



18-Common Foot and Ankle Disorder

Objectives:

1. To understand the importance of bony and soft tissues structure of Foot and Ankle.
2. To get a concise idea on common Foot and Ankle disorders.
3. To differentiate from simple disorders and serious ones.
4. To learn about initial management and prognosis.

Team members: Sadiq Arab, Rayan Al Qarni, Faisal Alrabuiea

Team leader: Mohammed Baqais

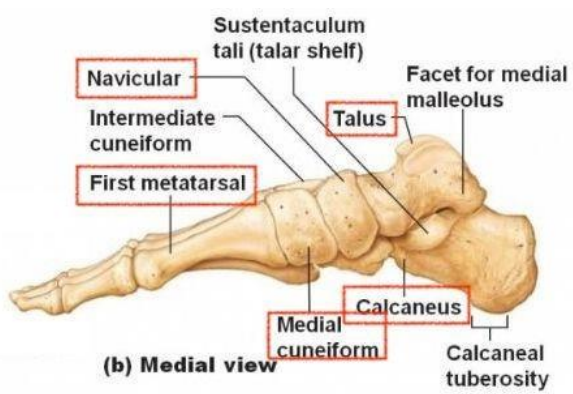
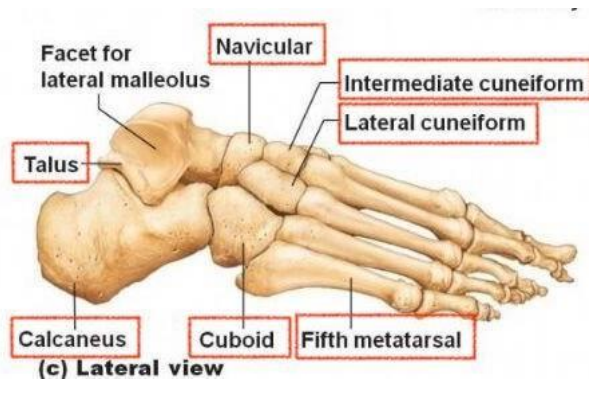
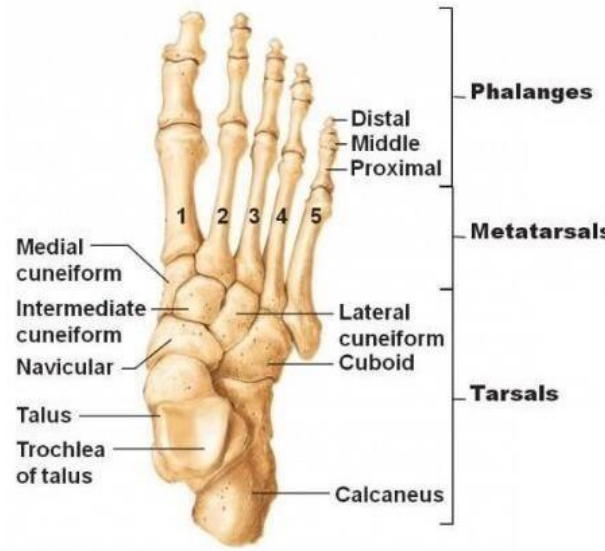

Revised by: Abdulaziz ALmohammed

References: Team 435, slides , notes

introduction

Anatomy

- The foot is (consist of 26 bones) divided into:
- ⇒ **Forefoot:** Phalanx + Metatarsals
- ⇒ **Midfoot:** Navicular+Cuboid+3 cuneiforms
- ⇒ **Hind (rear) foot:** Talus + Calcaneus

Foot Skeleton	
Medial aspect	Lateral aspect
 <p style="text-align: center;">(b) Medial view</p>	 <p style="text-align: center;">(c) Lateral view</p>
Dorsal view	
 <p style="text-align: center;">(a) Superior view</p>	 <p style="text-align: center; margin-top: 10px;">should be done in standing position since it's the function of the foot to bear weight</p>

- We have more bones on the medial side than we have on the lateral side; that's because medial side gives stability while lateral gives flexibility

Importance of foot and ankle:

- They are the structures which are subject to **most weight bearing** (Loading) of the body.
- Have very important **proprioception** function.
- Their **sensory** role is very important.
- Their appearance or deformity is easily noticeable.
- Faulty or improper shoe wear can cause symptoms.
- With advancing age; deformity becomes more common.

Flat foot

[High yield osmosis notes](#)

- Means reduced longitudinal arches of the foot.
- Most cases are **developmental**¹: i.e. arches do not develop normally².
- Usually is painless.³
- Rarely acute flat⁴ foot can be encountered. [Unilateral and usually happens after trauma]
- Rigid flat foot can be the result of **tarsal coalition** (fibrous or bony cross union between bones of the foot)



high arch Pes cavus



normal to low arch



flat foot Pes planus

Imaging

normal X-ray



Flat foot: Lateral Weight bearing X-rays



- Blue line: along the talus all the way to the metatarsal bone should be continuous with a 0 degree up to 4 degree is considered normal
- if the angle is >4 degree → considered flat foot

¹ could be acquired in elderly due to [posterior tibialis weakness](#)



² (Normally, the arch is formed within 4-6 years).

³ 80:20 rule: 20% of the population has it, 80% of them are asymptomatic

⁴ [gradual loss of the arch in case of an injury to the foot resulting in complete tear of the posterior tibialis tendon](#)

Rigid or flexible flat foot:

Normal	Flexible	Rigid
Normally the heel is straight or minimally in valgus	In flat foot the heel is in extreme valgus	
Standing on tip-toes: the heel moves inward (from valgus to varus). The arch is still present.	Standing on tip-toes: the heel moves inward (from valgus to varus). The arch will reconstruct in flexible flat foot.	In cases of rigid flat foot heel does not move inward (stay in valgus). The arch will remain absent in rigid flat foot.
on examination table: when ankle is held still, and heel is moved sideways; it moves normally	It moves normally	it does not move in stiff heel (rigid) as normally

	
This patient has normal appearance Right heel and excessive valgus Left heel.	<ul style="list-style-type: none"> ➤ Both heels correct their valgus and point medially in some varus. ➤ This is NOT rigid flat foot and there is no tarsal coalition or bony bar connecting tarsal bones.

Management:

- Usually NO action is needed. (Asymptomatic)
- if symptomatic **Always start with conservative (5 steps)**
- Foot exercises is prescribed to stretchen their calf muscles; but its value is not confirmed.
- Orthotics and insoles are sometimes prescribed; but its benefit is doubtful. (only to elevate the symptoms and to facilitate walking)
- However, choosing correct and good type of shoes can be of benefit on the long run.

Always start with conservative

- 1- weight loss
- 2-shoes
- 3-Orthotics
- 4-activity modifications
- 5-physiotherapy

Rigid flat foot may require surgical management. **Removal of coalition**

Hallux Valgus

[Toronto notes](#)

- Means lateral deviation of big toe.
- Usually at the metatarsophalangeal joint.
- Often is associated with a **bunion**^{5 6 7} (swelling and protrusion at the medial aspect of big toe).⁸
- Common at middle age and elderly⁹, mainly females¹⁰.
- Most cases are painless. [if painful, would be due to shoe pressure on a large or an inflamed bunion.]
- When severe it interferes with shoe wear and may cause symptoms.



Hallux Valgus Measurements

[2] **Hallux Valgus Angle:** angle between line extending along 1st metatarsal and a line extending along proximal phalanx.

- ⇒ **Normal:** <15
- ⇒ **Mild HV:** 16-25
- ⇒ **Moderate HV:** 26-35
- ⇒ **Severe HV:** > 35

[4] **1st intermetatarsal angle:** Angle between 1st metatarsal long axis and 2nd metatarsal

- ⇒ **Normal** < 10

[1] **Hallux interphalangeus angle:** Angle between long axis of proximal and distal phalanges

- ⇒ **Normal** < 8



(Normal foot)

⁵ **hallux valgus ≠ bunion.** **bunion** (swelling and protrusion at the medial aspect of big toe). Hallux valgus is the lateral deviation of the big toe away from the central line.

⁶ sometimes people have a bunion without hallux valgus and we treat it by a bunionectomy; a surgery by which we remove the bunion.

⁷ a bunion is not a growth instead it's exposure of the metatarsal head

⁹ rheumatoid arthritis

¹⁰ heals

Management:

- if painless (most common) reassure.
- if painful (interfering with walking), always start with conservative (5-steps)
- Correct and suitable shoe wear.
- Avoidance of tight shoes.
- Protection to the bunions. (by cushioning)
- Surgery is reserved for symptomatic and disturbing cases. (if conservatives fail to relieve pain for 3-6 months)
 - ⇒ Surgery is annoying (hardware on skin)
 - ⇒ Removal of bunion is not cosmetic
- Following surgery; patient has to continue proper shoe wear.

Always start with conservative

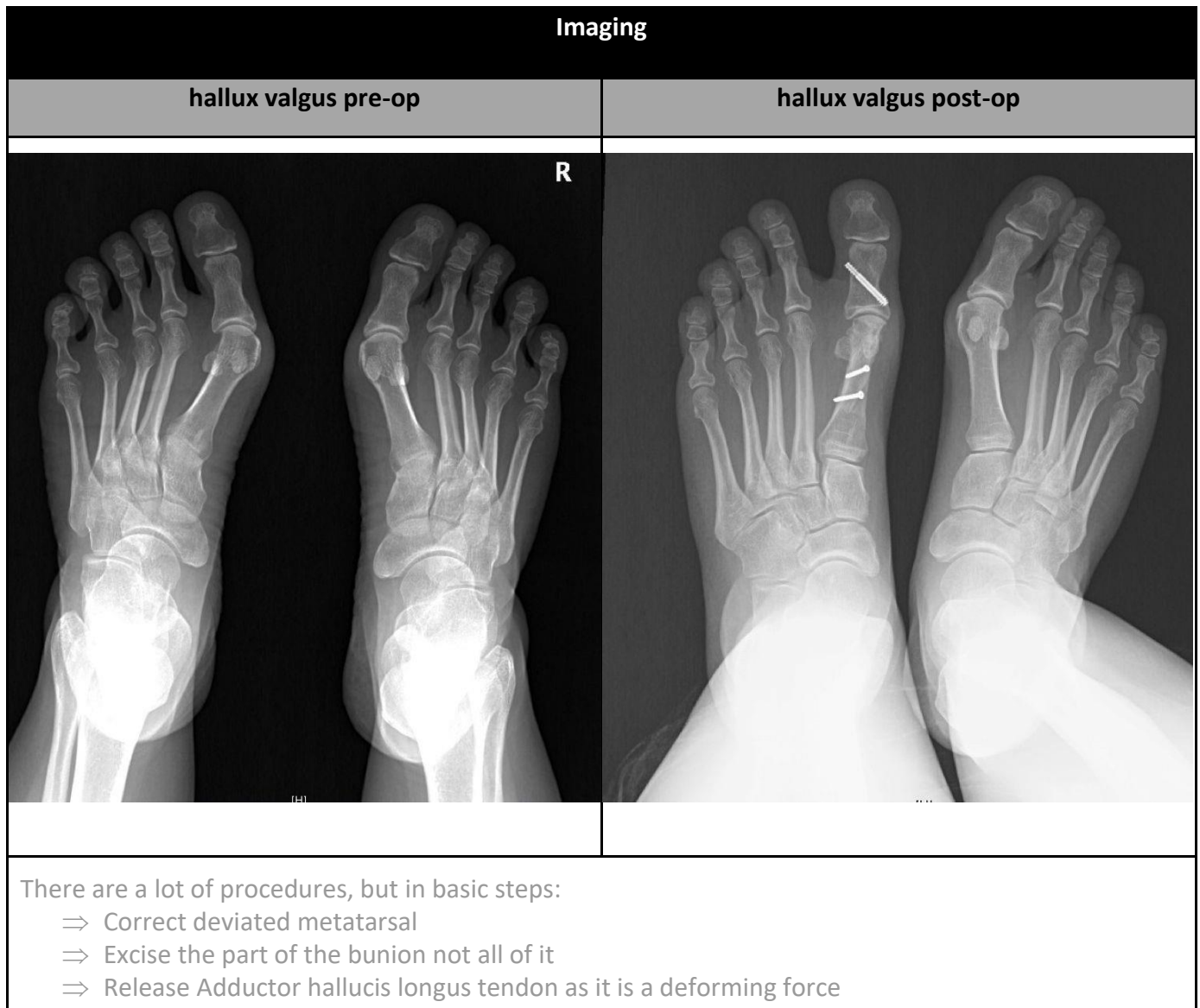
1- weight loss

2-shoes

3-Orthotics

4-activity modifications

5-physiotherapy



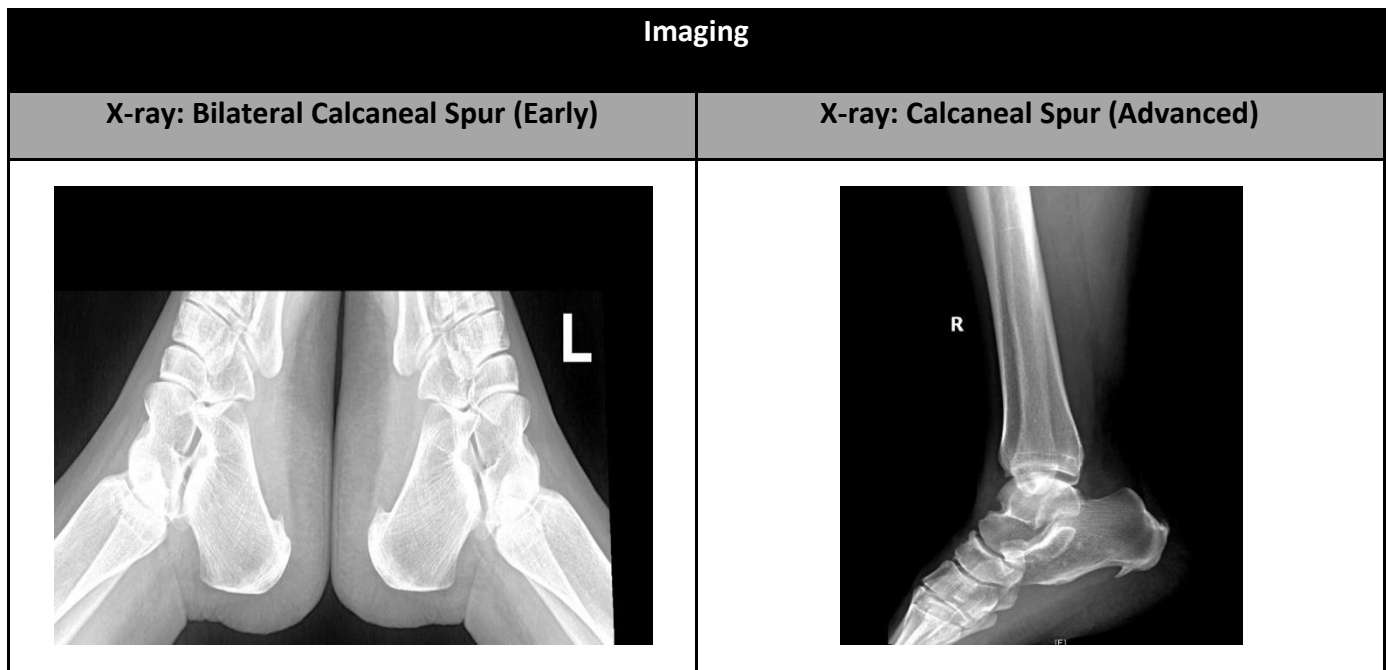
Plantar Fasciitis التهاب اللفافة الأخمصية

[Toronto notes](#)

[Kaplan notes](#)

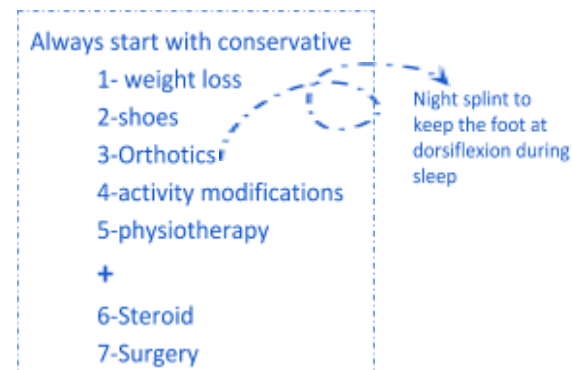
[Mayo clinic](#)

- Common disorder at middle age and elderly. affect about 90% of the population
- Insidious in onset; unilateral or bilateral.
- Vague pain at heel region.
- **Localised tenderness** to insertion of plantar fascia into calcaneum.
- Plain lateral X-ray of heel frequently shows **calcaneal spur**¹¹ (مسماة القدم), (prominence or ossification at the site of anterior calcaneum at plantar fascia insertion site)¹²
- Commonly associated with flat feet.
- No visible heel swelling, no skin changes and no increase in local temperature.
- Inflammatory process is at site of pain; i.e. at plantar fascia insertion into calcaneum.
- Heel pain like stabbing pain when patient puts foot to the ground **first step in the morning; and gets less after some walking.**¹³



Management:

- At present NO easy or simple management is available.
- Mainly conservative. مشي على ارض غير صلبة
- Includes stretching exercises to plantar fascia: active and passive.
- (at the beginning the pain will get worse but gradually will decrease)
- Use of soft heel insoles (Silicone) may be helpful.
- Shock wave therapy (SWT) may be effective¹⁴.
- Local steroid injections are helpful sometimes.



¹¹ no relation between the spike (spur) you see on x-ray and the pain. some patient have very large spikes with no pain and some have very severe pain with no spike, what we get from that is that it doesn't have to be removed to alleviate the pain

¹² it is an indication of inflammation for many years

¹³ when we sleep or set for long periods our feet are in plantar flexion, making the achilles tendon short and when we step on the floor for the first time, we do dorsi flexion which stretches the achilles tendon stretching the plantar fascia with it causing pain.

¹⁴ to break down the thick tissue, اللي مانعرف كيف يصير

if the first 5 steps of conservative didn't relieve the pain.

1. we do **MRI** to confirm diagnoses
2. give **steroid injection** if the steroidal injections didn't relieve the pain,
3. do nerve conduction study to determine other causes. other causes which although rare but give same symptoms of plantar fasciitis are: **tarsal tunnel syndrome** posterior to the medial malleolus compressing on lateral and medial plantar nerves (branches of posterior tibial nerve) and **nerve entrapment** due to large muscle in athletes.

➤ Surgery (rarely done): partial release of plantar fascia or calf muscle.

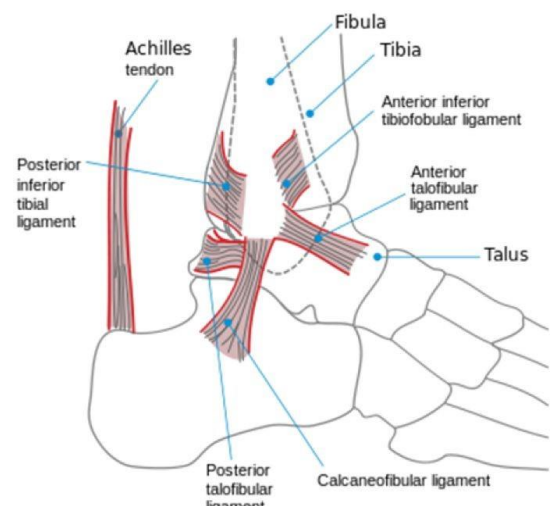
Ankle Sprains

[Mayo clinic](#)

- One of most common injuries.
- Usually occurs during sports activities. soccer in male/ heals in female
- But may occur at home or at street.
- Is the result **of twisting injury**.
- There is pain, swelling and local (lateral) bruising.
- X-rays **do not show fracture**.
- The injury is partial or complete ligament rupture. [rule of thumb: if the patient **can't walk** after the injury it indicate a **complete tear** of ligament, if able to **walk** after the injury it indicate a **partial tear**]

Lateral Collateral Ligament Complex is composed of

1. **Anterior talofibular ligament (ATFL)**; Most commonly injured [to detect it's rupture **Ankle anterior drawer test** is used]. When the result is inconclusive, Do an ankle stress x-ray
2. **Calcaneofibular ligament (CFL)**; second most commonly injured [to detect its rupture **inversion test** is used]
3. **Posterior talofibular ligament (PTFL)** rarely injured



- **Always there is a history of twisting injury.**
- Pain, swelling and bruising at and around ankle.
- No tenderness of lateral malleolus; but tenderness anterior, posterior or inferior to it i.e. over ligaments.
- Dorsiflexion and plantar flexion possible; but **inversion and eversion very painful**.¹⁵
- **X-Rays: NO fracture.**

in twisting injury **You have to rule out fracture** by feeling the **bony provenances** on the foot and ankle (medial & lateral malleolus, base of 5th metatarsal, heal, anterior ankle joint) in examination **to make sure there is no focus tenderness**; if there is focus tenderness do x-ray to make sure no fracture in the ankle joint



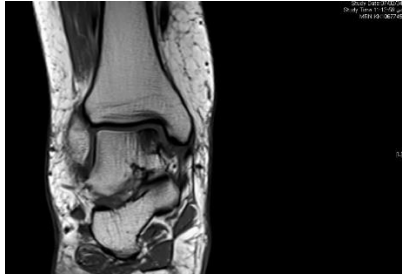
¹⁵ [always compare, since it might be hyperlaxity]

Management:¹⁶

- **RICE:** Rest, Ice, compressors, Elevation.
- Used to apply Back-slab splints for few days.
- Rest should only be for few days.
- **PRICES: recent view** = Protection¹⁷, relative Rest, Ice, Compression, Elevation and support.
you do this for a few weeks then start physiotherapy to strengthen the tendons and muscles. 80% will recover completely even if complete tear, most soccer players have ligament tears some even have complete.

Osteochondral defect of talus ^{18,19}

- Very localised areas of joint damage; due to **lack of blood supply**.
- **On-Off swelling / جرح في الغضروف**
- Lack of blood supply is often post traumatic, but occasionally No cause can be found.
- A local cartilage and varying depth of underneath bone are involved and may separate of main talus inside the ankle joint.
- Usually **postero-medial part** of dome of talus.
- **Localised pain** on weight bearing and even at rest may present. (antalgic gait)

Imaging		
Plain AP X-ray: lesion is suspected	CT Coronal view; lesion highly suspected	MRI: lesion is confirmed
		
bone is white highly sclerotic (marble-like) indicating loss of blood supply, very fragile and easily broken.		MRI with contrast the bone is white, and the lesion is black, due to loss of blood supply.

¹⁶ always start with conservative, even if you are treating a professional athlete.

¹⁷ Splints are better than back slap casts because you can wear/remove splint anytime and splints allow dorsiflexion and plantar flexion movements.

¹⁸ الإصابة العظمية الغضروفية

¹⁹ ankle injury resulting in loss of bone and cartilage in talus.

Management:²⁰

- Depends on how much symptoms and disturbance the patient suffers. [always start with conservative, even if patient in severe pain and unable to walk]
- When the OCD is large and Loose or almost loose. [we do arthroplasty]
- Arthroscopic debridement of the lesion and drilling of its crater (base).
- Rarely Fixation of a large defect which has significant bony part, by absorbable screws.

Arthroscopic debridement and cleaning of the lesion then we either:

1. put a cartilage transplant from a location where the body doesn't need it like the lateral side of the knee or from outside the body
2. or we do microfracture (**what we usually do**) by drilling multiple small holes into the bone, then blood will fill out these holes which stimulate growth of fibrocartilage by fibroblasts

Always start with conservative

- 1- weight loss
- 2-shoes
- 3-Orthotics
- 4-activity modifications
- 5-physiotherapy

Diabetic Foot

[Kaplan notes](#)

- Long term diabetes or **failure to control diabetes**
- adequately may result in **Neuropathy**.
- Neuropathy: is nerve damage. (no proprioception)
- It can result in numbness, tingling and reduced sensation of the feet.
- Decreased circulation **Vasculopathy** associated with neuropathy can result in small cuts on feet being overlooked and becoming infected.

- **Infection** in diabetic foot may result in **Gangrene**.

Care of Feet in Diabetes:

- Very important as well as **blood sugar control**.²¹
- wear protective shoes.
- Daily self-inspection of feet is mandatory.
- If patient is unable to do self-inspection (due to poor sight or hips and knees stiffness); a member of the family or assistant should do it.
- Avoid dryness of the feet because dryness causes cracks.
- Regular inspections by healthcare personnel should be arranged
- A visit to a doctor should take place immediately whenever any complication occurs.

Surgery in Diabetic Foot:

- big toe amputation or any toe amputation, the risk of below knee amputation is 50%. because most likely their blood sugar won't be controlled.
- Skilled care of wounds and ulcers in diabetic foot is required.
- **Wound debridement**, antibiotics and repeated dressing should be done.
- Amputations may become necessary when there is Gangrene.
- Toe amputation or ray amputation, forefoot amputation, below or above knee amputation.

Charcot Foot

²²

- Occurs in people who have significant nerve damage to the foot. in diabetics bone degeneration due to neuropathy (loss of sensation), microtrauma leading to deformity.
- The bones of the foot become weak and the joints inflamed, swollen and lax.
- walking on the foot leads to disintegration and collapse of the joints and Deformity: such as **Rocker- bottom deformity**.
- Caused by:
 - ⇒ Any disorder which lead to **Neuropathy**.
 - ⇒ There is decreased sensation and decreased ability to feel temperature, pain and trauma.



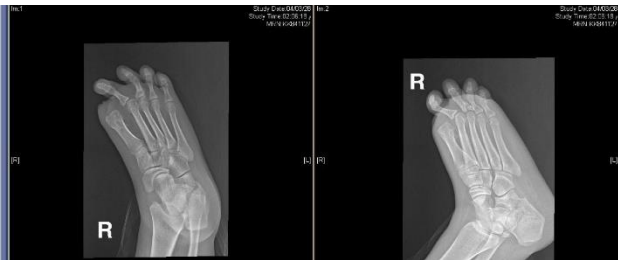



²⁰ doesn't heal by itself, since it's avascular

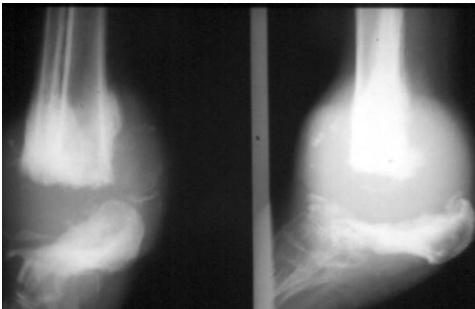
²¹ it's all about blood sugar control.

²² bone degeneration due to loss of blood supply, in diabetics

Charcot Foot Clinically:

- Warms of an area of foot or whole foot. Often mistaken by osteomyelitis. To differentiate we do **elevation test** we raise the leg up for 5-10 minutes, if persistent redness and swelling it is infection if redness and swelling subside it is Charcot foot.
- May become red or dusky in colour.
- Swelling in the area.
- Pain or soreness.
- X-rays changes are important to detect and interpret, as early there is NO changes.
- Later: haziness, osteopenia, irregular joint destruction, subluxation or even dislocation.

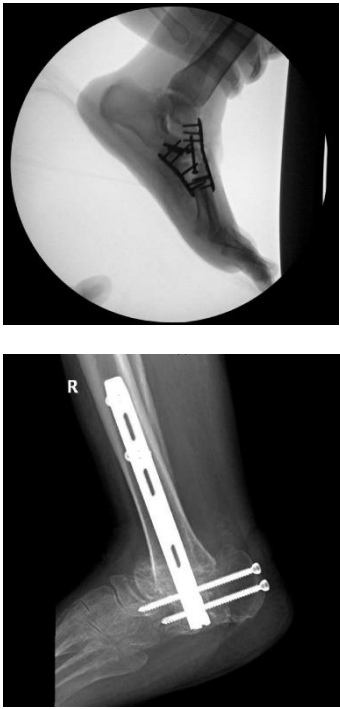
Imaging	
(R)Diabetic foot 04/03/1428	
	diabetic foot amputated big toe means uncontrolled blood sugar; which means 50% risk of below knee amputation.
(R)Diabetic foot: Early Charcot 1431	
	Came to clinic in pain still blood sugar uncontrolled you can see haziness and loss of joint lines; due to degeneration.
(R)Charcot Ankle 1431	
	complete loss of talus dome
(L) Side Early Charcot 1433	
	

<p>Advanced Case of Charcot</p>	<p>complete</p>
	

Diagnosis of Charcot Foot:

- Good history²³ and clinical examination.
- Awareness.
- Exclusion of other causes which may give similar picture: like infection or tumour.
- MRI, bone scans, aspiration biopsies can help.

Management:

<p>Non-Surgical Management of Charcot Foot</p>	<p>Surgery in Charcot Foot</p>	<p>Amputation in Charcot foot</p>
<ul style="list-style-type: none"> ➤ Immobilisation: ➤ Custom Shoes and Bracing: [we don't do cast because it might cause ulcers in a diabetic patient with neuropathy.] ➤ Activity modification 	<ul style="list-style-type: none"> ➤ May be indicated in certain cases [we don't do surgery until blood sugar is controlled] <div style="text-align: center;">  </div>	<ul style="list-style-type: none"> ➤ May be indicated as a last option. ➤ Mainly when there is severe instability which cannot be controlled by surgery or orthosis. ➤ Also when surgery fails to achieve stability. ➤ Presence of refractory infection increase the possibility of amputation.

²³ Always ask about diabetes and whether it's controlled or not

MCQ

1. a pt. Who has sprain his ankle with negative anterior drawer test, which ligament is torn?

- A. Anterior talofibular ligament (ATFL)
- B. posterior talofibular ligament (PTFL)
- C. calcaneofibular ligament

Ans: C

2. 60 years old diabetic lady has mild pain, decreased sensation for many years in her foot, no ulcer on her feet and no evidence of infection What is the diagnosis?

- A. Diabetic Foot
- B. Charcot Foot

Ans: B

3. A young patient presented after ankle twisting injury. An MRI was done and the diagnosis of Anterior talofibular ligament tear was confirmed. What is the appropriate management?

- A. Back slap cast in nature position of the ankle
- B. Casting in the eversion position
- C. Immediate surgery
- D. Delayed surgery

Ans: B

5.A 44-year patient complains of heel pain, the pain is worse first thing in the morning and with walking, there's tenderness upon palpation of the anteromedial heel. what's the initial management for this patient?

- A. NSAIDs
- B. Stretching exercise of plantar fascia and Achilles tendon

Ans: B

4. A female present with painful flat foot and examination revealed limited dorsiflexion improved with knee flexion. what is the cause?

- A. Soleus muscle tightness
- B. Gastrocnemius tightness
- C. Gastrocnemius loose
- D. Achilles tendon tightness

Ans: B

5. which of the following best describe the angle for the diagnosis of Metatarsus primus varus:

- a. Angle between 1st metatarsal long axis and 2nd metatarsal $N > 10$
- B. Angle between 1st metatarsal long axis and 2nd metatarsal $N < 10$
- C. C-Angle between long axis of proximal and distal phalanges $N < 8$
- D. D- Angle between long axis of proximal and distal phalanges $N > 8$

Ans: B