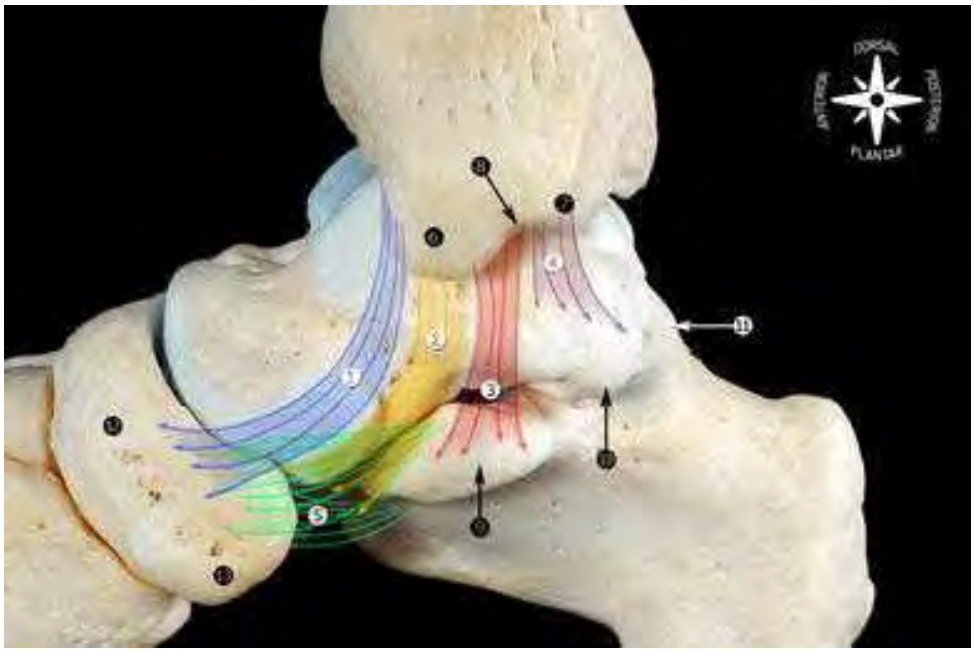

Schematic representation of the main components of the medial collateral ligament found as frequently observed in our dissections. The morphology of the medial malleolus is helpful to understand the origins of the medial collateral ligament. In the medial view, two areas or segments (culliculi) can be seen, separated by the intercollicular groove. *1* Tibionavicular ligament; *2* tibiospring ligament; *3* tibiocalcaneal ligament; *4*deep posterior tibiotalar ligament; *5* spring ligament complex (plantar and superomedial calcaneonavicular ligaments); *6* anterior culliculus; *7* posterior culliculus; *8* intercullicular groove; *9* sustentaculum tali; *10*medial talar process; *11* lateral talar process; *12* navicular; *13* nav icular tuberosity

Golanó et.al. 2010 Anatomy of the ankle ligaments: a pictorial essay

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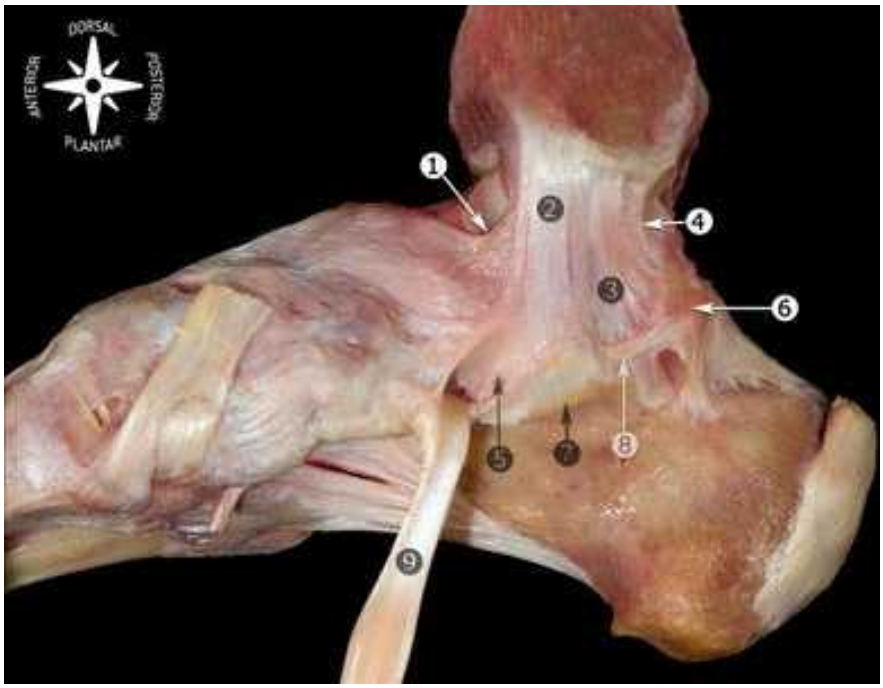

Medial view of the anatomic dissection of the main components of the **medial collateral ligament.**

*1*Tibionavicular ligament;

2 tibiospring ligament;

3 tibiocalcaneal ligament;

4 deep posterior tibiotalar ligament;

5 spring ligament complex (superomedial calcaneonavicular ligament);

6 medial talar process;

*7*sustentaculum tali;

8 medial talocalcaneal ligament;

9 tibialis posterior tendon

Golanó et.al. 2010 Anatomy of the ankle ligaments: a pictorial essay

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Syndesmosis Injury (High Ankle Sprain)

- Often incomplete
- Inability to push off ankle
- Usually inversion mech, Common in:
  - Soccer (tackle)
  - Football (player prone, foot stepped on)
  - Skiing (slalom, catch ski on gate)
- Mechanism
  - Forceful external rotation, hyper Dorsiflexion, hyper Plantarflexion

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Syndesmosis Injury (High Ankle Sprain) Exam

- Less swelling than with severe lat ankle sprain
- Palpate tibia & fibula
  - rule out #
- Ant jt line / ant syndesmosis tender
- Squeeze test +ve
  - squeeze above mid calf causes distal pain
- Ext Rotation (Kleiger's) test:
  - stabilise distal leg & ext rot foot
  - > 3mm difference between feet +ve
- Push off / heel raise weak
- Check neurovascular status:
  - rule out compartment syndrome

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Kleiger's Test

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Fractures

- Direct Trauma
- Avulsion
- Stress

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Direct Trauma

- Most of these are pretty obvious
  - Incident
  - Significant localised pain
  - Generally trouble weight bearing

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Lisfranc Injury

- The Lisfranc joint complex consists of the articulations of the intertarsal, intermetatarsal, and tarsometatarsal surfaces.

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- Transverse stability provided by the wedge-shaped metatarsal bases and their corresponding cuneiform-cuboid articulations, with the second metatarsal recessed between the medial and lateral cuneiforms as the keystone.
- Stability in this area is provided by the Lisfranc ligament, which runs from the medial cuneiform to the second metatarsal.

Lisfranc Presentation

- Often Hx of high speed injury such as motor vehicle accident or skiing
- Can be result of twisting the foot in a fall, particularly landing on ball of foot
- Will report
  - Pain in mid foot on palpation
  - Pain lifting heel off ground
  - Pain and swelling across top of foot
  - May be bruising under foot
  - Difficulty walking and balancing
- Early diagnosis important for effective management

Lisfranc Injury

DiDomenico 2012

- Note separation between the medial column and the central column of the foot.
- Diffuse bruising through the arch

Avulsion Fractures

- Distal fibula
  - Usually associated with an inversion ankle sprain
  - Increased specific pain at lateral malleolus
- Proximal 5th metatarsal

5th Metatarsal Fractures

https://upswinghealth.com/conditions/fifth-metatarsal-fractures/

- Jones fractures often require surgical intervention
- Shaft and head fractures usually traumatic

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5th MT Fracture Etiology

- Zone 1 (avulsion)
  - Twisting injury. Occurs when the rearfoot gets forced into inversion during plantar flexion, for example landing awkwardly after a jump – think basketball, volleyball
- Zone 2 (Jones Fracture)
  - Significant adduction to the foot with a raised heel such as a quick change of direction when running – think various football codes, netball, ultimate frisbee.
  - Often involve the 4th and or 5th MT articulation. Non-union rates as high as 15-30%
- Zone 3
  - Proximal zone 3 usually stress fracture territory. Runners and others that might accumulate repetitive load in high volumes
  - Also the site of dancer's fractures or spiral fracture. Comes from rolling foot coming down from demi-pointe or landing a jump

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5th MT Fracture Presentation

Smidt 2021

- Regardless of type, they will be painful on palpation
- There will be pain with weight bearing.
  - Stress fractures will generally increase with time under load
  - Other fractures are immediately painful
- Resisted foot eversion will be painful

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5th MT Fracture Management

1

Zone 1 non-displaced

- Conservative management
- 3-6 weeks protected weightbearing hard soled shoe, walking boot or cast
- Progression to normal weightbearing as tolerated over the 3-6 weeks

2

Zone 2 non-displaced

- Conservative management an option
- 6-8 weeks non-weightbearing in a short leg cast
- Most athletes will opt for surgery

3

Zone 3 stress fracture

- Conservative management
- non-weightbearing in a short leg cast – could be up to 20 weeks!

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Stress Fracture Presentation

- Pain associated with repetitive activity, commonly running
- Usually a gradual increase in symptoms and activity based
- Very specific tenderness to touch
- Stress reaction is a continuum

Incidence of Stress Fractures

TABLE 1 LOW- AND HIGH-RISK BONE STRESS INJURIES IN RUNNERS

Low Risk	High Risk
Posteromedial tibia	Femoral neck
Fibula/lateral malleolus	Anterior cortex of the tibia
Femoral shaft	Medial malleolus
Pelvis	Talus (lateral process)
Calcaneus	Navicular
Diaphysis of second to fourth metatarsals	Proximal diaphysis of the fifth metatarsal
	Base of second metatarsal
	Great toe sesamoids

Warden 2014

Bone Stress Injury Continuum

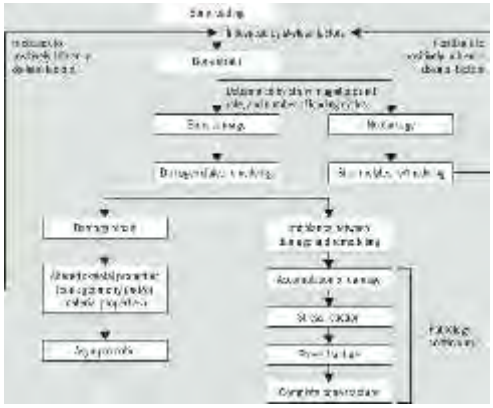

FIGURE 1. Proposed pathophysiology of BSIs. Abbreviation: BSI, bone stress injury. Reproduced from Warden et al,118 with kind permission from Springer Science and Business Media.

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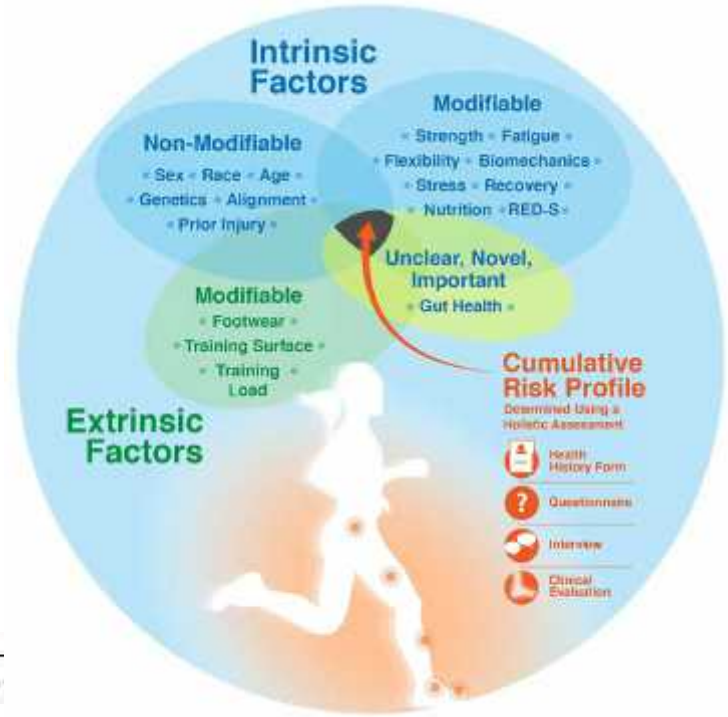

Hamstra-Wright 2021

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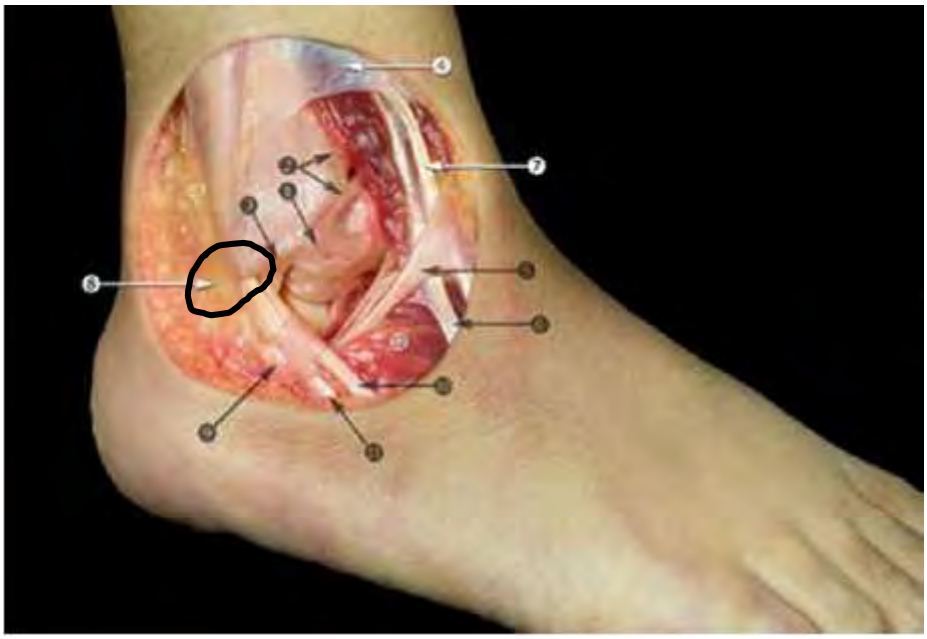
Common Tendon Injuries

- Achilles
  - Tendinopathy
  - Rupture
- Peroneal
  - Tendinopathy
  - Subluxing

Subluxing Peroneal Tendon

- Rupture of the superior peroneal retinaculum.
- Commonly subsequent to inversion ankle sprains
- Athlete feels “pop/flick” along with pain and sense of instability behind lateral malleolus
- Test: resisted dorsiflexion and eversion
- Treatment: Surgery or 6 weeks in a boot to allow healing



Golanó et.al. 2010 Anatomy of the ankle ligaments: a pictorial essay

Anterolateral view of the ankle. Anatomic dissection. *1* Anterior talofibular ligament; *2* anterior tibiofibular ligament; *3* fibular insertion of the calcaneofibular ligament; *4* superior extensor retinaculum; *5* inferior extensor retinaculum; *6* peroneus tertius tendon; *7* extensor digitorum longus tendons; *8* superior peroneal retinaculum; *9* inferior peroneal retinaculum *10* peroneus brevis tendon; *11* peroneus longus tendon; *12*extensor digitorum brevis muscle

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Achilles Tendon Rupture Presentation

- Sudden onset
- Often an audible crack or pop
- Push off phase of running
- 30-50yr olds most common
- Mx: Surgery vs Conservative

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PG1

Thompson and Maltes Tests

https://www.youtube.com/watch?v=E1_Z3GRG7cO

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Achilles Tendinopathy Presentation

- Gradual onset
- Characterised by pain and swelling
- Often associated with a sudden increase in training intensity or duration
- Initially treated with conservative management of exercise and local therapies, can end in surgical management.

Aicale 2020

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Slide 33

PG1 Pete Garbutt, 4/06/2021

Look to the structure for clues to management

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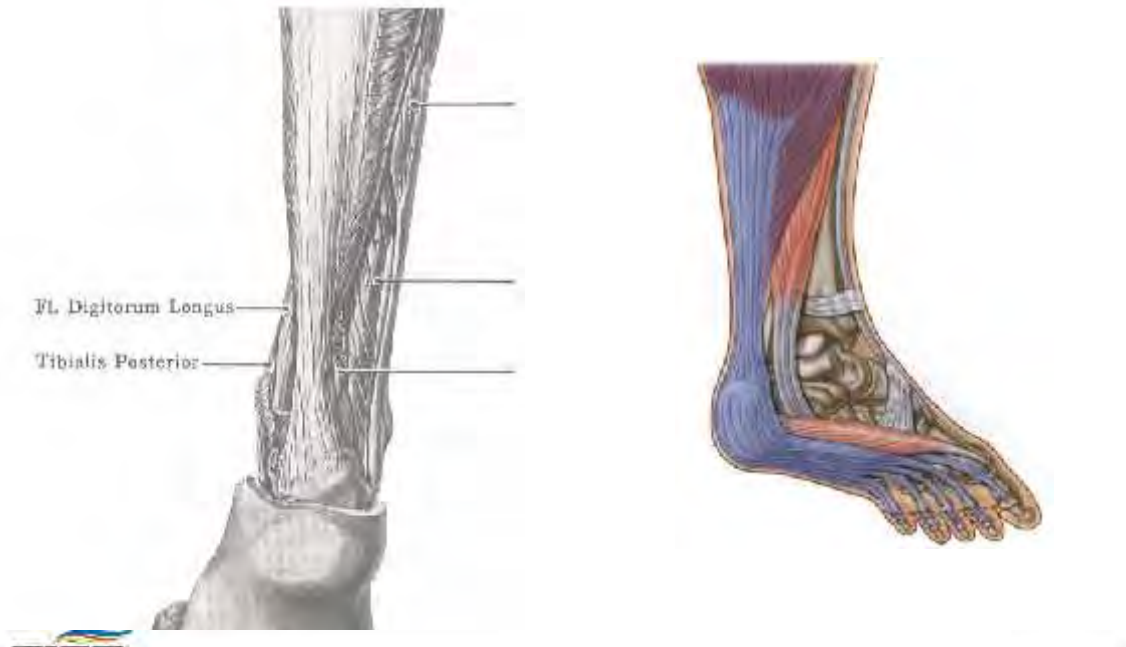

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Plantar Fasciopathy

- Gradual onset
- Increase in loading often associated
- Pain in morning and when getting up from resting
- Pain often medial side of heel to medial longitudinal arch
- Foot strengthening an important part of management

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Calcaneal Fat Pad Syndrome

- Can be degenerative or traumatic
- Pain more likely on heel strike in walking rather than mid-stance
- Squeezing the fat pad will give pain as opposed to stretching the foot into dorsi-flexion
- Will respond more readily to softer heels in shoes or gel cups

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Nerve Injuries

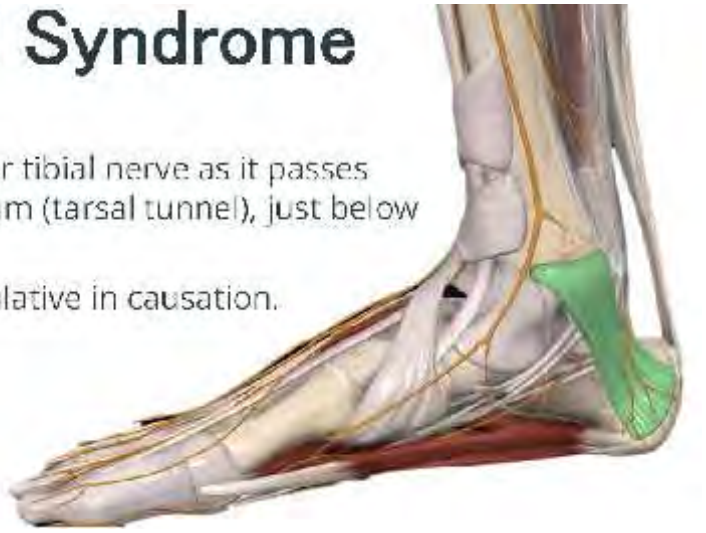
- Tarsal Tunnel Syndrome
- Medial/Lateral Plantar nerve entrapment
- Medial calcaneal nerve

https://www.sportsinjuryclinic.net

Medial/Lateral Plantar Nerve Entrapment

- Lateral plantar nerve passes deep to the proximal insertion of the abductor hallucis muscle. It continues across the sole anteriorly and laterally, between the digitorum brevis and quadratus plantae muscles.
- Generally an irritation of the soft tissues, may be traumatic

Tarsal Tunnel Syndrome



- Compression of the posterior tibial nerve as it passes through the flexor retinaculum (tarsal tunnel), just below the medial malleolus
- May be traumatic or accumulative in causation.
  - Osteoarthritis
  - Rheumatoid arthritis
  - Diabetes
  - Overpronation
  - Cyst or ganglion

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Calcaneal Nerve Entrapment

- Very similar to tarsal tunnel, but symptoms are more localised.
- Overpronation and inappropriate footwear are the most common causes

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Tinnel Test

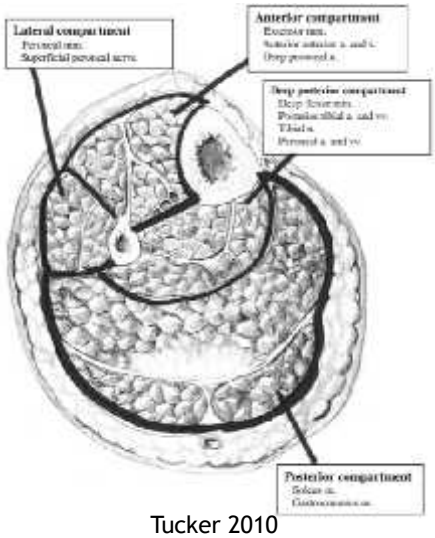
https://www.youtube.com/watch?v=emjRzKj0vQU

Lower Leg Compartment Syndrome – Acute

- Sudden onset
- Associated with trauma such as fracture or significant contusion
- 6 P's
  - Pain
  - Poikilothermia
  - Pallor
  - Paresthesia
  - Pulselessness
  - Paralysis
- This is a medical emergency

Lower Leg Compartment Syndrome – Exertional (Chronic)

- History very important in Dx
  - Often bilateral
  - Pain in a compartment at the same
    - Time
    - Intensity
    - Distance
  - Pain increases if exercise continued to a point of being unbearable
  - Pain and tightness resolve after a rest period
  - Pain described as burning, aching or pressure
  - Numbness or tingling in the dermatomal distribution of nerve running through compartment
  - Muscle weakness associated with specific compartment



Tucker 2010

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Muscular strains/tears – prevalence

- Hamstring – 37%
- Groin – 23%
- Quad – 19%
- Calves – 17%

https://www.youtube.com/watch?v=2VsyiX2J9Cg

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What Does The Evidence Suggest?

- Most clinical tests for muscle injuries show low to very low diagnostic effectiveness.
- FIFA 11+ as well as the Copenhagen Adductor strengthening program can reduce groin injuries
- Nordic Hamstring exercises are superior to usual care for reducing hamstring injury rates.
- Lengthening exercises appear to be superior for return to play over usual care for hamstring injuries as well as lower reinjury rates.
- PRP doesn't appear to have any impact on return to play or reinjury rates.

Ishoi 2020 Diagnosis, prevention and treatment of common lower extremity muscle injuries in sport

What is our role?

- Apply the available evidence
- Be a sports chiropractor – Ask Why?

Quadriceps Contusion

- Major concern is development of myositis ossificans
- Risk factors
  - Untreated for 3 or more days
  - Ipsilateral knee effusion
  - Previous quadriceps injury
  - Knee flexion less than 120 degrees

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