Foot & Ankle Viva

Dr.Aiman Sideeg,

modified by

Dr.isam sami moghamis

Index

- *Viva 1: Hallux valgus. 5 → 32*
- *Viva 2: Hallux rigidus. 37 → 45*
- *Viva 3: Charcot arthropathy. 47 → 56*
- *Viva 4: Pes cavus. 58 → 75*
- *Viva 5: PTT dysfunction. 81 →97*
- *Viva 6: Rheumatoid foot. 89 → 103*
- *Viva 7: Silfverskiöld test. 105 → 107*
- *Viva 8: Ankle arthroscopy. 109 → 117*
- *Viva 9: Ankle arthritis. 119 → 133*
- *Viva 10: Types of shoes. 135 → 138*
- *Viva 11: Foot anatomy. 140 → 144*
- *Viva 12: Drop foot. 146 → 157*
- *Viva 13: Heel pain. 159 → 163*
- *Viva 14: Bunionette . 165 →168*
- *Viva 15: Ankle sprain. 170 → 188*
- *Viva 16: Morton neuroma. 190 → 199*
- *Viva 17: Diabetic foot. 201 → 214*
- *Viva 18: Congenital overlapping toe. 216 → 218*
- *Viva 19: lesser toes deformities. 220 → 222*

Viva 1

- Describe the photograph
- What are the risk factors for this condition?
- What is the Pathoanatomy of this condition?
- What are the causes of pain in this condition?
- How would you treat this patient ?
- What are the possible complications following surgical treatment?
- What are the characteristic features of Juvenile Hallux Valgus?

Describe the photograph

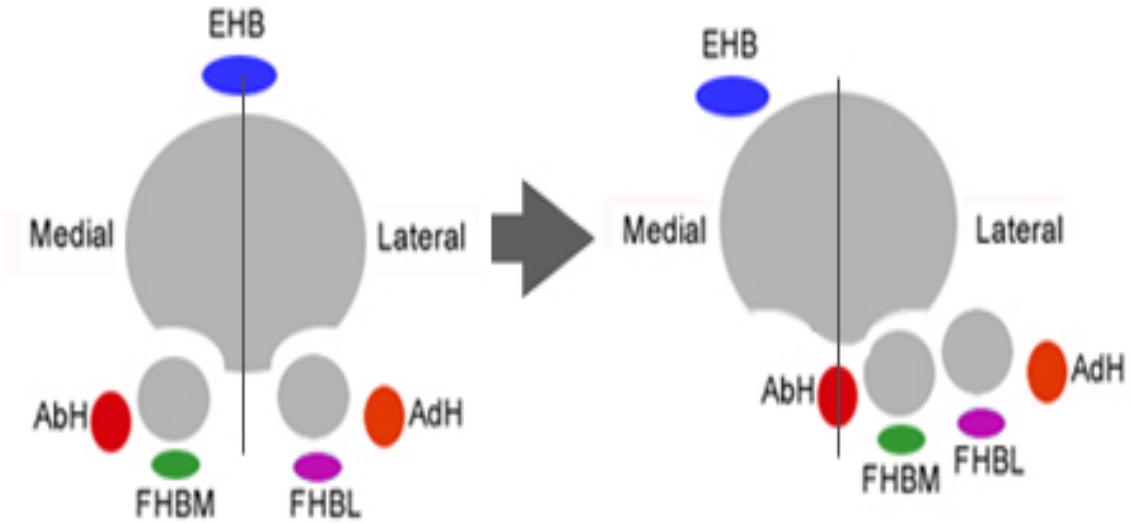
- *This is a clinical photograph, a weight bearing frontal view of both feet showing Hallux valgus deformity with the hallux over-riding the second toes. I can only count three lesser toes on the left foot. There is also a small area of scar on the dorsum of the right foot.*
- *Hallux valgus is defined as a lateral deviation of the proximal phalanx on the 1st metatarsal head with medial deviation of the 1st MT.*
- *Occurs in female: male 4:1(middle aged group)*

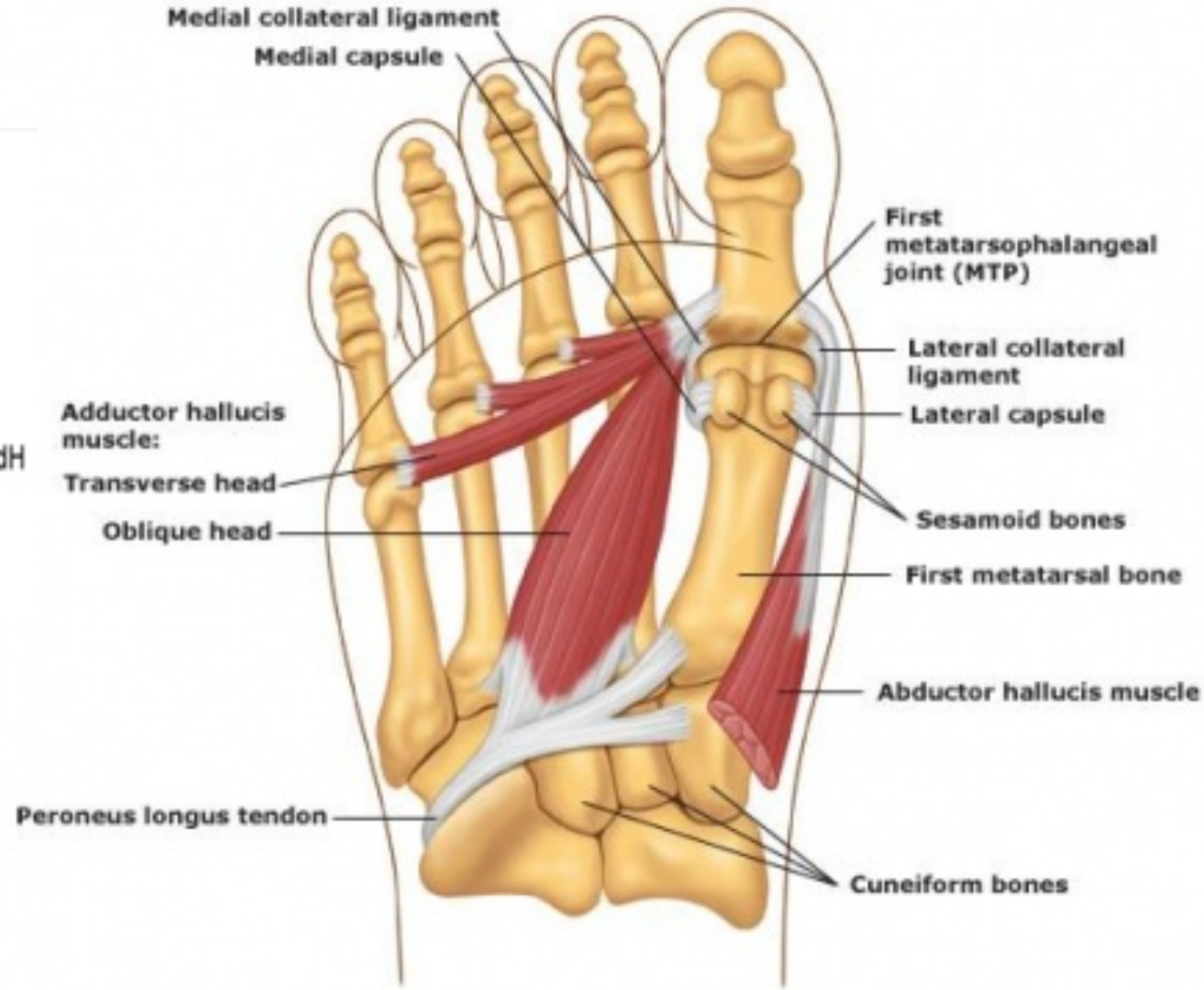
What are the risk factors for this condition?

- *Genetic predisposition (70% of patients with Hallux valgus have a family history).*
- *2nd toe deformity – amputation*
- *Rheumatoid arthritis*
- *Ligamentous laxity*
- *Narrow-toed, high-heeled footwear.*

What is the Pathoanatomy of this condition?

- *The proximal phalanx deviates laterally → 1st MT deviates medially → the sesamoid complex assumes a lateral position relative to the 1st MT head → progressive weakening of the medial capsule of the 1st MTP joint with contracture of the lateral capsule → The abductor hallucis becomes slightly more plantar to the medial aspect of the first metatarsophalangeal (MTP) joint(pronation deformity) → This leaves the adductor tendon unopposed as an increasing deforming force laterally with its attachment to the proximal phalanx and the lateral sesamoid → Lastly, the flexor hallucis brevis, flexor hallucis longus, and extensor hallucis longus all increase their valgus moment on the MTP joint and further deviate the first ray → with progression the windlass mechanism is lost leading to loss of weight bearing under the 1st MT and transfer to lesser MTs (transfer metatarsalgia)*


EHB
Medial
Lateral
AbH
AdH
FHBM
FHBL
EHB
Medial
Lateral
AbH
AdH
FHBM
FHBL


Medial collateral ligament
Medial capsule
First metatarsophalangeal joint (MTP)
Lateral collateral ligament
Lateral capsule
Adductor hallucis muscle:
Transverse head
Oblique head
Sesamoid bones
First metatarsal bone
Abductor hallucis muscle
Peroneus longus tendon
Cuneiform bones

What are the causes of pain in this condition?

❖***Extrinsic pain***

- *Due to deformity. Extrinsic pain may be managed non-operative management by Shoes with a wider deeper toe box, Padding the bunion, Pressure from the next adjacent toe can be managed with a silastic toe spacer.*

❖***Intrinsic pain***

- *Joint incongruence*
- *Degeneration*
- *Synovitis: MTP joint/sesamoid joint. Intrinsic pain is more readily treated by surgical restoration of joint congruence although orthotics (sole stiffener, Morton's extension, forefoot rocker) may have a role.*

How would you treat this patient ?

- *I would like to take history, including questioning about the main complaints of the patient (pain (due to inflamed bunion)-difficulty with shoe wear-cosmetic)- relevant conditions such as diabetes, inflammatory arthritis, vascular disease and neuropathy- also it is important to consider the patient's activity level and expectations.*

How would you treat this patient ?

- *I would examine:*

➢ ***Look:*** *The gait and the posture of the weighted foot as hallux valgus is often associated with a planus foot- calluses- swelling and redness along the medial aspect of MTP due to bursal inflammation- other deformities (hammer lesser toes)*

➢ ***Feel****: I would palpate for areas of tenderness, paying particular attention to the hallux MTP joint and lesser metatarsal heads.*

➢***Move****: I would assess the degree of active and passive correction possible and the range of movement of the involved joints. I would assess ROM of the 1st TMT joint. Neurovascular status must also be assessed.*

➢***Special test****: Grind test to check for MTP joint arthritis*

How would you treat this patient ?

- *I would obtain weight bearing AP, oblique and lateral radiographs of the foot to evaluate:*

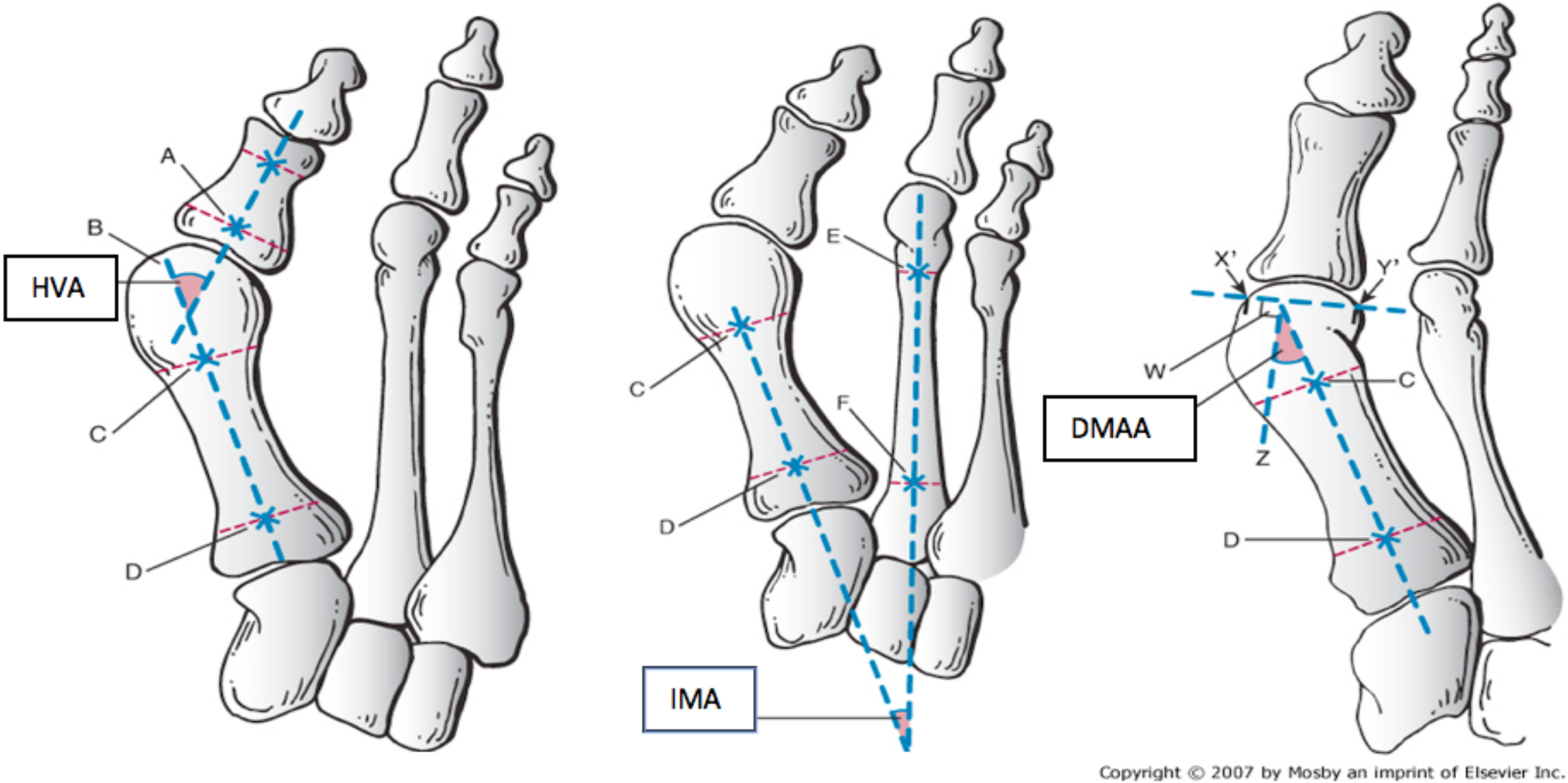
➢*MTP joint congruency*

➢*position of sesamoids*.

➢*Degenerative changes*

➢*Radiographic parameters (HVA-IMA-DMAA-PPAA)*

ANGLE	LOCATION	NORMAL
HVA	Between long axes of 1st proximal phalanx and 1st metatarsal	<15°
IMA	Between long axes of 1st and 2nd metatarsal	<9°
DMAA	Between line bisecting MT shaft and through base of cartilage cap	<15°
PPAA	Articular angle at base of proximal phalanx in relation to longitudinal axis	<10°



Mann and Coughlin classified deformities by HVA (some overlap and inconsistency in the literature for IMA)

Angle	Normal	Mild	Moderate	Severe
HVA	<15	<20	<40	>40
IMA	<9	10-12	13-15	>15

How would you treat this patient ?

- *Goals of treatment:*

➢ *Relive pain and correct deformity*

➢ *Refunction the 1st ray*

➢ *reduce the tendency to transfer metatarsalgia*

How would you treat this patient ?

- *I would start with non-surgical treatment:*

➢*Shoe wear modifications including low heeled shoes-wide toe box.*

➢*Bunion pads and toe spacers.*

➢*Medial arch support insoles to limit mid and forefoot pronation.*

How would you treat this patient ?

- *Surgical principles:*

➢ *Remove the bunion*

➢ *Correct the hallux valgus angle*

➢ *Correct the intermetatarsal angle*

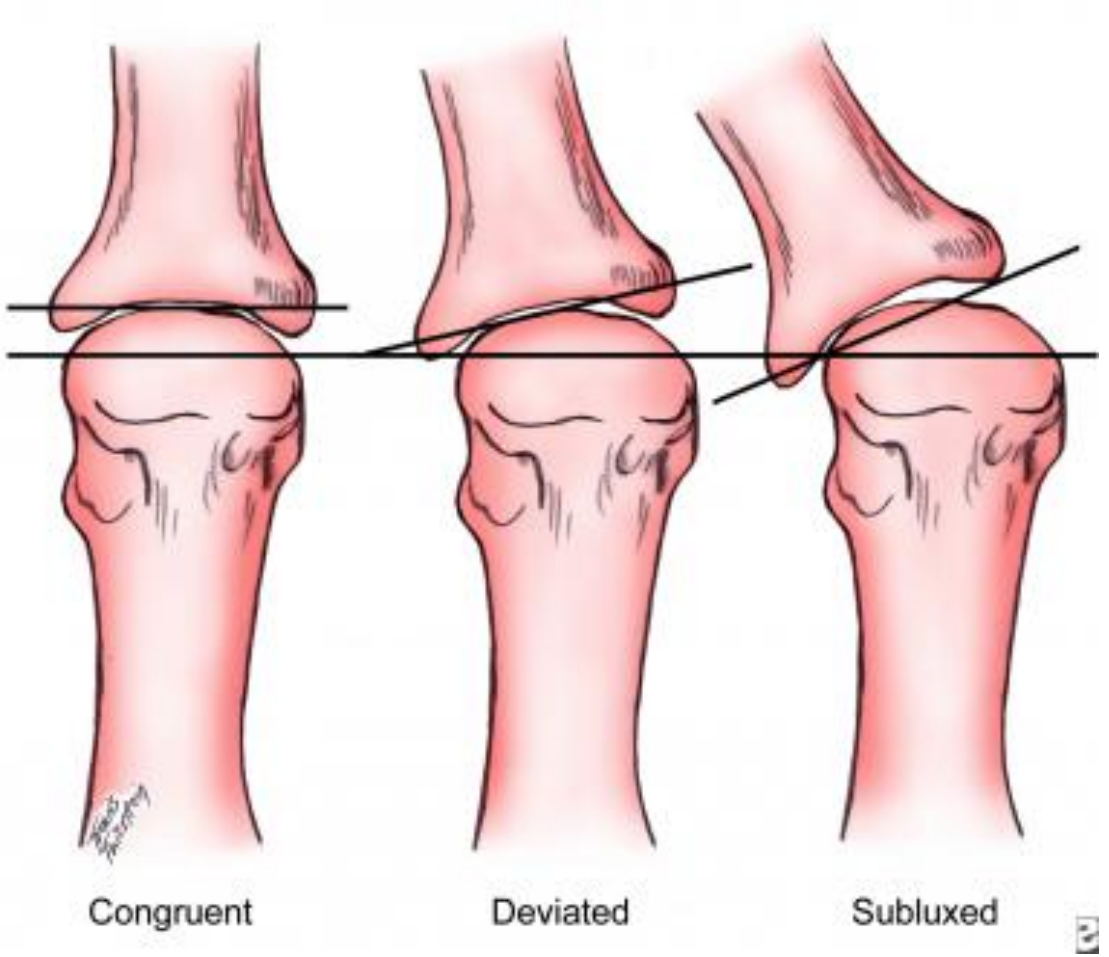
➢ *Correct hallux interphalangeus*

➢ *Correct and maintain the distal metatarsal articular angle (DMAA)*

➢ *Restore joint congruence: Most deformities are incongruent and, hence, do not need DMAA correction. (Congruent HV: no joint subluxation and DMAA >10°; incongruent HV: Joint subluxation but DMAA is normal.)*

How can you determine congruency of the first MTPJ?

- *Congruency is determined by connecting the medial and lateral edge of the first metatarsal head articulating surface with a similar line of the proximal phalanx*



How would you treat this patient ?

- *Surgical principles:*

➢ *Avoid first MT shortening and elevation (defunctions first ray)*

➢ *Stabilise and debulk the medial MTP joint capsule with capsulorhaphy*

➢ *Avoid plantar dissection to prevent AVN first MT head*

➢ *Relocate sesamoids under first MT head*

How would you treat this patient ?

- *General rules:*

➢ *Distal osteotomy for mild deformity.*

➢ *Proximal osteotomy for severe deformity.*

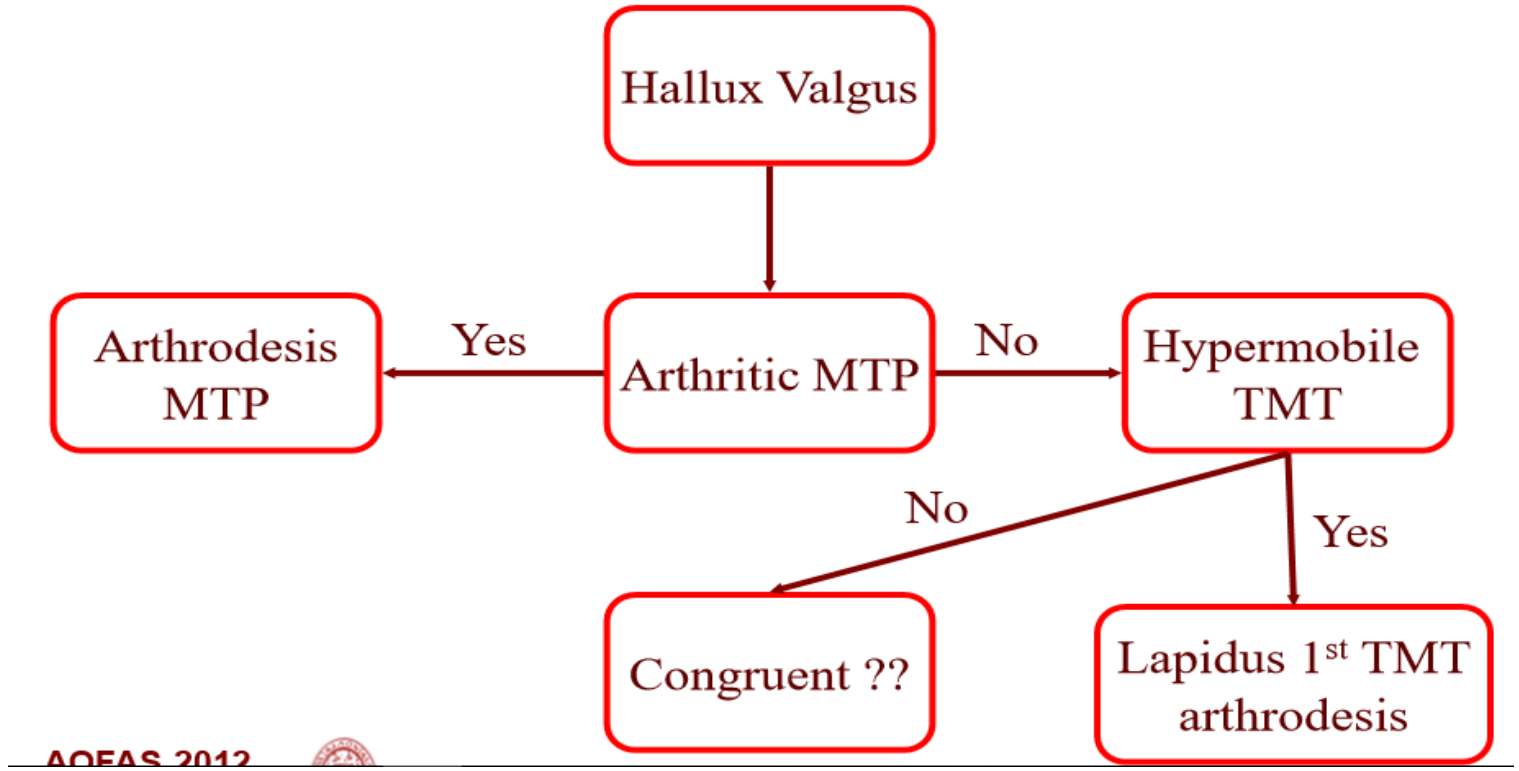
➢ *A combination of proximal and distal osteotomy is carried out where proximal osteotomy adversely affects DMAA*

How would you treat this patient ?

- *General rules:*
- *IMA <=13 AND HVA <=40 degrees*
  - *Cheveron*
- *IMA >13 AND HVA >40 degrees*
  - *Proximal osteomty*
- *Instability of the first TMT*
  - *Lapidus*
- *Arthritis of the first TMP*
  - *Fusion*
- *Increased DMAA*
  - *Distal medial closing wedge osteomty in addition what is required based on the angular deformity*

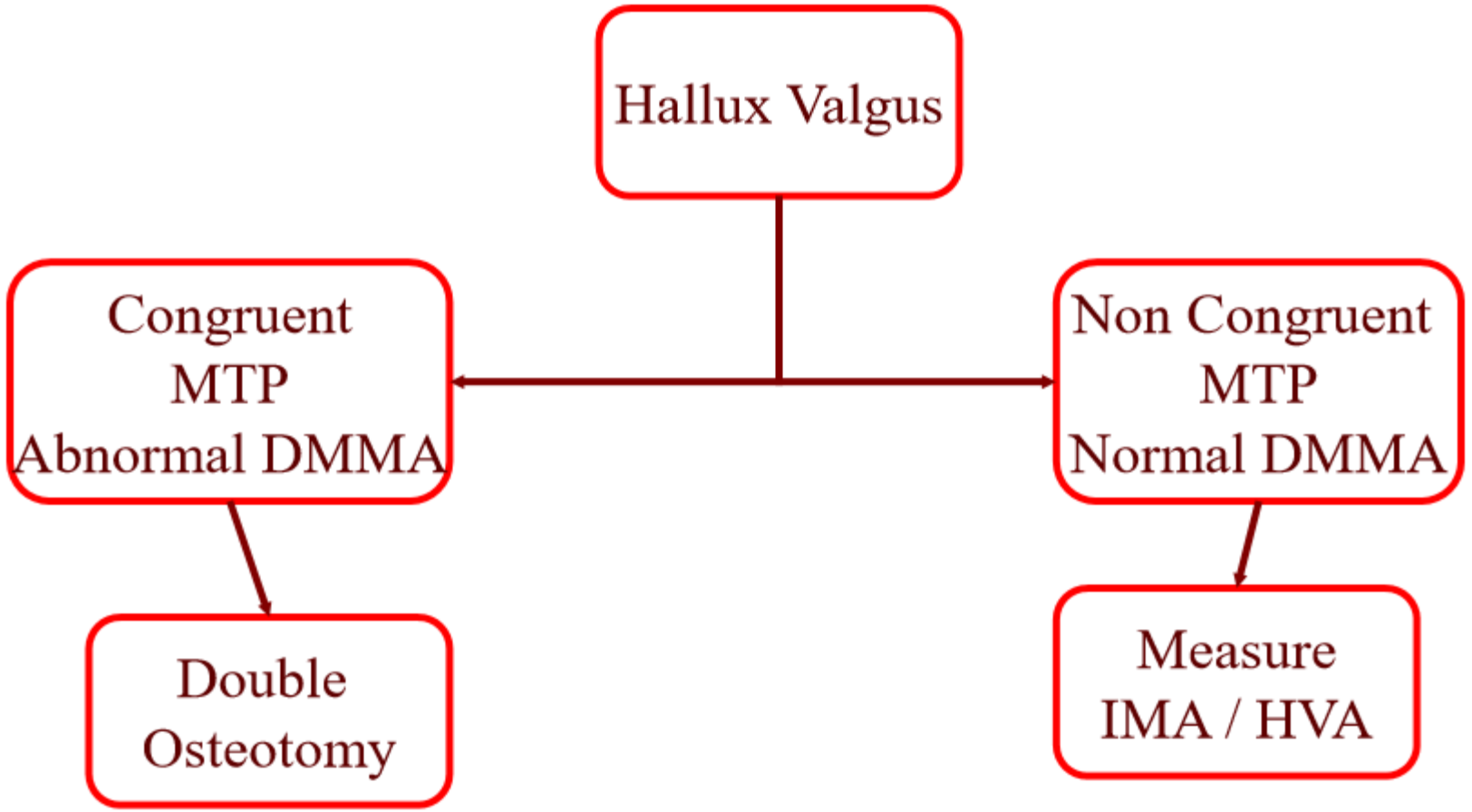
How would you treat this patient ?

- *Treatment algorithm:*



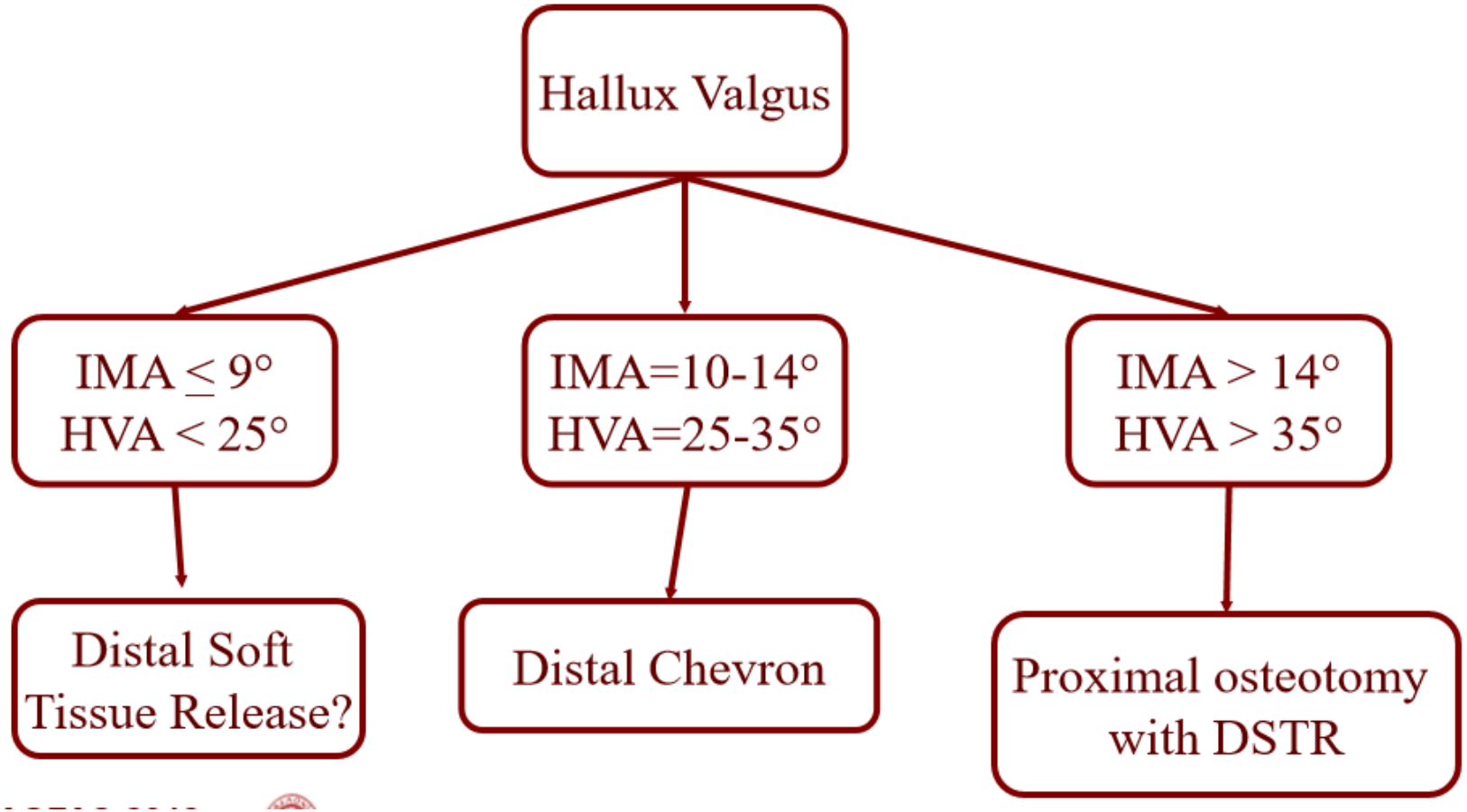
How would you treat this patient ?

- *Treatment algorithm:*



How would you treat this patient ?

- *Treatment algorithm:*



How would you treat this patient ?

- *Modified Mcbride technique:*

➢ *Performed in conjunction with MT osteotomy – Lapidus procedure. Rarely appropriate in isolation.*

➢ *Goal is to correct an incongruent MTP joint.*

➢ *Dorsal incision in the 1st web space at the level of the 1st MTP joint*

➢ *release of adductor from lateral sesamoid/proximal phalanx*

➢ *Release of transverse ligament*

➢ *lateral capsulotomy*

➢ *Retain lateral sesamoid to prevent Hallux varus. (original McBride included lateral sesamoidectomy)*

➢ *Excision of medial eminence*

➢ *medial capsular imbrication*

How would you treat this patient ?

- *Chevron osteotomy technique:*

➢ *It is V-shaped, extracapsular, distal metatarsal osteotomy.*

➢ *Indicated in: mild deformity*

➢ *Can be combined with proximal phalanx osteotomy (Akin-medial closing wedge osteotomy)*

➢ *Longitudinal incision cantered over the medial MTP joint, the capsule is opened longitudinally, excision of medial eminence, lateral release (with release of the adductor tendon and transversemetatarsal ligament), K-wire is inserted from medial to lateral 5mm from the articular surface to make the apex, osteotomy to create two limbs, with the plantar limb being slightly longer than the dorsal limb, chevron angle is about 35 – 60 degrees. Avoid over penetration of the lateral cortex to avoid injury to the dorsal MT artery which may results in AVN of MT head. The MT head is shifted laterally, 1mm lateral translation leads to 1 degree of correction. If stability is in question, insert two medullary K-wire from proximal to distal which are replaced with compression screw. Capsule is closed with imbrication*

How would you treat this patient ?

- *Other distal metatarsal osteotomies:*

➢ *Biplanar Chevron to correct DMAA. (chevron + medial closing wedge osteotomy)*

➢ *Mitchell's osteotomy: Distal 1st MT osteotomy (extra-articular). More proximal than Chevron),shortens and defunctions the metatarsal*

How would you treat this patient ?

- *Proximal Chevron metatarsal osteotomy:*

➢ *Indicated in moderate to sever deformity.*

➢ *Adversely affecting the DMAA and a second distal osteotomy can be indicated*

- *Other proximal osteotomies include:*

➢ *Mau / Ludloff: Mau is more stable than Ludloff, but provides less degree of correction*

➢ *Proximal crescentic or Broomstic osteotomy*

➢ *Scarf osteotomy: mid-shaft Z osteotomy allows lateral translation of the distal metatarsal, it is very stable osteotomy because: it can be performed very long, so more contact surface for fixation and healing. Technique: longitudinal medial incision over MTP joint – care must be taken to disrupt the vessels coming from plantar and retrocapital. Longitudinal cut is made parallel to the weightbearing plane (plantar surface of MT), the proximal transverse angle is made in an angle of 45° with the longitudinal cut and directed posteriorly to allow lateral displacement*

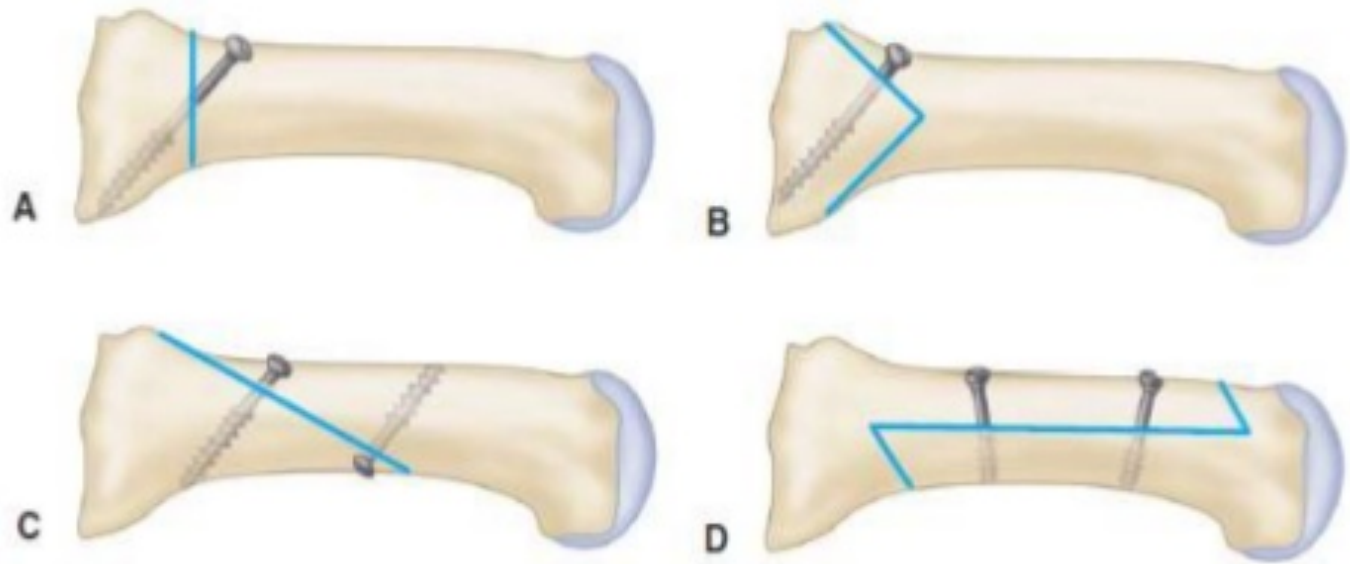
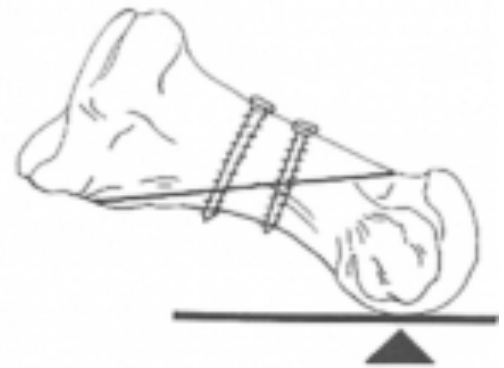


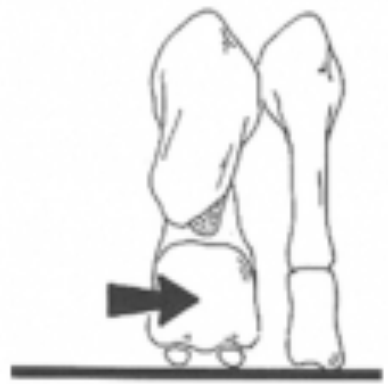
FIGURE 81-39 Four commonly used metatarsal shaft osteotomies. **A,** Proximal crescentic osteotomy. **B,** Proximal chevron osteotomy. **C,** Ludloff osteotomy. **D,** Scarf osteotomy. (From Trnka HG, Parks BG, Ivanic G, et al: Six first metatarsal shaft osteotomies: mechanical and immobilization comparisons, *Clin Orthop Relat Res* 381:256, 2000.)

MAU OSTEOTOMY

- Rotation osteotomy
- The distal portion of the metatarsal is rotated or pivoted around a relatively fixed axis
- Distal dorsal to proximal plantar
- Resistance to dorsal deformity

(dorsal shelf)





How would you treat this patient ?

- *Lapidus :*

➢ *first TMT joint arthrodesis with distal soft tissue procedures (medial eminence removal, first web space release of AdH, lateral capsule release)*

➢ *Indicated in TMT instability – moderate to severe deformity.*

➢ *If abnormal HVI angle Akin osteotomy to correct Hallux IP joint and* ***great toe pronation.***

How would you treat this patient ?

- *Keller's arthroplasty:*

➢ *Resection of the base of the proximal phalanx*.

➢ *Complications – high level of transfer metatarsalgia – cock up deformity due to injury to FHL.*

➢ *Limited to individuals with low functional demands*

How would you treat this patient ?

- *1st MTP joint arthrodesis :*

➢ *Recommended for the management of Hallux valgus associated with osteoarthritis – rheumatoid arthritis – failed previous surgery – neuromuscular disease.*

➢ *Position of fusion: 10 to 15 degrees valgus – 10 to 15 degrees dorsiflexion relative to the 1st MT.*

What are the possible complications following surgical treatment?

- *Recurrence: due to insufficient preoperative assessment and failure to follow indications.*
- *Avascular necrosis*
- *transfer metatarsalgia: associated with shortening of MT.*
- *Hallux varus: overcorrection of 1st IMA - excessive lateral capsular release with overtightening of medial capsule - lateral sesamoidectomy.*
- *Cock up toe deformity : due to injury of FHL - most severe complication with Keller resection*

What are the characteristic features of Juvenile Hallux Valgus?

- *Pain is not common.*
- *Less severe*
- *Bilateral*
- *Familial*
- *Generalized ligamentous laxity & flexible flatfoot*
- *Elevated DMAA and IMA*
- *Surgical option (open physis) : medial opening wedge cuneiform osteotomy*
- *Recurrence rate up to 50%.*

Viva 2

- Describe the X-ray
- What is hallux *rigidus* ?
- What is the etiology of this condition?
- Are you aware of any classification system for this condition?
- How would you manage this condition?

Describe the X-ray

- *This is a radiograph of a right foot showing osteoarthritis of the first metatarsophalangeal joint (MTPJ) with narrowing of joint space, osteophytes formation and subchondral sclerosis.*
- *This condition is called Hallux rigidus*

What is hallux rigidus ?

- *Hallux rigidus is a degenerative arthritic disease of the 1st MTP joint.*
- *It leads to significant limitation in the ROM of the first MTP joint.*
- *Like other degenerative arthritic diseases, the formation of osteophytes is quite common. These osteophytes can lead to a mechanical obstruction of the MTP joint dorsiflexion*

What is the etiology of this condition?

- *No primary aetiology has been defined.*
- *However, it is believed that repetitive microtrauma or an acute traumatic event can be the cause.*
- *Also it is related to 1st ray hypermobility*

Are you aware of any classification system for this condition?

Coughlin and Shurnas Classification			
	Exam Findings	*Radiographic Findings*	
Grade 0	Stiffness	Normal	
Grade 1	mild pain at extremes of motion	mild dorsal osteophyte, normal joint space	
Grade 2	moderate pain with range of motion increasingly more constant	moderate dorsal osteophyte, <50% joint space narrowing	
Grade 3	significant stiffness, pain at extreme ROM, no pain at mid-range	severe dorsal osteophyte, >50% joint space narrowing	
Grade 4	significant stiffness, pain at extreme ROM, pain at mid-range of motion	same as grade III	

How would you manage this condition?

- *First of all I would need to take history:*

➢*Main complaints: pain- stiffness-swelling-paraesthesia*

➢*Compression of the dorsal cutaneous nerve between the osteophyte and the shoe can lead to paraesthesia.*

➢*Shoe wear irritation on the dorsum of the MTP joint.*

➢*Patient's activity level*

How would you manage this condition?

- *Examination:*

➢ *Difficulty in push off. Limitation of the 3rd rocker.*

➢ *Assess the skin integrity*

➢ *Assess the presence of marginal osteophytes, which are typically dorsally and laterally*

➢ *Assess ROM of 1st MTP (limited dorsiflexion of the first MTP joint)*

➢ *Check whether the patient has pain limited to the extremes of motion or throughout the arc of motion*

➢ *I also need to assess the motion and look for any degenerative changes at the interphalangeal joint (IPJ). (A fusion of the first MTPJ may accelerate degeneration in the surrounding joints so if the IPJ is already symptomatic a joint-preserving procedure of the MTPJ may be more appropriate)*

➢ *Assess the neurovascular status*

How would you manage this condition?

- *I would start with non-operative management:*

➢*Reassurance: The radiological stage does not always correlated with clinical symptoms, which may progress slowly*

➢*Activity modification*

➢*NSAIDs*

➢*Orthotic devices that increase the rigidity of the forefoot portion of the shoe to limit MTPJ dorsiflexion (Morton extension) or rocker bottom shoes.*

➢*MUA and intra-articular steroid injection may provide relief of symptoms in mild/moderate cases. Not proven to be effective if severe changes are present.*

Morton extension orthotic

How would you manage this condition?

- *Surgical treatment depends on the grade of the disease*

❖ *Joint preserving procedures:*

➢ *Joint debridement and synovectomy in an acute chondral or osteochondral injuries.*

➢ *Cheilectomy (resection of the dorsal osteophyte along with removal of 25% to 30% of the dorsal aspect of MT head). Pain at extremes of motion of MTP joint is an indicator of good prognosis. Cheilectomy does not work when hallux rigidus is severe, if degenerative changes present, then increased ROM can lead to more symptoms.*

➢ *Dorsal closing wedge osteotomy of the proximal phalanx(Moberg) is used to increase dorsiflexion of the MTP joint. Usually combined with cheilectomy and is indicated if cheilectomy doesn't provide at least 30 to 40 degrees of dorsiflexion*

How would you manage this condition?

- *Surgical treatment depends on the grade of the disease*

❖ *Joint sacrificing procedures:*

➢ *Resection arthroplasty (keller's procedure) involves removal of the base of the proximal phalanx. It can destabilize the joint leading to cock up deformity, weakness during push off and transfer metatarsalgia. Used in elderly or sedentary patients*

➢ *MTP joint replacement (hemi/total): Limited long-term evidence to support use*

➢ *Arthrodesis of the MTPJ. The most commonly used procedure. The preferred alignment is 10 to 15 degrees valgus- 15 degrees dorsiflexion-neutral rotation to ensure an effective plane of motion of the IPJ, using two cannulated screws. The IP joint should be mobile (accelerates IP joint arthritis)*

Viva 3

75-year-old lady presented with right foot pain-swelling and redness

- What do you see?
- what is Charcot arthropathy?
- What are the risk factors Charcot arthropathy?
- How can you differentiate Charcot foot from infection?
- How does it evolve? (what are the stages of Charcot arthropathy)
- Are you aware of any classification system?
- What are the principles of treating this condition?

What do you see?

- *This is a clinical photograph showing a grossly deformed and swollen right foot and ankle. (Rocker-bottom)*

what is Charcot arthropathy?

- *Charcot arthropathy is the progressive destruction of bone and soft tissue that leads to loss of bony architecture, fracture, dislocation, and deformity.*
- *Up to 7.5% of patients with diabetes and neuropathy develop Charcot arthropathy.*
- *The pathogenesis has been explained by two major theories (The exact nature remains umknown):*

➢ *Neurotraumatic theory: (sensory – motor) bony destruction due to loss of pain sensation and proprioception with atrophy of intrinsic muscles and imbalance between intrinsics and extrinsics which leads to high plantar foot pressures combined with repetitive trauma*

➢ *Neurovascular theory suggests bone and joint destruction due to hypervascularity that result in hyperemia and periarticular osteopenia with contributory trauma.*

what are the risk factors Charcot arthropathy?

- *Risk factors:*

➢ *DM (90% of cases are related to diabetic neuropathy)*

➢ *Peripheral neuropathy*

➢ *Alcohol*

➢ *Leprosy*

➢ *Tertiary syphilis*

How can you differentiate Charcot foot from infection?

- *Erythema will decrease with leg elevation in Charcot (for 10 mins)*
- *Lack of significant elevation of fever and WBC count*
- *Blood glucose levels usually fluctuate with infection , so normal blood glucose level should discount infection in the differential diagnosis*

How does it evolve? (what are the stages of Charcot arthropathy)

- *Eichenholtz has staged this process:*

➢ *Stage 0: acute inflammatory phase: the foot becomes painful, swollen , and warm (erythematous). X-rays may show periarticular soft tissue swelling and varying degrees of osteopenia.*

➢ *Stage 1: fragmentation stage. Over the following weeks the oedema and erythema settle, the bone continues to fragment.*

➢ *Stage 2: Coalescence: the foot starts to stiffen up and the deformities become fixed. X-rays show resorption of bone debris*

➢ *Stage 3: Consolidation: over many months the oedema and erythema completely settle. X-rays show consolidation and remodelling of fracture fragments. (As a rough guide: forefoot 6 months, midfoot 12 months, hindfoot 18 months)*

Are you aware of any classification system?

- *Brodsky anatomic classification system:*

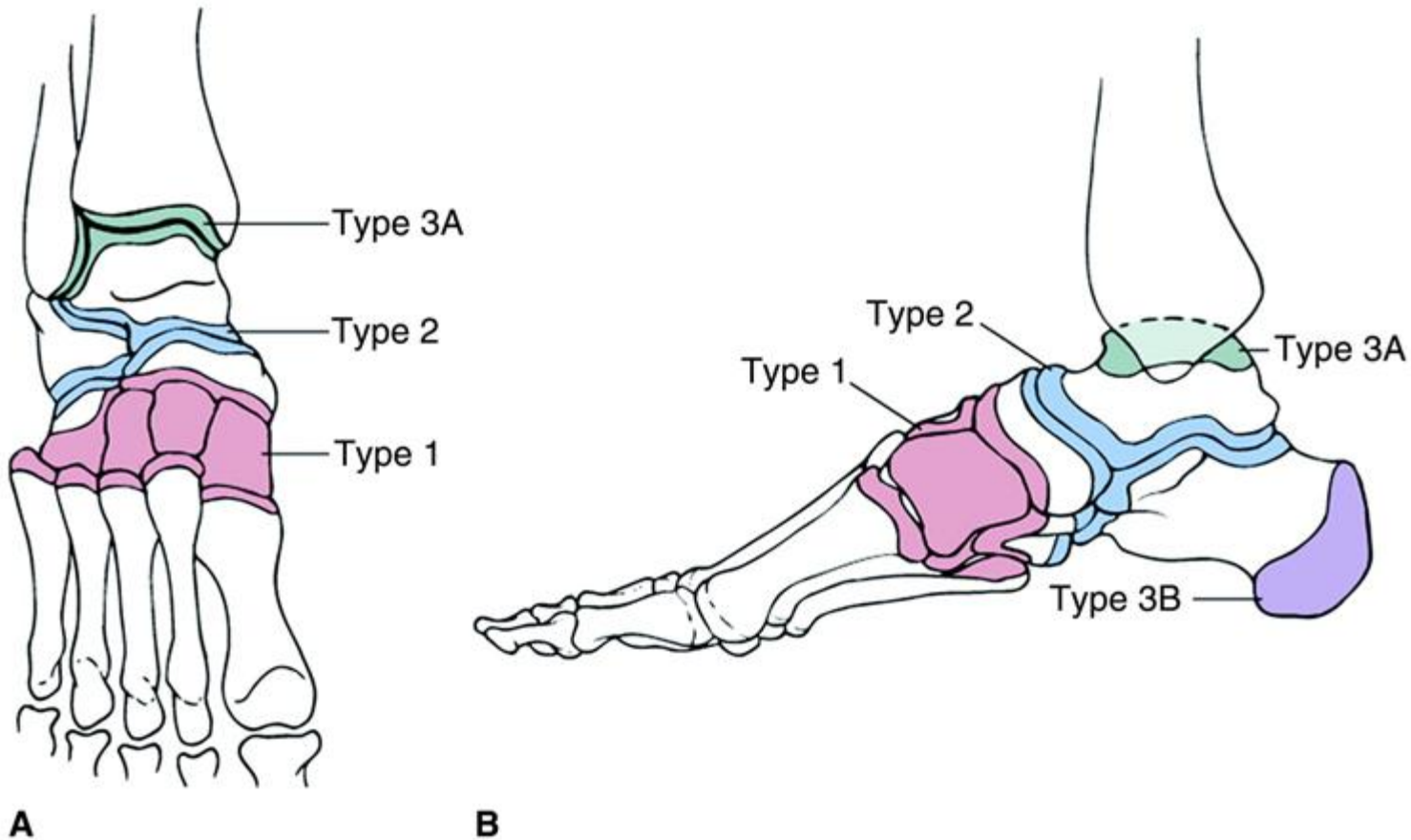
➢ *Type I: involves tarsometatarsal and naviculocuneiform joints. It is the most common type*

➢ *Type II: involves subtalar, talonavicular, calcaneocuboid joints*

➢ *Type III: involves tibio-talar joint. A: tibio-talar. B: fracture of calcaneal tuberosity.*

➢ *Type IV: combination of area*

➢ *Type V: forefoot involvement*


Type 3A
Type 2
Type 1
A
Type 2
Type 1
Type 3A
Type 3B
B

What are the principles of treating this condition?

- *Prevention: optimum management of co-morbidities (diabetes)*
- *Goals of treatment : to achieve plantigrade, stable foot that is able to fit into a shoe and the prevention of recurrent ulceration*
- *TCC(total contact casting) is the gold standard of treatment.*
  - *It allows an even distribution of the pressures across the plantar surface of the foot.*
  - *Weight bearing should be restricted.*
  - *Casts should be changed every 2-4 weeks until erythema and edema have resolved and the temperature has reduced. TCC is commonly continued up to 4 months.*
  - *Once the active phase has ended, the patient can be fitted with a Charcot restraint orthotic walker (CROW)and later with custom shoe orthosis.*

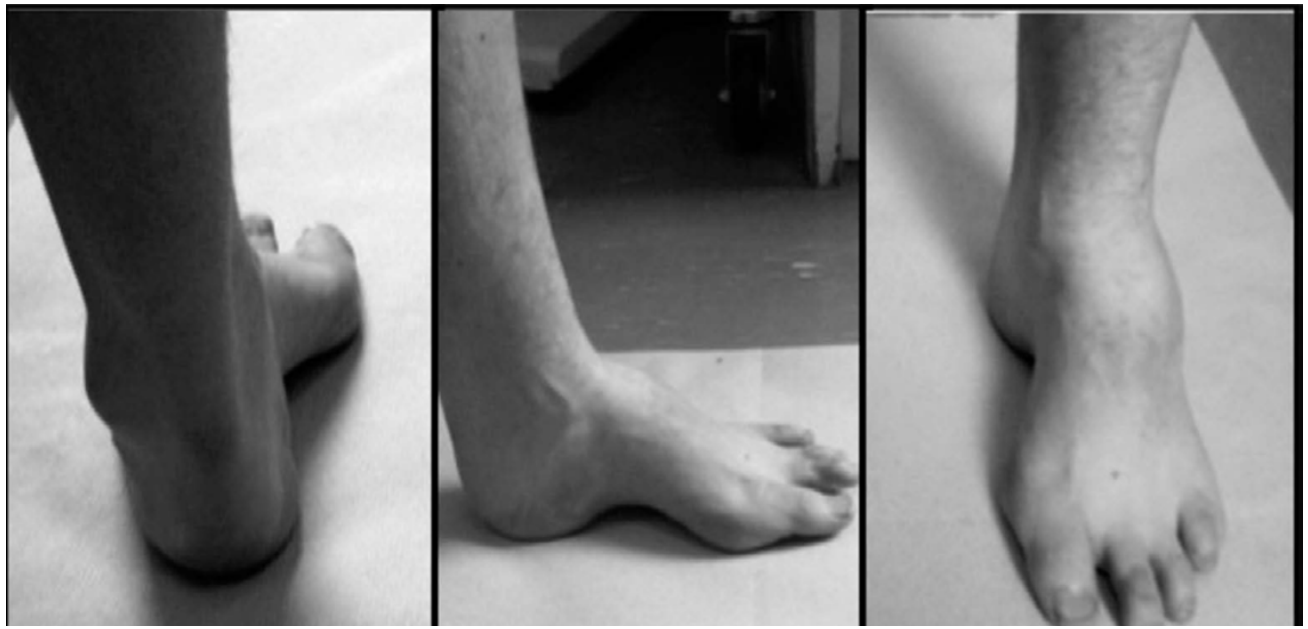
What are the principles of treating this condition?

- *Surgery performed in the inflammatory phase has a high rate of non-union, infection, wound complications, late deformity and amputation.*
- *Indications for surgical intervention: If a plantigrade foot cannot be achieved, recurrent ulcers and instability. Surgical options: exostectomy, reconstruction with osteotomy and fusion, amputation*

Viva 4

These are pictures of the left foot of a 20-year-old man.

- What do you see?
- What is the underlying pathology?
- what is the Pathoanatomy?
- What is HMSN?
- How would you assess this patient?
- What are the principles of management?



What do you see?

- *These photographs show the anterior, medial and posterior views of a left foot with a cavus deformity.*
- *The hindfoot is in varus and there is elevated medial longitudinal arch.*
- *There doesn't appear to be any significant clawing or abnormality of the toes. (forefoot adduction)*
- *Pes cavus can be divided in to :*
  - *Pes cavus with hindfoot varus deformity*
  - *Pes cavus with hindfoot calcaneus deformity (seen in polio or CMT due to weakness of GN)*

What is the underlying pathology?

- *Du to imbalance in the musculature of the foot. It can be caused by:*
  - *plantar flexion deformity of the forefoot or*
  - *dorsiflexion deformity of the hindfoot known as calcaneocavus.*
- *The causes of a cavus foot may be broken down into:*

➢ *Congenital: idiopathic (most idiopathic cases are simple cavus without varus deformity)- arthrogryposis-sequela of clubfoot*

➢ *Acquired: traumatic or neuromuscular.*

- ➢ *The neuromuscular:*
  - ➢ *Central disease: cerebral palsy or Friedrich's ataxia, spinal cord lesions such as spina bifida or spinal dysraphism,*
  - ➢ *Peripheral lesions such as an HMSN or muscular causes such as muscular dystrophy.*

what is the Pathoanatomy?

- *It is resulted due to imbalance in the musculature of the foot.*
- *The primary deformity is forefoot plantar flexion specially of the 1st ray that may result from weakness of tibialis anterior relative to peroneus longus, but more commonly due to intrinsic weakness and contracture. It results in an increase in arch height and pronation of forefoot(due to overpowered PL)*
- *Two factors contribute to the development of hindfoot varus deformity:*

➢ *The hindfoot assumes a compensatory varus posture to balance the forefoot valgus*

➢ *overpower of the tibialis posterior to the weakened peroneus brevis .*

➢ *Elevation of the arch occurs as a result of tightening of the windlass mechanism due to imbalance between the weakened intrinsic and extrinsic muscles.*

what is the Pathoanatomy?

- *Clawing of the toes due to loss of the intrinsic function (MTP flexion and IP extension) and the patient try to compensate by using the toe extensors resulting in MTPJ hyperextension and IPJ flexion.*
- *EHL acts as an accessory dorsiflexor in the absence of tibialis anterior.*
- *Overtime the plantar fascia contracts and the hindfoot varus deformity becomes more rigid*

What is HMSN?

- *Hereditary Motor Sensory Neuropathy is a chronic progressive peripheral neuropathy*

➢ *HMSN I: also called myelinopathy CMT, the most common HMSN. Autosomal dominant, peripheral myelin degeneration due to defect in PMP 22 in Chr17. occurs in the 1st to 2nd decade*

➢ *HMSN II: also called neuropathy CMT, the myelin sheath is intact but there is Wallerian axonal degeneration. Occurs in the 2nd generation. Autosomal dominant*

➢ *HMSN III: autosomal recessive, presents in infancy, characterized by peripheral nerve demyelination with severely decreased motor nerve conduction*

How would you assess this patient?

❖***History:***

- *Common complaints in cavus feet are pain, particularly forefoot pain, lateral foot pain under the metatarsal heads(1st and 5th), or arch pain, instability of the ankle with a history of frequent ankle sprains. They may also have problems with fitting of footwear or alteration of gait.*
- *Laterality:*

➢*Unilateral involvement suggests a focal diagnosis (spinal cord anomaly or nerve injury)*

➢*Bilateral involvement and family history are common in CMT*

- *Congenital or acquired: when did you notice the deformity? Were you born with it?*
- *Progression: is it getting worse?*

How would you assess this patient?

❖***History:***

- *Any associated weakness or numbness? Is there any weakness in your hands? Any problems with your back? Any problems with your bladder or bowel?*
- *How the symptoms affect the function (work – sport – walking)*
- *Any previous history of ulceration or infection?*
- *I would also ask about any past medical and surgical history, family history (runs in families), and any previous surgical or non-surgical treatment the patient had received.*
- *What are the patient (and parent) expectations? What do you expect from your visit?*

How would you assess this patient?

❖***Examination:***

- *My assessment would have two components. I need to determine any underlying cause of the cavus and also evaluate the deformity itself.*
- ***Look****:*

➢*whether this is a unilateral or bilateral deformity*

➢*wasting of leg and hands muscles*

➢*Inverted champagne bottle appearance*

➢*Hindfoot in varus, neutral or valgus alignment. Is it in equinus or calcaneus ?*

➢*height of the longitudinal arch and whether I can pass more than two fingers underneath.*

➢*While the patient is standing I will look at the spine for any stigmata of an underlying abnormality such as a hairy patch or scoliosis.*

How would you assess this patient?

❖***Examination:***

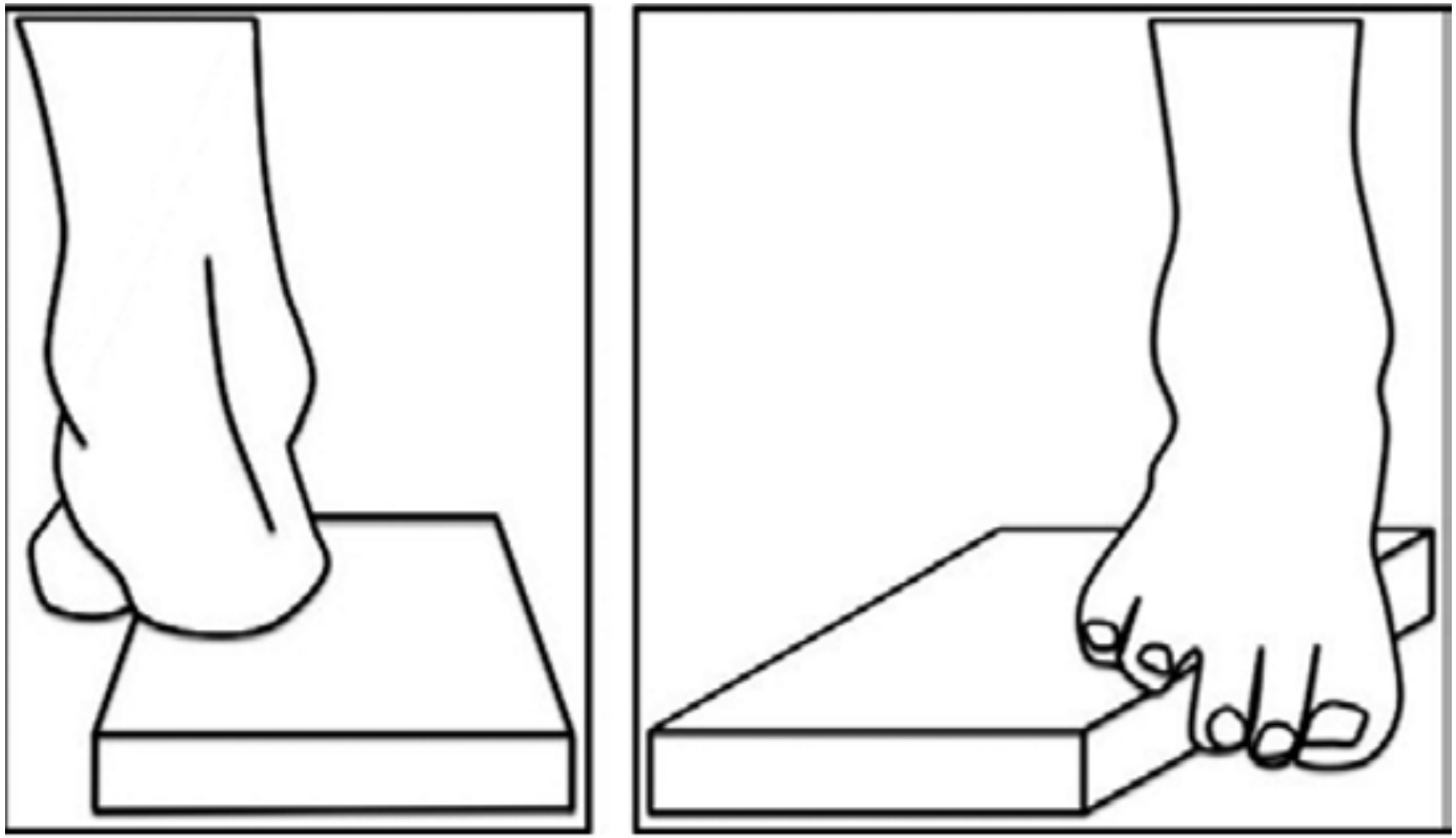
- ***Look****:*

➢*Gait: The patient may have foot drop gait*

➢*While the patient is standing I would perform Coleman block test to look for flexibility of the hindfoot deformity by eliminating the deforming drive of the forefoot.*

➢*In a cavus foot the first ray is plantarflexed so to place the foot stable on the ground the hindfoot has to move into varus.*

➢ *In the Coleman block test the foot is positioned so that the lateral border of the foot and the heel are placed on a block and the medial forefoot is allowed to hang off the edge of the block. If the heel then assumes a physiological alignment of neutral to 5 valgus when viewed from behind the hindfoot deformity is both flexible and driven by the forefoot.*



How would you assess this patient?

❖***Examination:***

- ***Look****:*

➢*With the patient sitting I would inspect the soles of the feet for callosities or ulceration*

➢*I would like to inspect the patients shoes to evaluate for any lateral side shoe wear especially in presence of hindfoot varus*

How would you assess this patient?

❖***Examination:***

- ***Feel****:*

➢*Any areas of tenderness (forefoot-lateral foot)*

❖***Move:***

➢*Look at the active and passive range of movement and see whether the deformities are flexible or fixed.*

➢*Tightness of tendoachilles (silverskoild test)*

❖***Neurological assessment***

➢*I would assess sensation, deep tendon reflexes and power of the major muscle groups, particularly the tibialis anterior and posterior and the peroneal tendons*

❖***Special test***

➢*I would assess* ***lateral ankle ligament competence*** *with an anterior drawer*

How would you assess this patient?

❖***Investigation:***

➢*weight bearing radiographs, LAT ankle, and an AP and LAT of the foot.*

➢*Talo-calcaneal angle (**Turco**) in lateral view, <35°*

➢***Meary's angle**, the angle between the long axis of the talus and the first metatarsal shaft. It will be increased with apex up.*

➢ ***Hibb's angle** is the angle between the long axis of the first metatarsal shaft and the long axis of the calcaneum. normally is 150 degrees but may decreases as the cavus worsens*

➢ *The **calcaneal pitch angle**, the angle between the floor and the undersurface of the calcaneum, should be less than 30 but may be increased in a cavus foot*

How would you assess this patient?

❖***Investigation:***

➢*MRI of the spine is indicated if the patient had any signs or history suggesting an underlying spinal cause (hairy patch or scoliosis- unilateral involvement)*

What are the principles of management?

- *The goal of treatment: pain relief – preserve function –protect the foot & ankle from further deformity*

➢ *Non-operative treatment indicated in flexible mild cases*

✓ *Physiotherapy: eversion & dorsiflexion strengthening -Heel cord stretching exercises- proprioception exercise for instability*

✓ *Orthotic: semi-rigid insole with depression for the 1st ray- heel lift & lateral wedge*

What are the principles of management?

- *Operative treatment*
- *Flexible: (hindfoot corrects in Coleman block test)*

✓ *Plantar fascia release*

✓ *PTT transfer to the dorsum of the foot through the interosseous membrane (to decrease the varus moment.*

✓ +/- *transfer of peroneus longus tendon to peroneus brevis.*

✓ +/- *TAL*

✓ +/- *dorsiflexion osteotomy of the 1st MT*

✓ +/- *Girdlstone-Taylor procedure (transfer of FDL to EDL) in flexible claw lesser toes*

✓ +/- *Jones transfer (EHL transfer to the 1st MT neck + IP joint arthrodesis) in flexible Hallux clawing*

What are the principles of management?

- *Operative treatment*
- *Rigid: (hindfoot doesn't correct in Coleman block test)*
  - ✓ *Add lateralizing calcaneal osteotomy*
- *Sever rigid deformities:*
  - ✓ *Triple arthrodesis*

Viva 5

- Describe what you see
- Tell me about posterior tibial muscle
- What is the classification system used for this condition?
- After your examination, how would you investigate this patient?
- What are the treatment options?

Describe what you see

- *This is a clinical photograph showing a posterior view of feet in weight bearing position.*
- *There is*
  - *Pes planus deformity and collapse of the medial longitudinal arch , hindfoot valgus, marked heel valgus and too many toes(more than 2 toes).*
  - *Clinical findings are consistent with flatfoot or pes planus.*
- *In adults it is usually acquired and commonly due to tibialis posterior dysfunction.*
- *Other causes include inflammatory arthritis, Charcot arthropathy, osteoarthritis and trauma.*
- *It is commoner in females and the incidence increases with age.*

Tell me about posterior tibial muscle

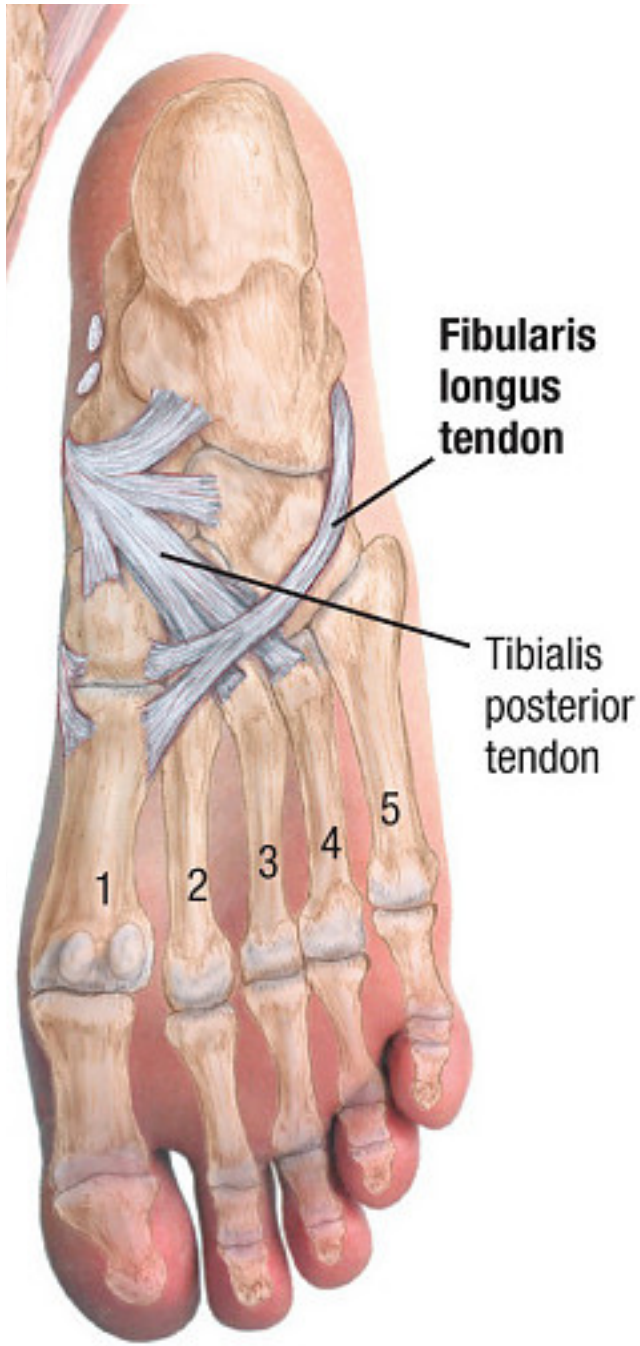
- *The muscle originates from the posterior fibula-tibia-interosseous membrane*
- *It is innervated by the posterior tibial nerve*
- *The tendon travels distally posterior to the medial malleolus before dividing in to three limbs*

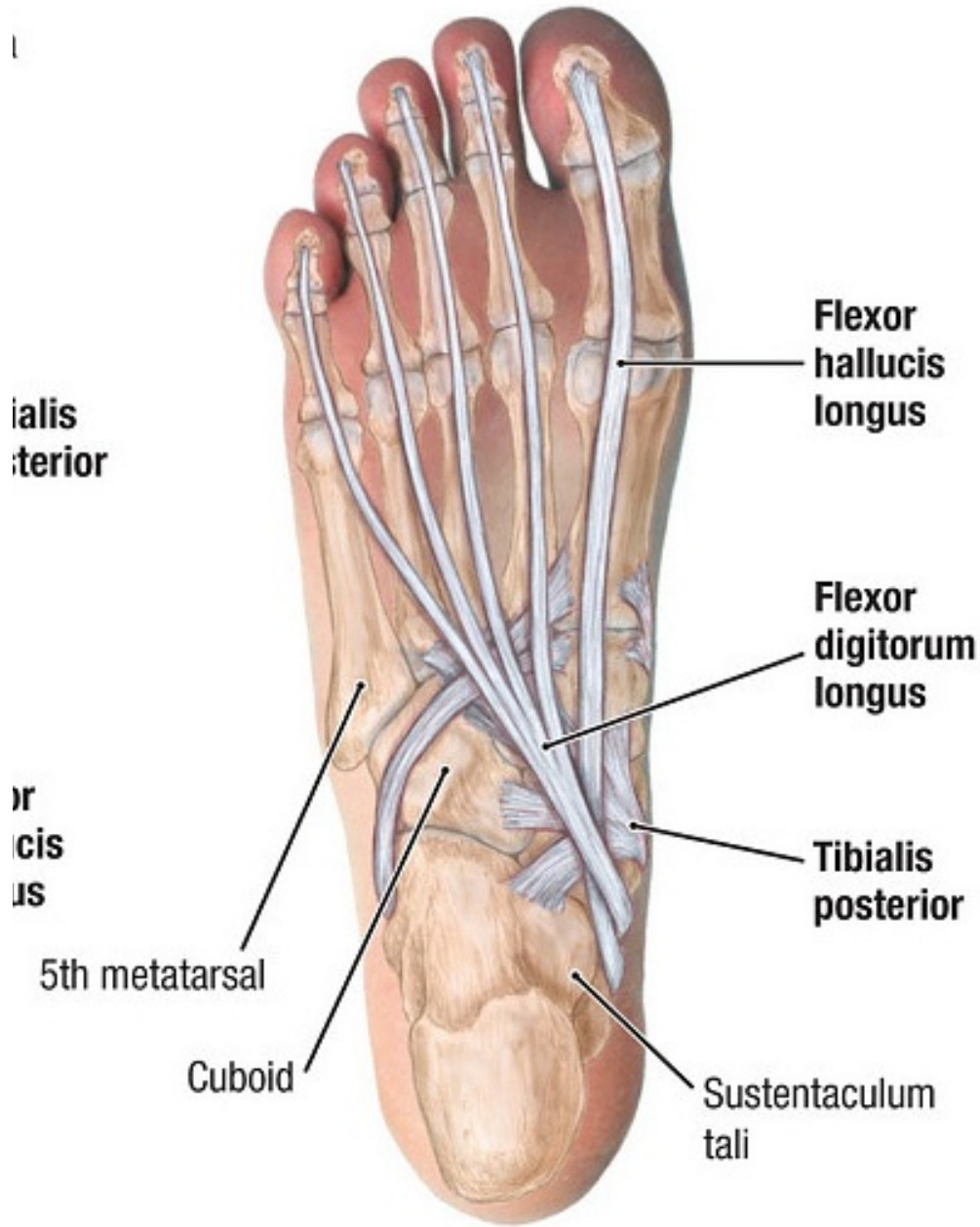
✓ *The anterior limb inserts into the tuberosity of the navicular and the medial cuneiform*

✓ *The middle limb inserts into the 2^{nd}-3^{rd} cuneiform-cuboid-2^{nd} through 5^{th} MT*

✓ *The posterior limb inserts on the sustentaculm tali anteriorly.*

- *The PTT lies in an axis posterior to the ankle joint and medial to the subtalar joint.*
- *It acts as*
  - *Hindfoot inversion*
  - *Forefoot adduction and supination*
  - *It acts as a secondary plantar flexor at the ankle joint*


Fibularis
longus
tendon
Tibialis
posterior
tendon
1
2
3
4
5

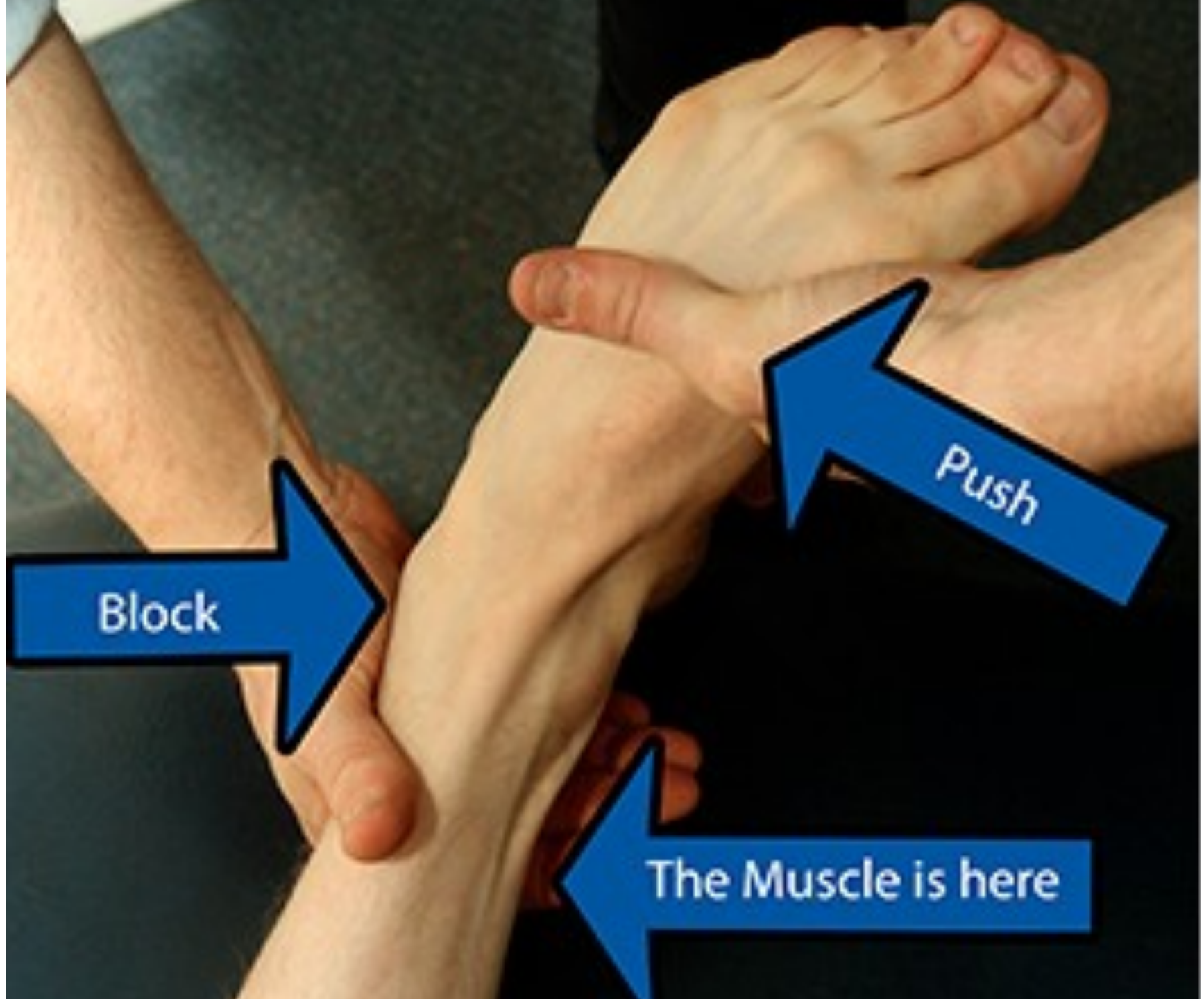

Flexor
hallucis
longus
Flexor
digitorum
longus
Tibialis
posterior
5th metatarsal
Cuboid
Sustentaculum
tali

Tell me about posterior tibial muscle

- *Activation of the PTT allows locking of the transverse tarsal joints creating a rigid lever arm for the toe-off phase of the gait.*
- *The major antagonist of the PTT is PB.*
- *There is watershed area between the navicular and the distal medial malleolus.*
- *Patients who suffer from PTTI develop a flatfoot deformity. The four classic findings of a patient suffering from PTTI are: collapsed medial arch, hindfoot valgus, forefoot abduction and varus?? (too many toes sign)*

How to test for the posterior tibilais power?

- *The foot is positioned in planter flexion and full inversion*
- *If the patient is unable to maintain foot position when the examiner apply an eversion forces the patient is having weak PTT*


Block
Push
The Muscle is here

What is the classification system used for this condition?

- Jhonson classification with modification by myerson
- Stage I
  - There is no deformity, only tenosynovitis, the patient is able to do single heel raise test, and no arthritic changes on radiographs
- Stage II flexible hindfoot sub divides to
  - IIA: flatfoot deformity, flexible hindfoot and normal forefoot, the patient is unable to do single heel raise test, no arthritic changes on radiographs, there is collapse of the medial arch
  - IIB: flatfoot deformity, flexible hindfoot and forefoot abduction with talonavicular angle (uncoverage of the talus) >40%, the patient is unable to do single heel raise test, no arthritic changes on radiographs, there is collapse of the medial arch
  - IIC: *1st TMT instability*.

What is the classification system used for this condition?

- Stage III rigid hindfoot
  - Flatfoot deformity, rigid hindfoot and forefoot, unable to do single heel raise test and radiographs showed subtalar arthritis with no talar tilt
- Stage IV
  - Flatfoot deformity, rigid hindfoot and forefoot, unable to do single heel raise test and radiographs showed subtalar arthritis with talar tilt in mortise view(hindfoot valgus)

	Deformity	Physical exam	Radiographs
Stage I	• Tenosynovitis • No deformity	• (+) single-heel raise	• Normal
Stage IIA	• Flatfoot deformity • Flexible hindfoot • Normal forefoot	• (-) single-leg heel raise • Mild sinus tarsi pain	• Arch collapse deformity
Stage IIB	• Flatfoot deformity • Flexible hindfoot • Forefoot abduction ("too many toes", >40% talonavicular uncoverage)		
Stage III	• Flatfoot deformity • Rigid forefoot abduction • Rigid hindfoot valgus	• (-) single-leg heel raise • Severe sinus tarsi pain	• Arch collapse deformity • Subtalar arthritis
Stage IV	• Flatfoot deformity • Rigid forefoot abduction • Rigid hindfoot valgus • Deltoid ligament compromise	• (-) single-leg heel raise • Severe sinus tarsi pain • Ankle pain	• Arch collapse deformity • Subtalar arthritis • Talar tilt in ankle mortise

After your examination, how would you investigate this patient?

❖***Weight bearing foot A/P & lateral radiographs- ankle mortise***

➢*A/P foot:*

✓*Talonavicular uncoverage*

➢*Lateral view:*

✓*Decreased calcaneal pitch (normal angle is between 17-32°)*

✓*Increased (Meary's angle) angles >4°and directed downword indicating pes planus.*

➢*Ankle mortise*

✓*Talar tilt due to deltoid insufficiency seen in stage IV*

Talar tilt

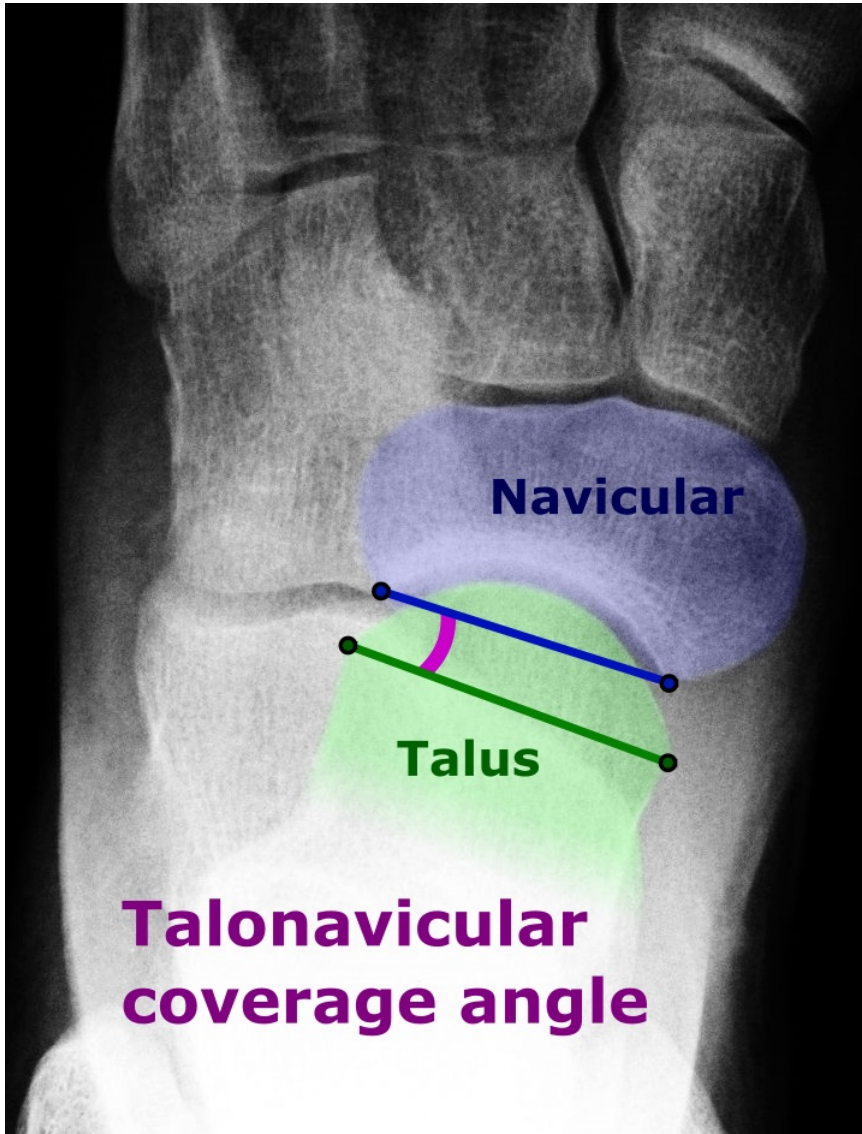
- line drawn parallel to articular surface of distal tibia
- second line drawn parallel to talar surface
- The two lines should be parallel to each other
- Abnormal Occurs due to deltoid insufficiency

Normal talar tilt

Abnormal talar tilt

Talonavicular coverage angle

- Two lines
- One connecting the edges of the articular surface of the talus and another connecting the edges of the articular surface of the navicula
- Normal angle is less than 7 degrees



What are the treatment options?

❖ ***Stage I***

➢ *Non-operative*

✓ *Initial period of immobilisation followed by shoe orthosis (UCBL with medial posting) + NSAIDs*

✓ *Physiotherapy*

➢ *Operative :*

✓ *Tenosynovectomy if conservative treatment fails*

What are the treatment options?

❖ ***Stage II***

➢ *Non-operative*

✓ *Similar to stage I*

➢ *Operative :*

✓ *IIA: medializing calcaneal osteotomy + FDL transfer to navicular bone from plantar to dorsal (flexion of the lesser toes to be maintained by flexor hallucis longus via the knot of Henry.) +/- ETA +/- spring ligament reconstruction. Then if the forefoot is supinated assess the 1st TMT , if stable >> plantar flexion opening wedge medial cuneiform osteotomy (Cotton).*

✓ *IIB: add lateral column lengthening*

✓ *IIC: if the 1st TMT is unstable or arthritic >> fusion.*

What are the treatment options?

❖***Stage III***

➢*Non-operative*

✓*AFO or arizona*

➢*Operative :*

✓*Triple arthrodesis(subtalar, talonavicular, calcaneocuboid)*

What are the treatment options?

❖***Stage IV***

➢*Non-operative*

✓*Similar to III*

➢*Operative :*

✓*If tibiotalar is not involved >> hindfoot arthrodesis + deltoid reconstruction ??*

✓*If tibiotalar is arthritic >> pantalar arthrodesis. Tibiotalarcalcaneal*.

Viva 7

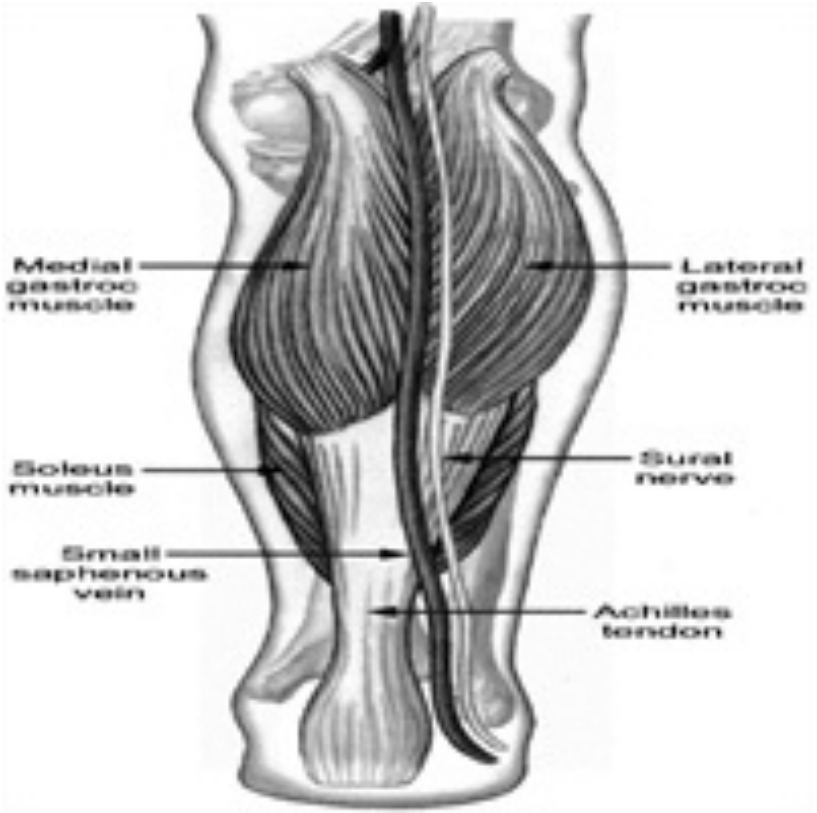
- Describe this test
- Describe Strayer procedure

Describe this test

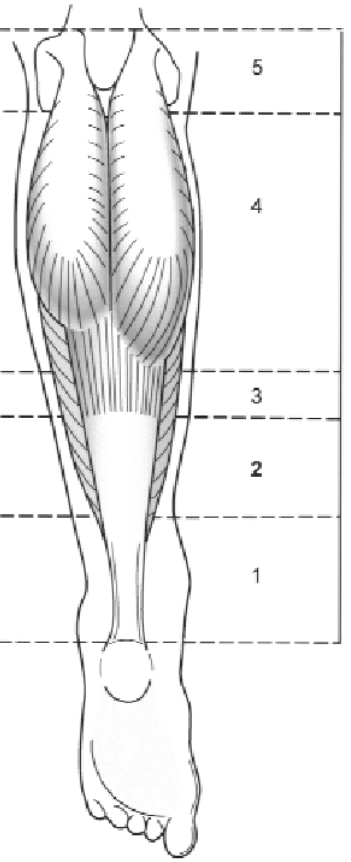
- *This is a clinical photograph demonstrates the Silfverskiöld test*
- *Used to differentiates gastrocnemius tightness from an Achilles tendon(gastrosolus complex) contracture by evaluating ankle dorsiflexion with the knee is extended and then flexed.*
- *Increased ankle dorsiflexion with knee flexion indicates gastrocnemius tightness.*
- *This occurs because gastrocnemius muscle relaxes with knee flexion as the muscle crosses the knee joint and the soleus muscle does not.*
- *If there is no difference in ankle dorsiflexion with knee flexion, then an Achilles tendon contracture is present.*

Describe Strayer procedure

- The Strayer procedure (gastrocnemius recession) is a treatment option for patients with clinically relevant gastrocnemius equinus contracture.



Procedure	Eponym	Level
Proximal GT	Silfverskiöld	5
Deep GSR	Baumann	4
Distal GT	Strayer	3
Superficial GSR	**Vulpius Baker**	**2**
TAL	Hoke White Paley	1

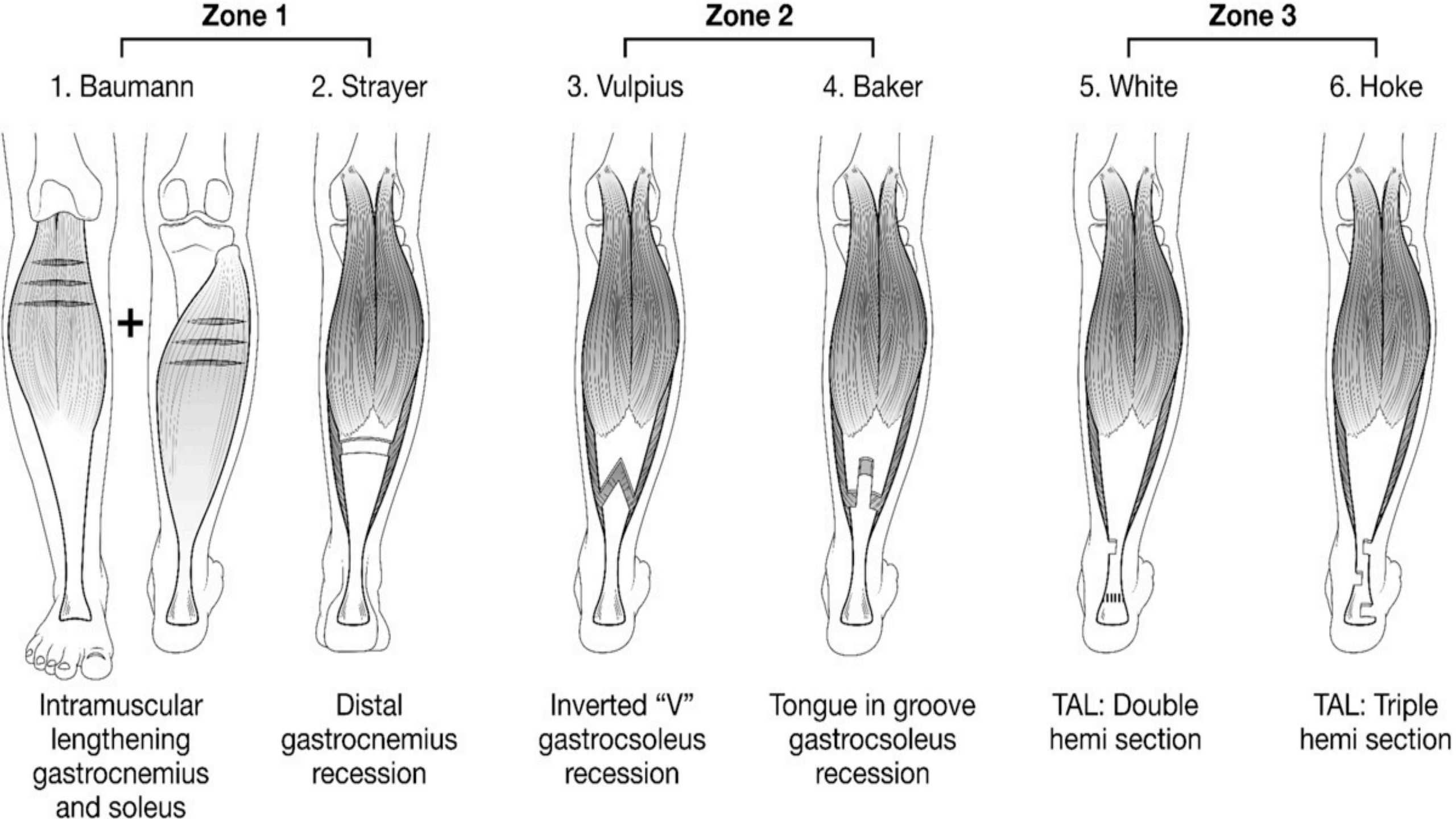


Gastrocnemius recession-

Strayer, Baker, or Vulpius

- **Strayer procedure-**
  - The cut in the gastrocnemius is transverse and more proximal
  - not lengthen the soleus whatsever

FIGURE 35-21 Distal recession of the gastrocnemius, Strayer technique.


Zone 1
Zone 2
Zone 3
1. Baumann
2. Strayer
3. Vulpius
4. Baker
5. White
6. Hoke
+
Intramuscular lengthening gastrocnemius and soleus
Distal gastrocnemius recession
Inverted "V" gastrocsoleus recession
Tongue in groove gastrocsoleus recession
TAL: Double hemi section
TAL: Triple hemi section

Viva 8

- What are the indications for ankle arthroscopy?
- Describe the different portals used for ankle arthroscopy

What are the indications for ankle arthroscopy?

- *microfracture of OCD*
- *debridement of post-traumatic synovitis*
- *resection of anterior tibiotalar spurs*
  - *such as anterior bony impingement*
- *os trigonum excision*
- *removal of loose bodies*

Describe the different portals used for ankle arthroscopy

❖***Positioning***

- *patient placed supine*
- *place tourniquet and exsanguinate limb*
- *external traction device applied to distract tibiotalar joint*
- *can load joint with saline to distend joint*

Describe the different portals used for ankle arthroscopy

❖***Anteromedial portal***

- *primary viewing portal*
- *access to anteromedial joint*
- *medial to tibialis anterior and lateral to medial malleolus*
- *Saphenous nerve & great saphenous vein at risk*

Describe the different portals used for ankle arthroscopy

❖***Anterocentral portal***

- *medial to EDL and lateral to EHL*
- *not commonly utilized due to danger to deep peroneal nerve and anterior tibial vessel*

Describe the different portals used for ankle arthroscopy

❖***Anterolateral portal***

- *primary viewing portal*
- *access to anterolateral joint*
- *located just lateral to peroneus tertius and superficial peroneal nerve and medial to lateral malleolus*
- *Intermediate dorsal cutaneous branch of superficial nerve is at risk*
- *By flexion and inverting the foot, it is possible put stretch on the nerve and to visualize it subcutaneously to avoid injury.*

Describe the different portals used for ankle arthroscopy

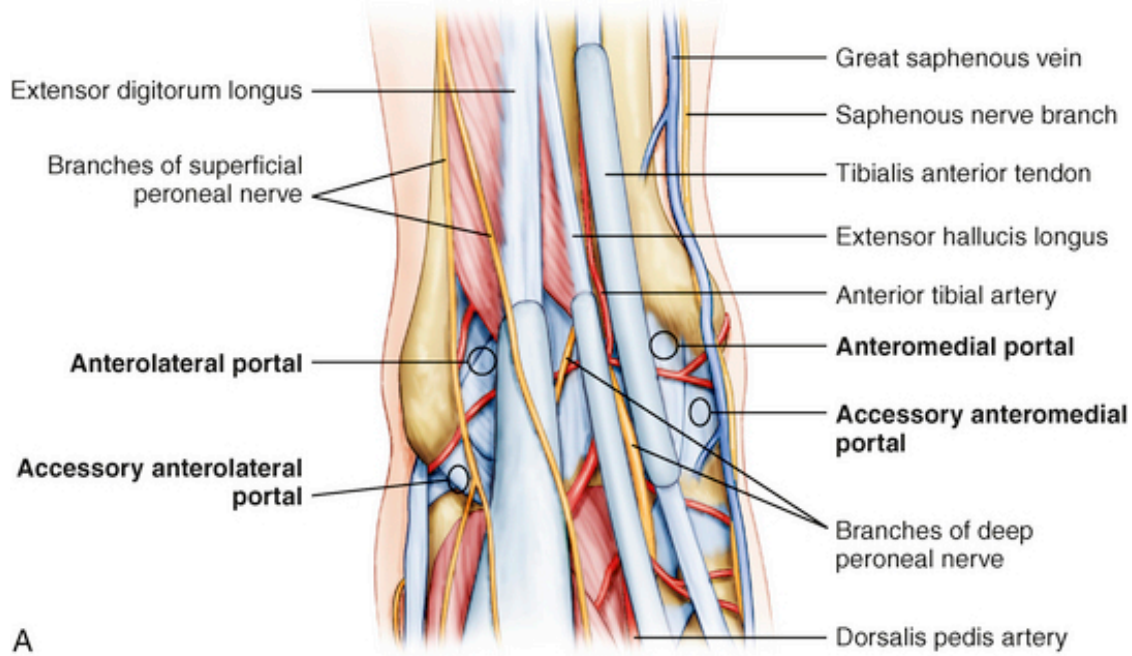
❖***Posterolateral portal***

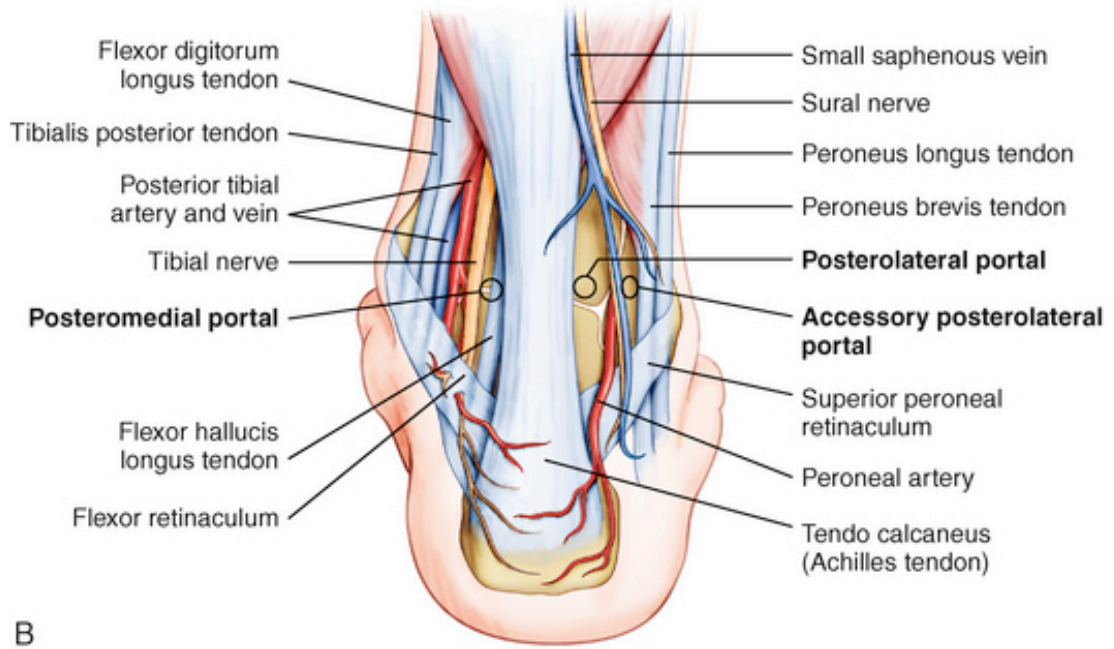
- *posterior viewing portal for access to os trigonum*
- *located 2cm proximal to tip of lateral malleolus*
- *medial to peroneal tendons and lateral to Achilles tendon*
- *Sural nerve & lesser saphenous vein at risk*

Describe the different portals used for ankle arthroscopy

❖***Posteromedial portal***

- *posterior viewing portal for access to os trigonum*
- *just medial to Achilles tendon*
- *Posterior tibial vessels & tibial nerve at risk*


Extensor digitorum longus
Branches of superficial peroneal nerve
Anterolateral portal
Accessory anterolateral portal
Great saphenous vein
Saphenous nerve branch
Tibialis anterior tendon
Extensor hallucis longus
Anterior tibial artery
Anteromedial portal
Accessory anteromedial portal
Branches of deep peroneal nerve
Dorsalis pedis artery
A


Flexor digitorum longus tendon
Tibialis posterior tendon
Posterior tibial artery and vein
Tibial nerve
Posteromedial portal
Flexor hallucis longus tendon
Flexor retinaculum
Small saphenous vein
Sural nerve
Peroneus longus tendon
Peroneus brevis tendon
Posterolateral portal
Accessory posterolateral portal
Superior peroneal retinaculum
Peroneal artery
Tendo calcaneus (Achilles tendon)
B

Viva 9

- Describe the X-ray
- what are the most common causes of endstage arthritis of the ankle?
- How do patients with ankle arthritis often present?
- Are you aware of any classification system?
- What are the management options available for ankle arthritis?

Describe the X-ray

- *This is an AP weight bearing radiograph of a left ankle showing narrowing of the joint space and some subchondral sclerosis consistent with post-traumatic arthritis. There is evidence of a previous fibula fracture superior to the syndesmosis and varus angulation of the ankle.*

what are the most common causes of end-stage arthritis of the ankle?

- *post-traumatic arthritis*
  - *most common etiology, accounting for greater than 2/3 of all ankle arthritis*
- *primary osteoarthritis*
  - *accounts for less than 10% of all ankle arthritis*
- *other etiologies include rheumatoid arthritis, osteonecrosis, neuropathic, septic, gout, and hemophiliac*

How do patients with ankle arthritis often present?

- *Patients with ankle arthritis will often report pain in the anterior ankle with weight bearing and during the push-off stage of the gait cycle. They will also often have a reduced and painful range of motion.*
- *angular deformity may be present depending on the history of trauma*

Are you aware of any classification system?

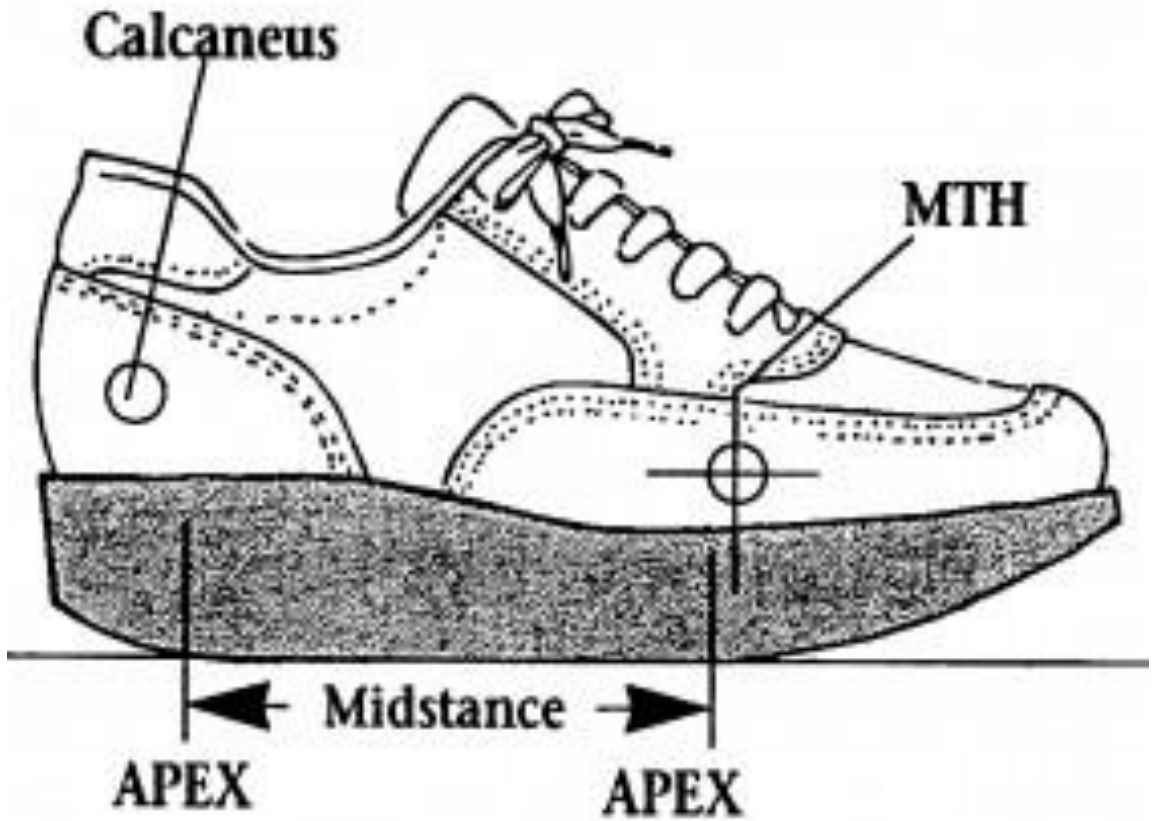
- *Takakura Classification*
- Stage I
  - Early sclerosis and osteophyte formation, no joint space narrowing
- Stage II
  - Narrowing of medial joint space (no subchondral bone contact)
- Stage IIIA
  - Obliteration of joint space at the medial malleolus, with subchondral bone contact
- Stage IIIB
  - Obliteration of joint space over roof of talar dome, with subchondral bone contact
- Stage IV
  - Obliteration of joint space with complete bone contact

What are the management options available for ankle arthritis?

❖***Non-operative:***

- *Pain medications (NSAIDS)*
- *Footwear modification with cushioned single rocker-bottom shoe to limit motion in the ankle during gait, increase propulsion at toe-off, decrease pressure on heel strike.*
- *Activity modification*
- *corticosteroid injection to help decrease pain*

Heel To Toe Rocker



What are the management options available for ankle arthritis?

❖***Operative:***

- *indicated upon failure of conservative treatment in a patient with radiographic evidence of ankle arthritis*
- *Ankle debridement and anterior tibial/dorsal talar exostectomy can help relieve impingement and improve symptoms in mild cases with pain during push off.*

What are the management options available for ankle arthritis?

❖***Operative:***

- **Arthrodesis :**
- *Still considered the gold standard*
- *reliable relief of pain and return to activities of daily living*
- *50% of patients demonstrated subtalar arthrosis10 years following ankle arthrodesis*
- *There is a 10% nonunion rate, which can be negatively influenced by such factors as smoking, diabetes, avascular necrosis, and prior arthrodesis.*
- *The optimum position of arthrodesis of the ankle: neutral dorsiflexion, hindfoot (5 degrees) valgus angulation, and approximately 5 to 10 degrees of external rotation.*

What are the management options available for ankle arthritis?

❖***Operative:***

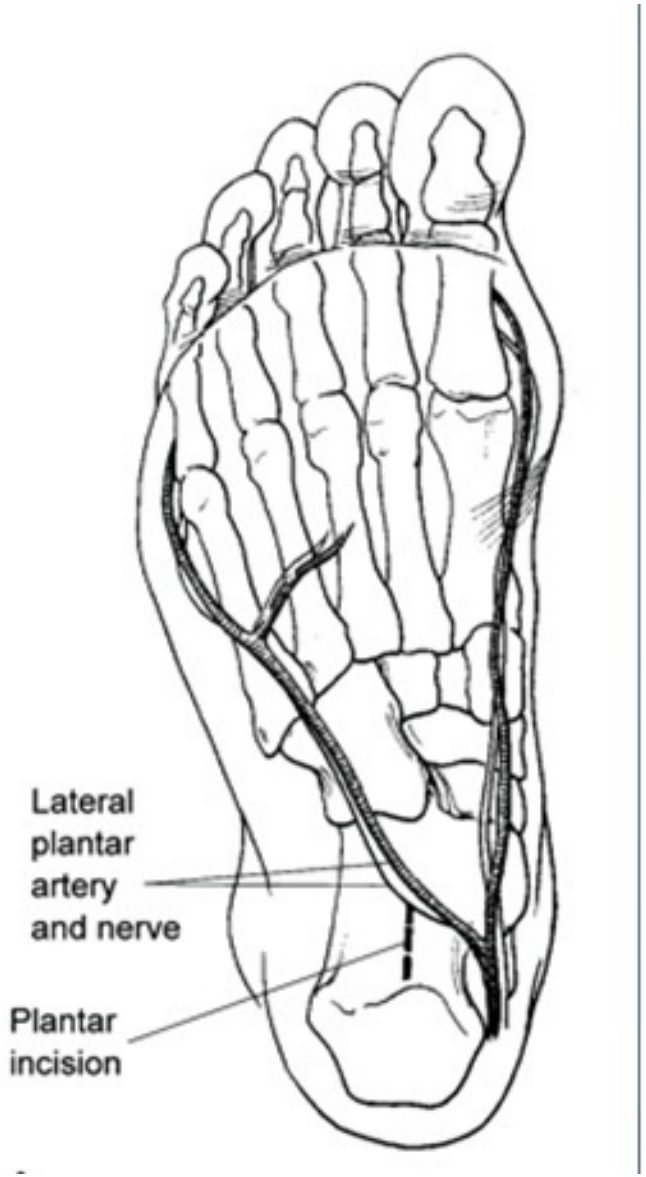
- **Arthrodesis :**
- *Options: Arthroscopically assisted - open arthrodesis through trans-fibular approach, used when deformity is present.*
- *Screws fixation or plate & screws (associated with risk of superficial nerve injury)- other option: Tibiotalocalcaneal (TTC) fusion with retrograde intramedullary nail (Load-sharing device with improved bending stiffness and rotational stability compared to plate-and-screw constructs) risk of lateral plantar nerve injury*

What are the management options available for ankle arthritis?

❖***Operative:***

- **Arthrodesis :**
- *Trans-fibular technique: A longitudinal incision is made directly over lateral aspect of fibula. The joint line is identified, using an image intensifier. The fibula is cut obliquely with a saw (superolateral to inferomedial ending at the level of the tibial plafond). The free distal end of the fibula is then reflected inferiorly. Care is taken not to divide the peroneal tendons at the tip of the distal fibula. Capsulotomy then allows access to joint surface. The bone of the distal fibula can then be used to harvest cancellous bone graft*


L
SB
W/Weight


Lateral
plantar
artery
and nerve
Plantar
incision

What are the management options available for ankle arthritis?

❖***Operative:***

- **Arthroplasty:**
- *Patient selection is crucial*
- *Indicated in inflammatory arthritis, elderly patients*
- *Contraindications: uncorrectable deformity, severe osteoporosis, talus osteonecrosis, charcot joint, ankle instability, obesity, and young laborers increase the risk of failure and revision*
- *Outcomes: recent 5-10 year outcome studies demonstrate up to 90% good to excellent clinical results, long-term studies are still pending on the newest generation of ankle arthroplasty*
- *increased stride length, cadence, and stride velocity as compared to ankle arthrodesis.*

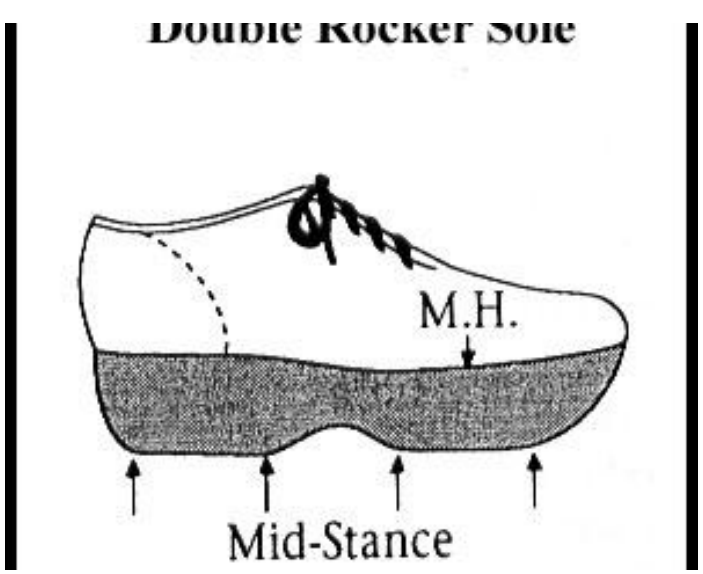
What are the management options available for ankle arthritis?

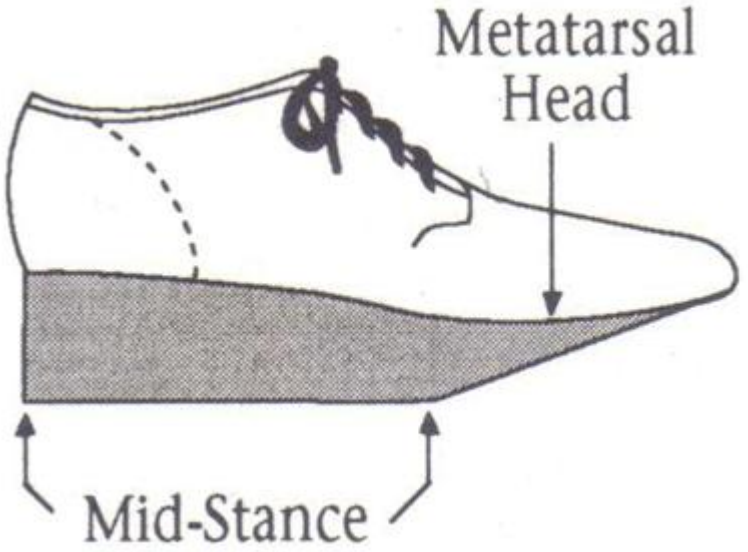
❖***Operative:***

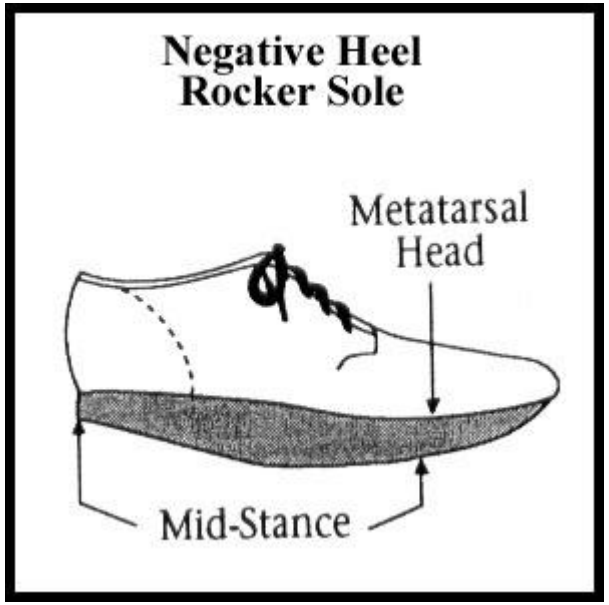
- **Arthroplasty:**
- *Types: The earlier designs involved a two-component design such as the Agility total ankle replacement, which required fusion of the distal tibiofibular joint. Most modern designs are three-component uncemented mobile bearing prostheses.*

Viva 10

- Describe the different types of sole shoe modification and the indication for each one

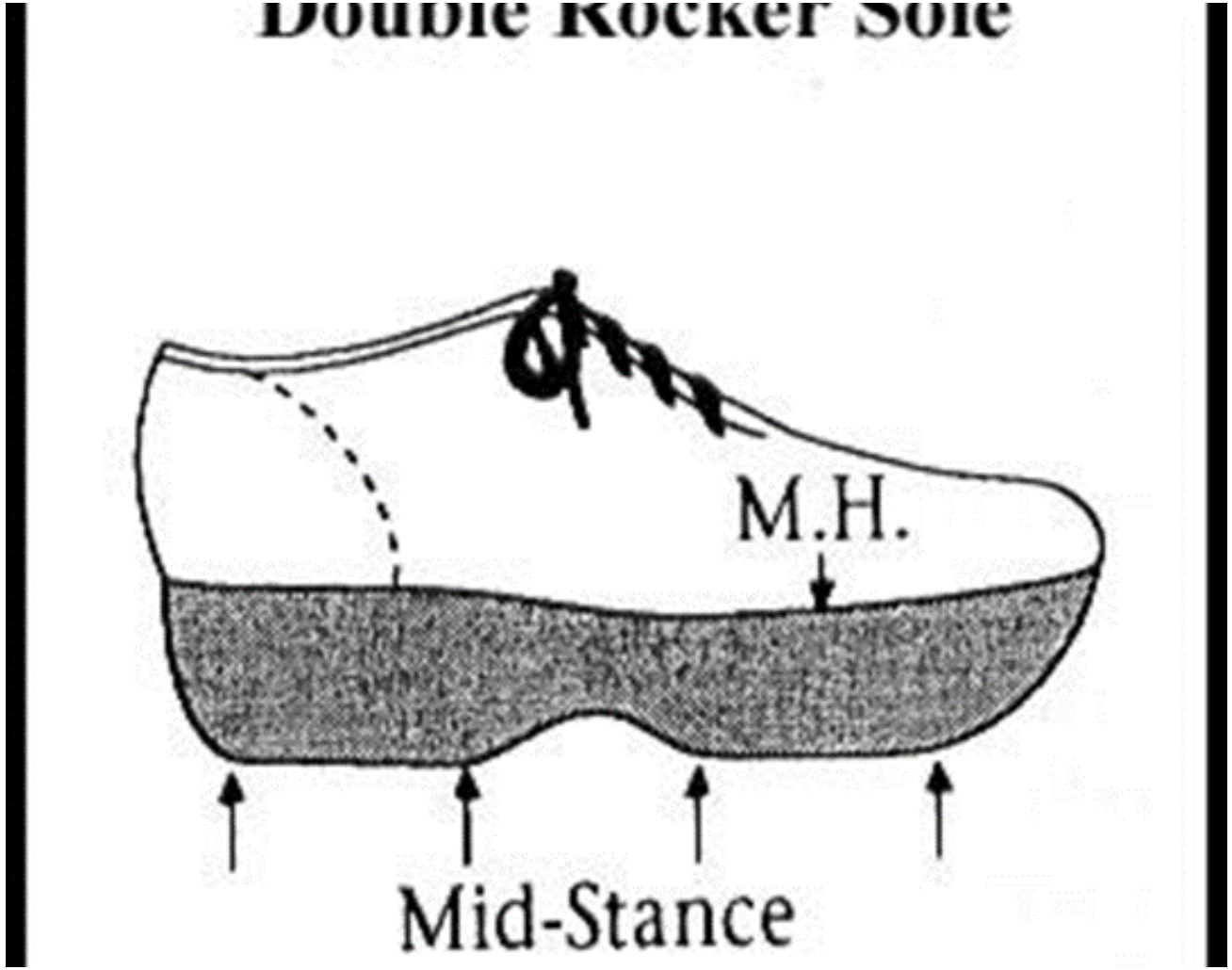






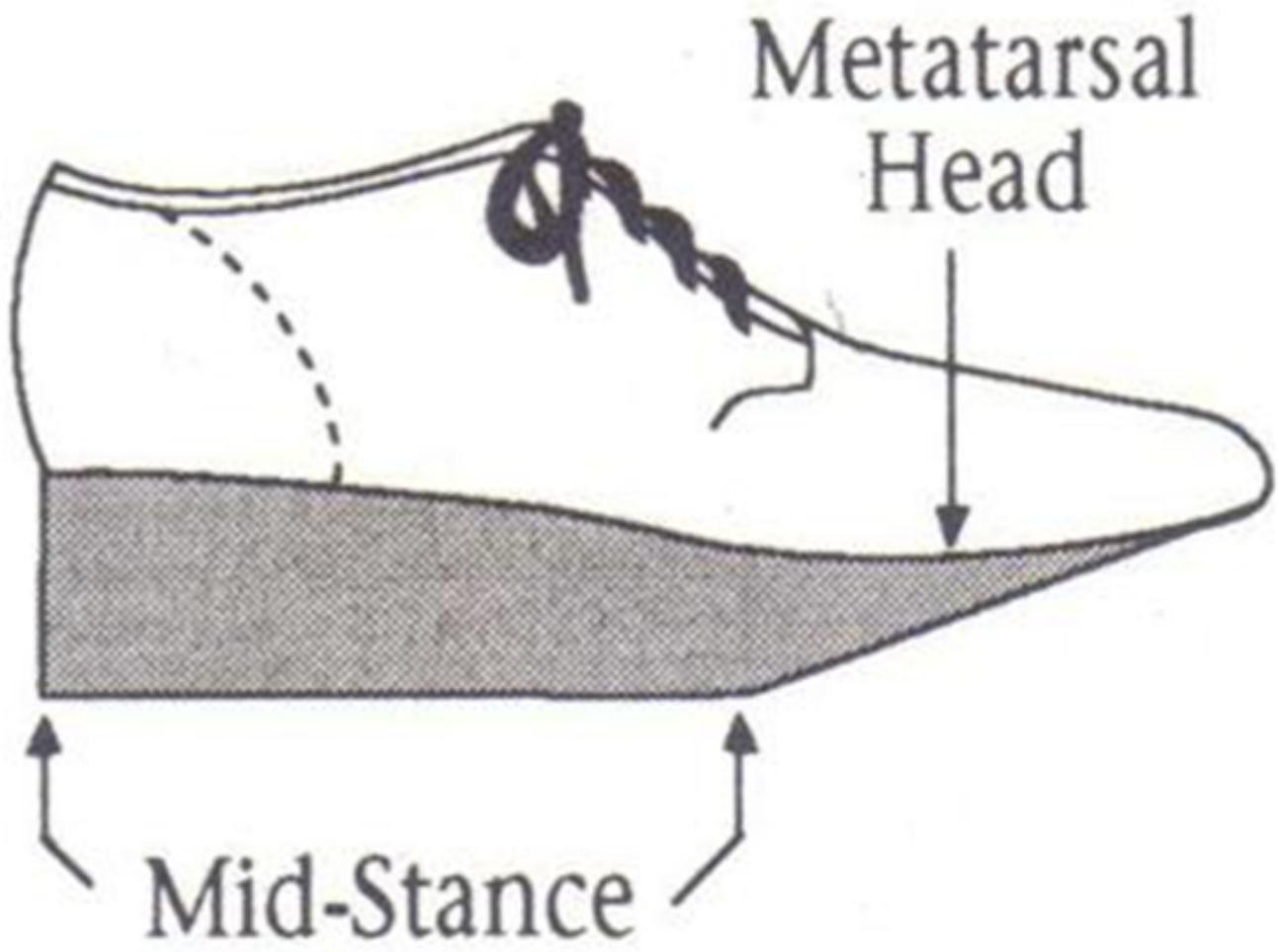
Double Rocker

- *Midfoot prominences are best relieved with double rocker soles which offload this region of the foot with weight bearing.*



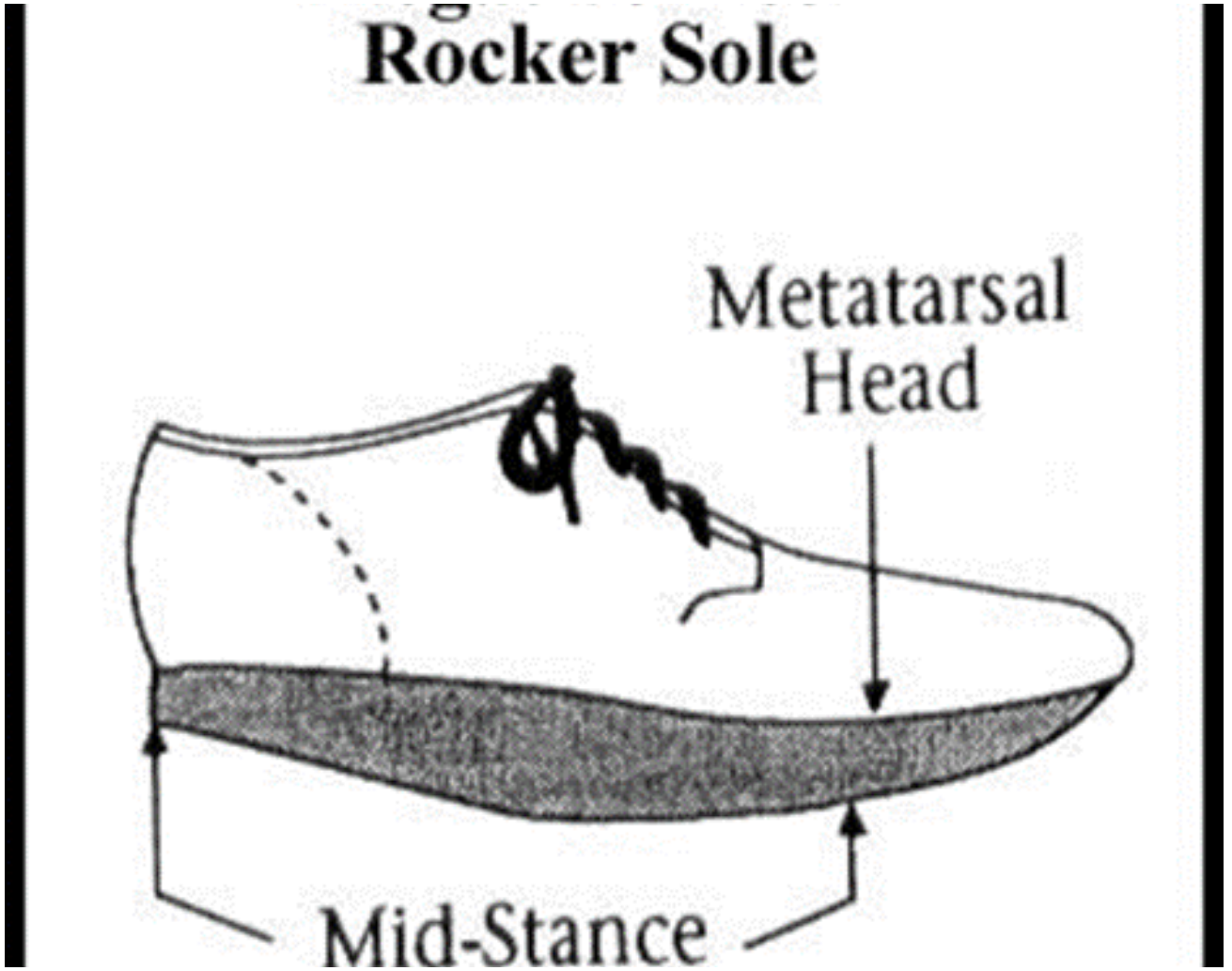
Severe angle rocker

- *severe toe-tip ulcerations*



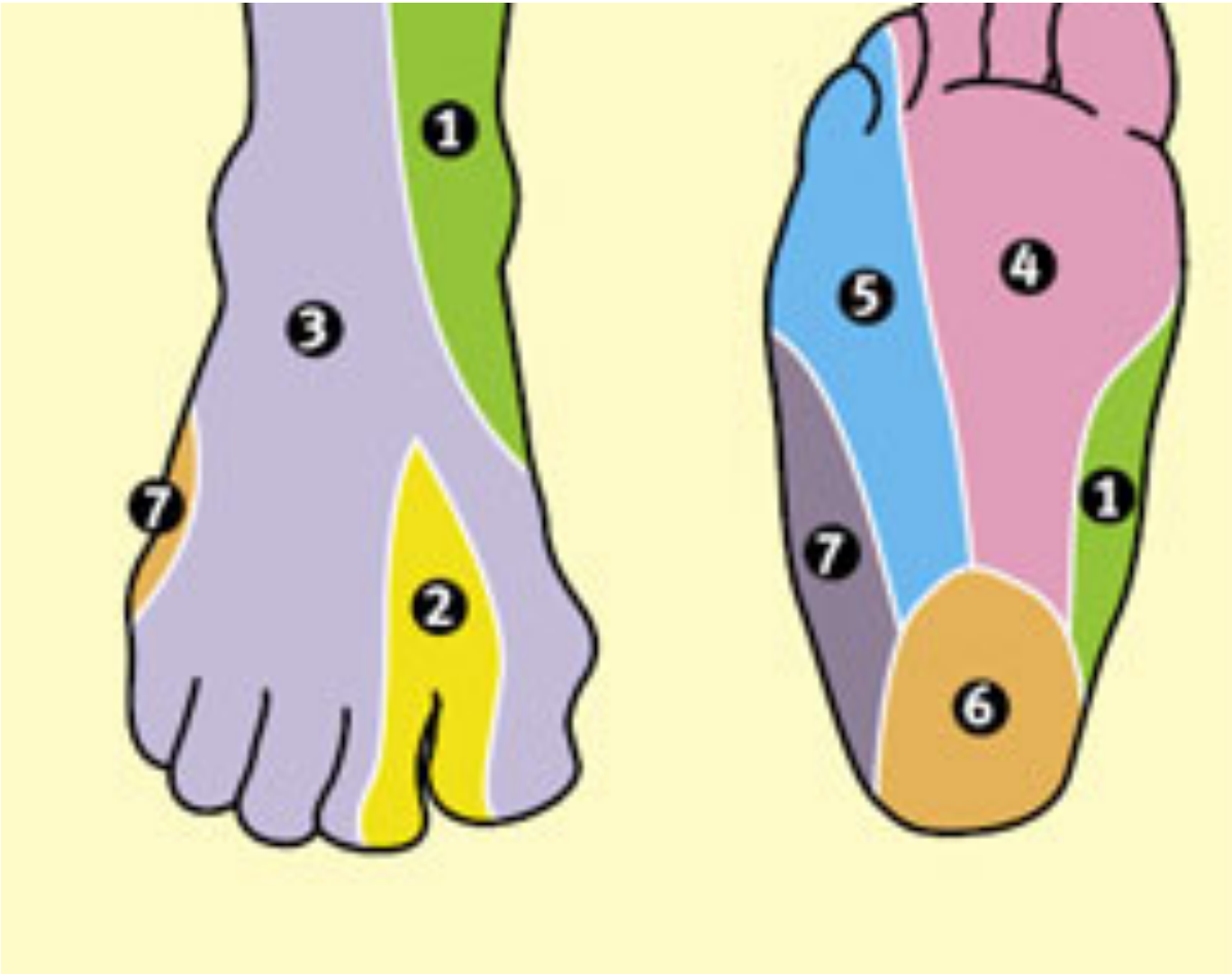
Negative heel rocker

- Fixed ankle dorsiflexion deformities



Viva 11

- On the diagram, name the cutaneous innervation of the foot marked 1-7.
- What are the layers of muscles in the plantar foot?



On the diagram, name the cutaneous innervation of the foot marked 1-7.

- *1- Saphenous nerve: it is the*
  - *terminal branch of the femoral nerve*
  - *supplies sensation of the medial side of the foot and the anteromedial side of the leg.*
  - *Can be blocked immediately anterior to the medial malleolus.*
- *2- Deep peroneal nerve:*
  - *travels in the anterior compartment where it innervates the TA-EDL-EHL-PT muscles before travelling distally over the anterior ankle capsule between the TA and EHL tendons.*
  - *It innervates the EDB & EHB muscles in the foot and*
  - *provides sensation to the 1st dorsal web space.*

On the diagram, name the cutaneous innervation of the foot marked 1-7.

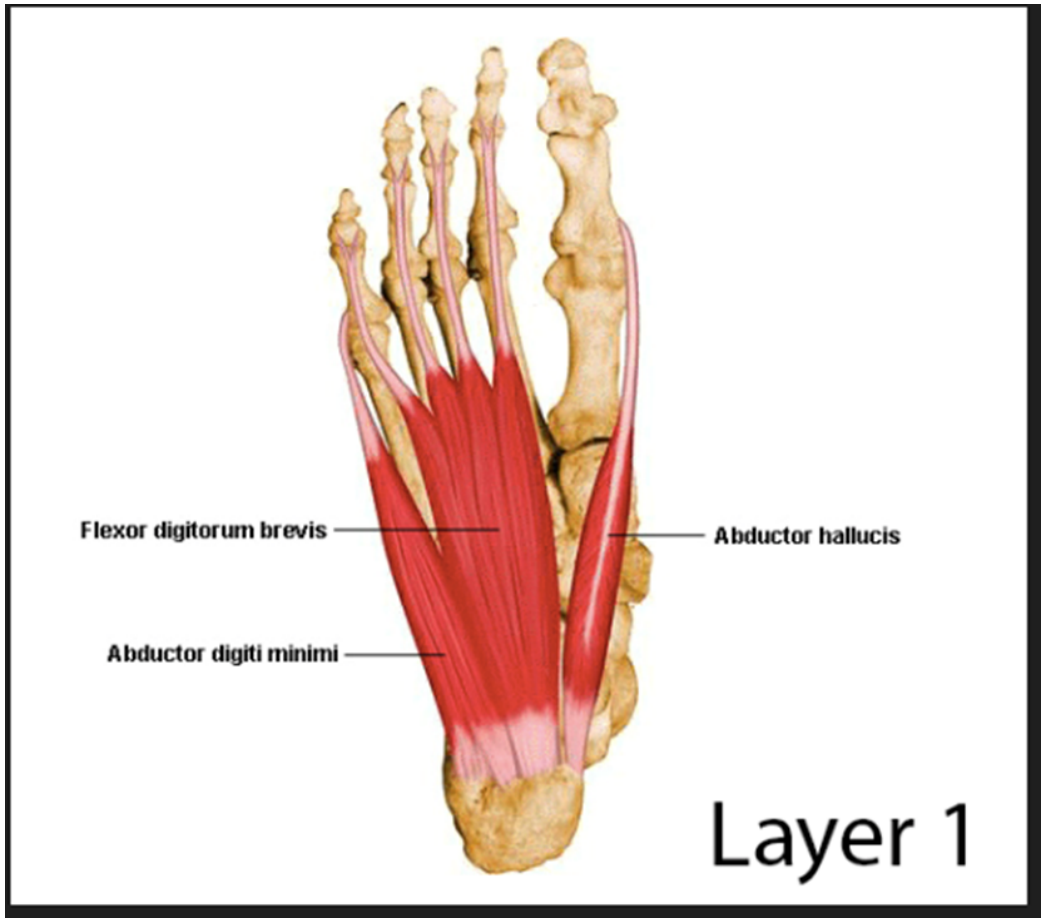
- *3- Superficial peroneal nerve:*
  - *travels in the lateral compartment where it innervates PL & PB muscles.*
  - *Exits the deep fascia about 8 – 12cm above the tip of fibula.*
  - *Divides into medial and intermediate dorsal cutaneous nerves to supply the dorsum of the foot.*
- *4- Medial plantar nerve:*
  - *branch of the tibial nerve,*
  - *supplies sensory innervation to the plantar-medial foot, the plantar aspect of the 1,2,3 and medial half of the 4th toe.*
  - *It gives motor innervation to the AbH, FHB, FDB & 1st lumbrical*

On the diagram, name the cutaneous innervation of the foot marked 1-7.

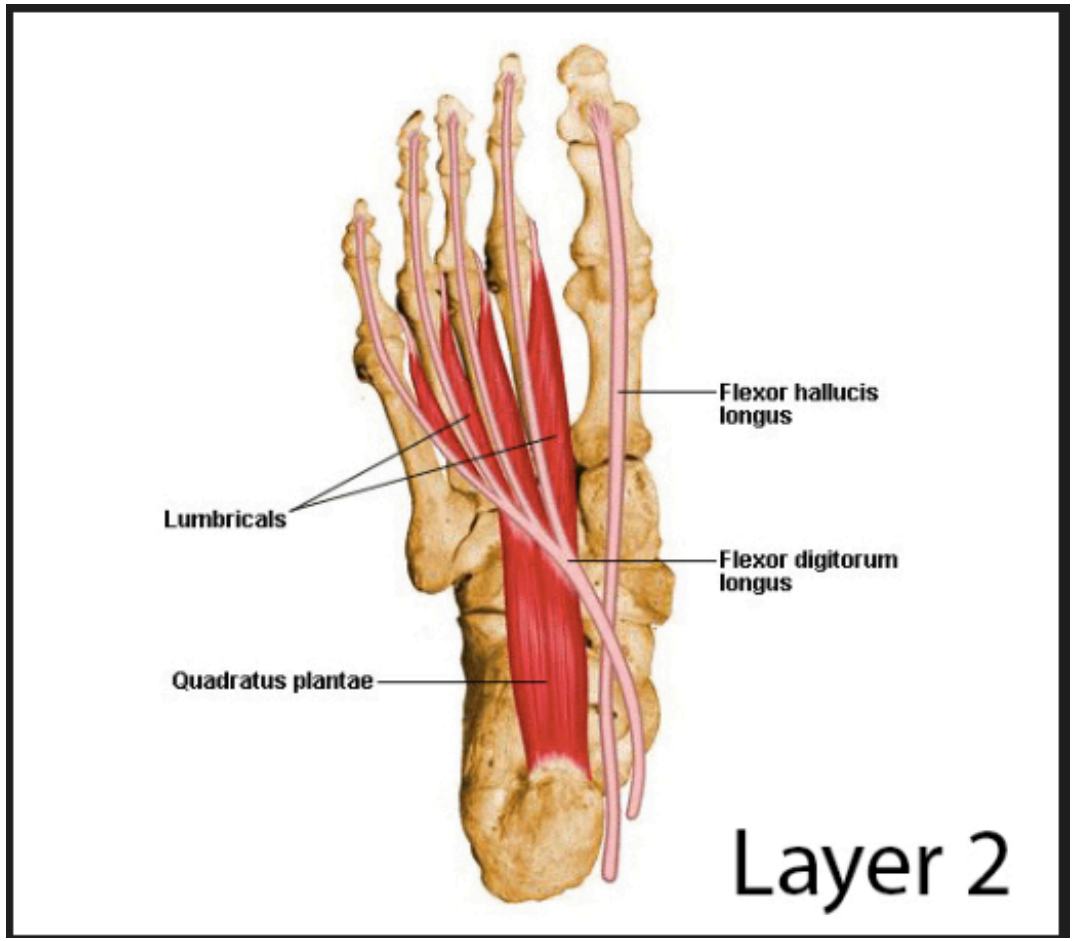
- *5- Lateral plantar nerve:*
  - *branch of the tibial nerve,*
  - *provides sensation to the plantar lateral foot, the 5th & the lateral half of the 4th toe.*
  - *Motor innervation to the (AdH, dorsal and plantar interossei, 2nd to 4th lumbricals, abd digiti minimi).*
  - *Baxter's nerve (1st branch of the lateral plantar nerve) supplies FDB, QP & ADM*
- *6- Medial calcaneal nerve: branch of the tibial nerve, innervates the plantar medial heel.*
- *7- Sural nerve: has a variable origin from the tibial and common peroneal nerve. It provides sensation to the dorsolateral foot and the dorsal 4th & 5th toes.*

❖*Tibial nerve: branch of the sciatic nerve, enters the deep posterior compartment of the leg between the two heads of GN muscle, travels between the soleus and the tibialis posterior. It is blocked with anaesthetic behind the medial malleolus.*

What are the layers of muscles in the plantar foot?

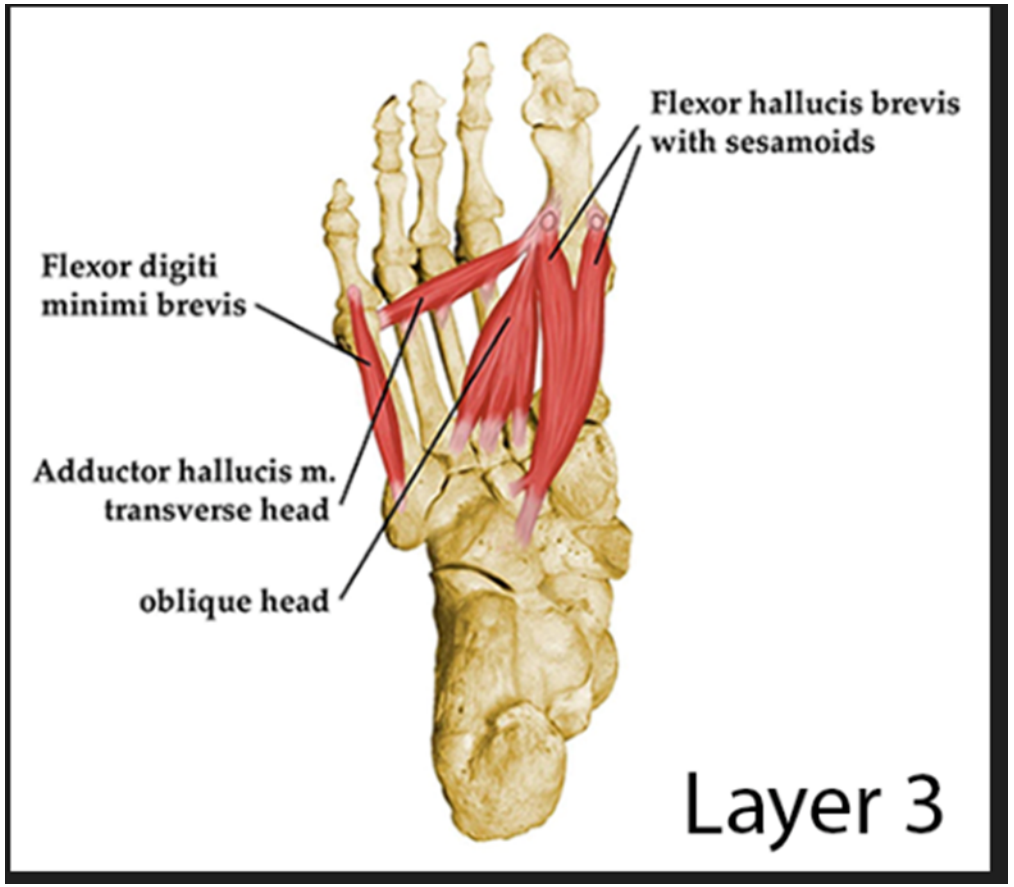


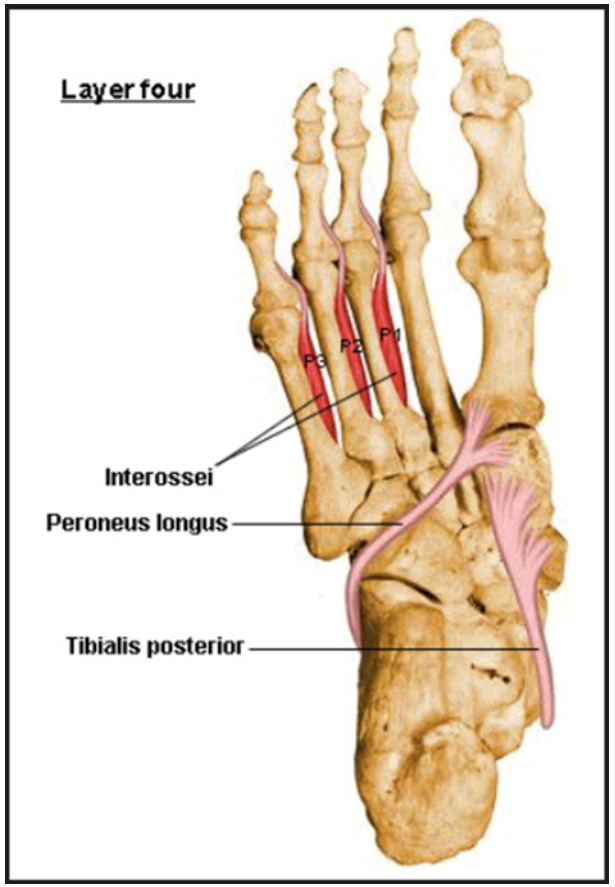
AFA



222

What are the layers of muscles in the plantar foot?





FAF

Viva 12

- Describe dropped foot gait pattern.
- What are the causes of drop foot?
- Describe the anatomy of sciatic, peroneal and tibial nerves
- How can you assess the patient clinically?

Describe dropped foot gait pattern.

- *The patient cannot dorsiflex or evert the foot.*
- *At initial contact the foot slaps on the ground due to loss of dorsiflexors.*
- *Sometimes it is called steppage gait, because the patient tends to walk with an exaggerated flexion of the hip and the knee to prevent the toes from catching on the ground during the swing phase*

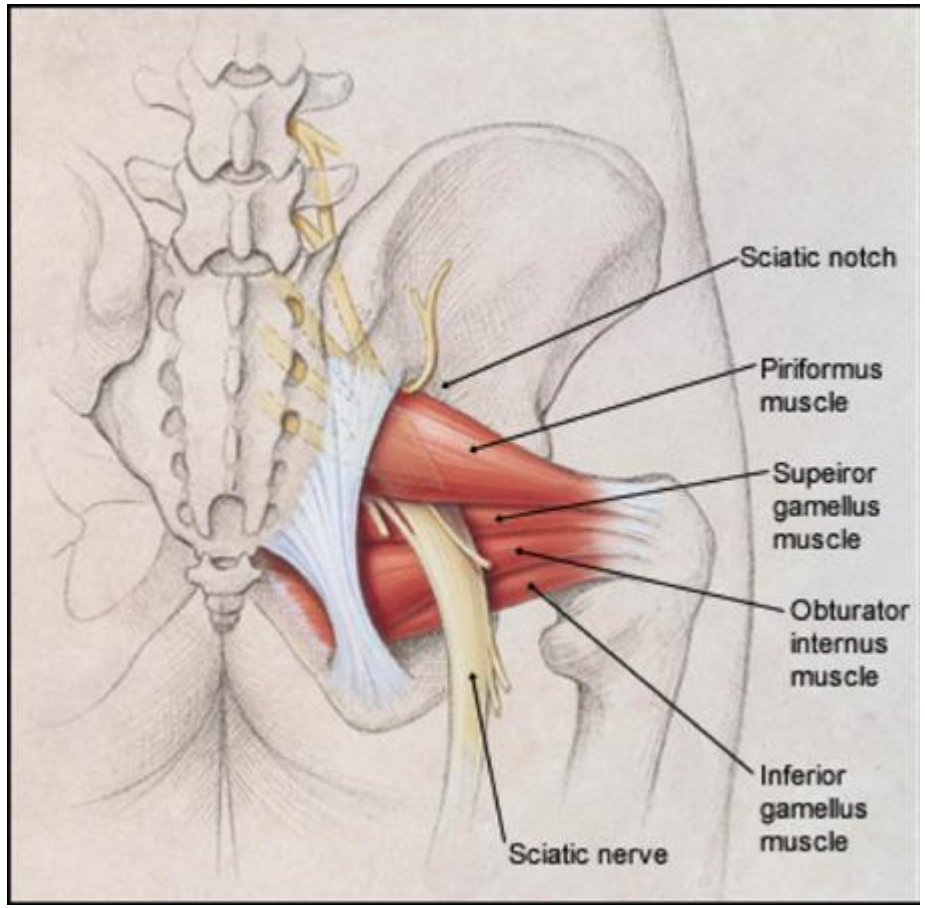
What are the causes of drop foot?

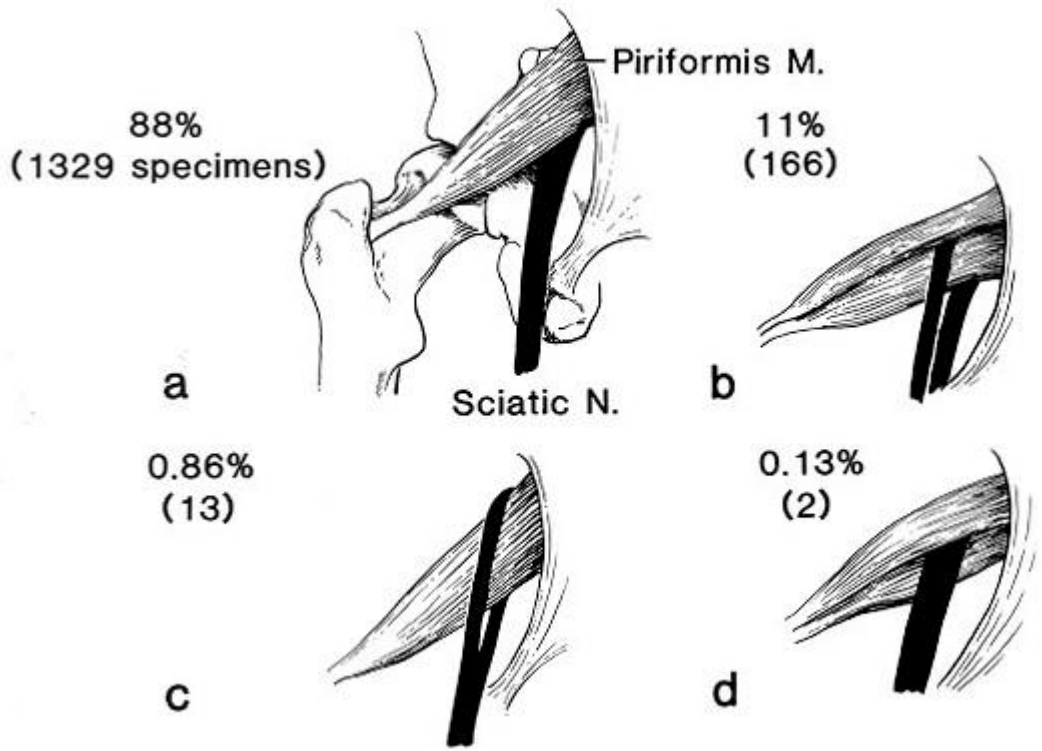
- *Neurodegenerative disorder of the brain (multiple sclerosis, stroke, cerebral palsy)*
- *L4-L5 disc herniation*
- *Lumbosacral Plexus injury (due to pelvic fracture)*
- *Sciatic nerve injury (hip dislocation)*
- *Common peroneal nerve injury (knee dislocation- fibular head fracture)*
- *Motor neuron disorder (polio and amyotrophic lateral sclerosis)*

Describe the anatomy of sciatic, peroneal and tibial nerves

❖*Sciatic nerve*

- *It is the thickest and largest nerve in the body. Arises from the ventral rami of L4-S3*
- *In most (> 80%) patients, the sciatic nerve lies anterior to the piriformis as it exits the pelvis through the greater sciatic notch and then runs through the interval between the piriformis and the superior gemellus to continue its course posterior to the remainder of the short external rotators.*
- *Other variations include passing superior to or piercing the piriformis.*
- *It ends by dividing into tibial and common peroneal nerve just above the popliteal fossa*


Sciatic notch
Piriformus muscle
Superior gamellus muscle
Obturator internus muscle
Inferior gamellus muscle
Sciatic nerve


Piriformis M.
88%
(1329 specimens)
11%
(166)
a
Sciatic N.
b
0.86%
(13)
0.13%
(2)
c
d

Describe the anatomy of sciatic, peroneal and tibial nerves

❖*Tibial nerve*

- *The tibial division of the sciatic nerve provides innervations to all of the hamstring muscles in the thigh (semitendinous-semimembranous- long head biceps femoris) with the exception of the short head of the biceps femoris which receives its innervations from the common peroneal branch of the sciatic nerve.*
- *Both heads of the gastrocnemius muscle are innervated by the tibial division of the sciatic nerve.*
- *The short head of biceps femoris was developed in the extensor compartment but migrated to the flexor compartment*

Describe the anatomy of sciatic, peroneal and tibial nerves

❖*Common peroneal nerve*

➢*It is the smaller terminal branch of sciatic nerve. It begins just above the apex of the popliteal fossa and descends underneath the medial border of biceps femoris, it passes inside the knee joint capsule, then passes into the peroneus longus where it divides into the superficial and deep peroneal nerves.*

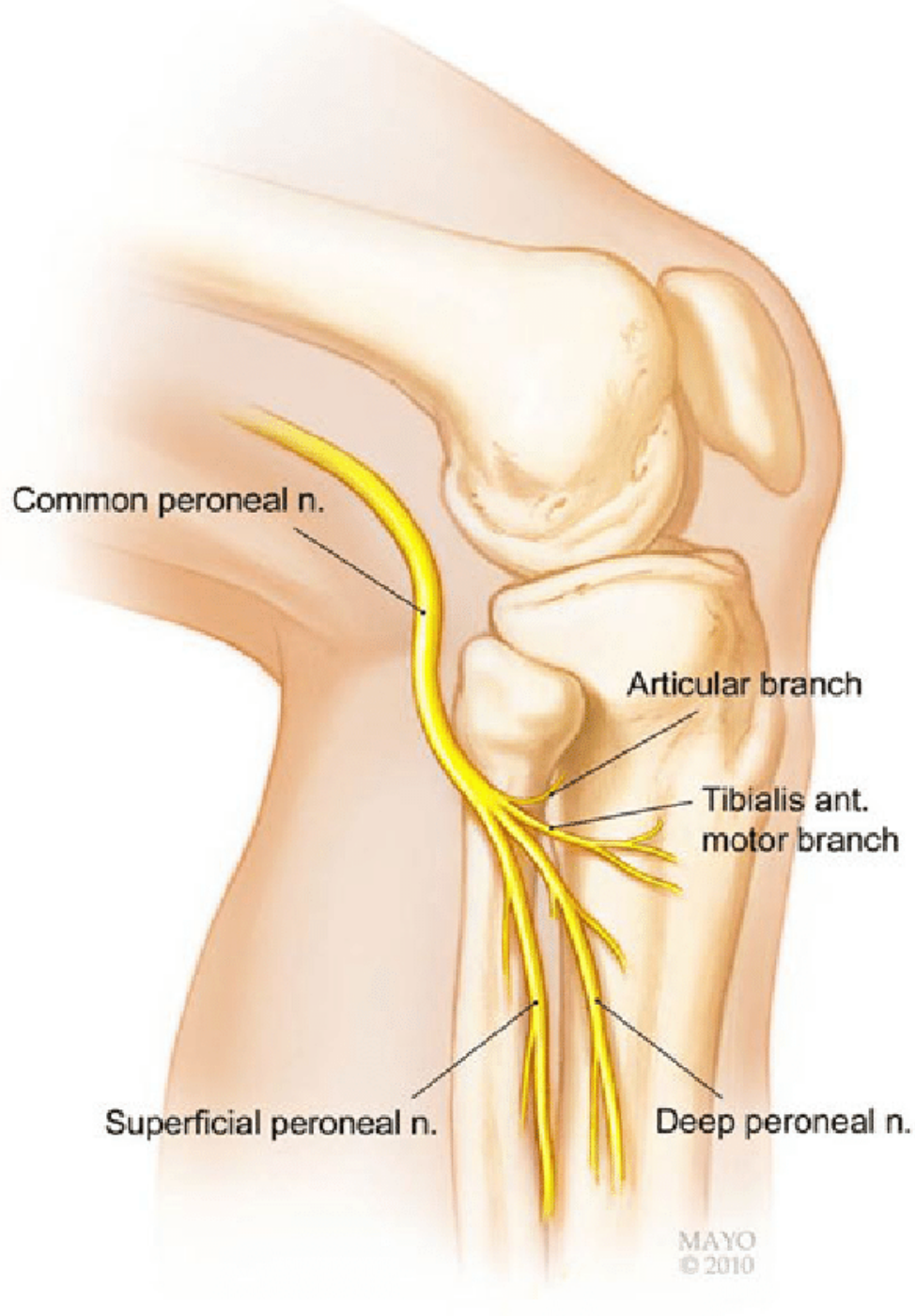
➢*Before dividing, the nerve gives of five branches (3 cutaneous and 2 articular):*

✓*Lateral sural cutaneous nerve*

✓*Peroneal communicating nerve*

✓*Recurrent genicular nerve (skin over the patella)*

✓*Superior & inferior genicular nerves*


Common peroneal n.
Articular branch
Tibialis ant.
motor branch
Superficial peroneal n.
Deep peroneal n.
MAYO
© 2010

How can you assess the patient clinically?

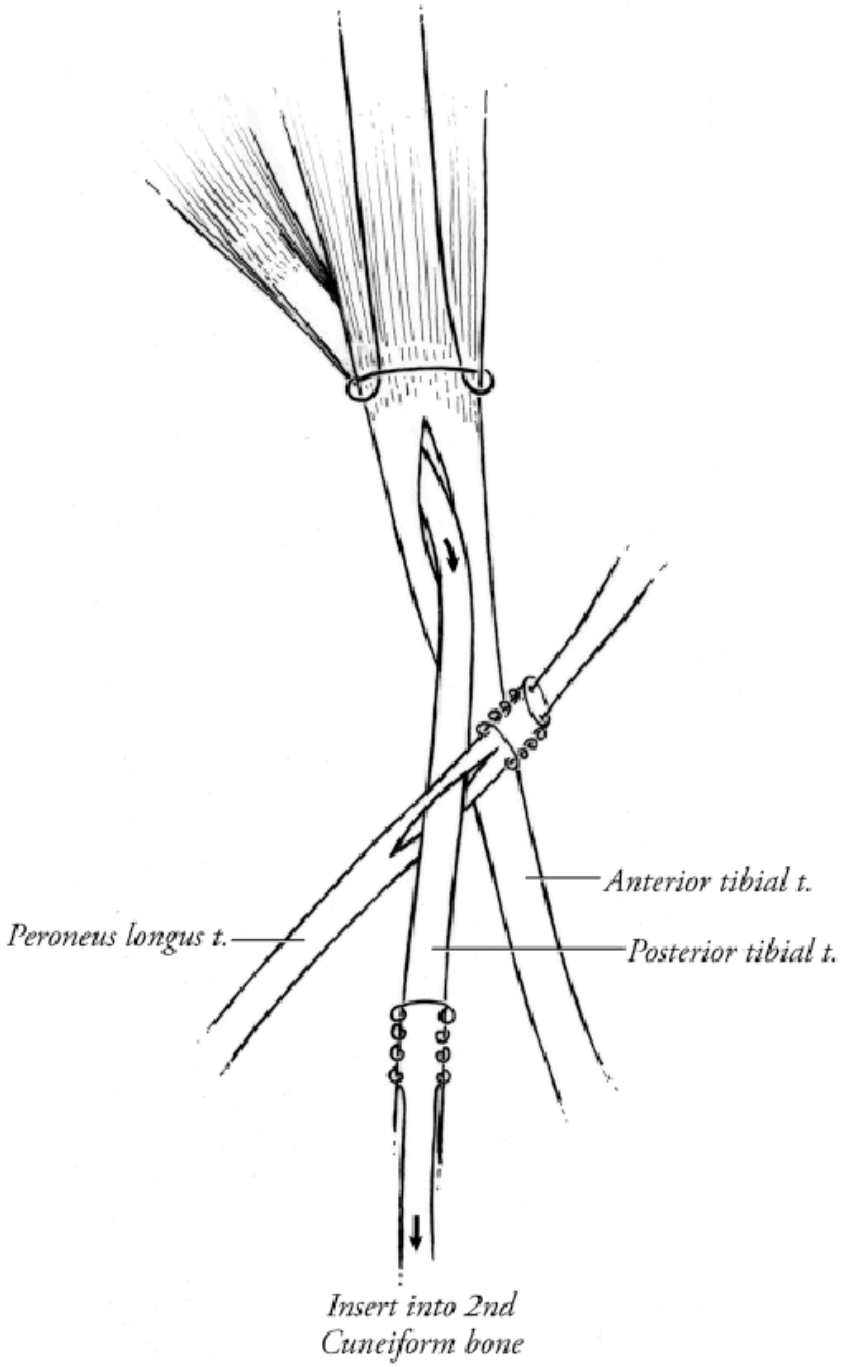
- *Examine the gait*
- *Check for Muscle wasting (front-lateral)*
- *Check the buttock for scar*
- *Check for the joint mobility.*
- *Level of the lesion: High lesion (above the knee)-both tibial and common peroneal nerve are paralysed. Low lesion (below the knee)-spared : peroneus longus and brevis.*
- *(Type 1 : anterior tibial nerve injury : Tibialis anterior, extensor hallucis longus, extensor digitorum longus and peroneus tertius. Type 2 : musculocutaneus nerve injury spared : all above muscle innervated by anterior tibial nerve lost)??*

- *Initial management consists of an ankle-foot orthosis (AFO) and physical therapy to maintain passive ankle dorsiflexion.*

- *If function fails to return during the course of conservative management and the patient demonstrates intact posterior tibialis muscle strength, posterior tibial tendon transfer to the dorsum of the foot has been shown to improve functional outcomes and eliminate the need for continued bracing.*

- *The most common procedure for posterior tibial tendon transfer involves transferring the tendon through the interosseous membrane and inserting the tendon on the lateral cuneiform.*

- *If tibialis posterior tendon is transferred with attachment to two other tendons, the peroneus longus and the anterior tibialis, it is called Bridle procedure*



- Multiple incisions are needed to move the tendon from one position to another.

1. *First incision, the posterior tibial tendon is harvested from its insertion on the navicular bone.*
2. *A second incision is made above the ankle. The tendon is pulled into this incision and then transferred inbetween the tibia and fibula to the front of the ankle.*
3. *Another incision is made on the dorsum of the foot at the lateral cuneiform bone at which the tendon is to be inserted.*

Viva 13

45-year-old lady presented complaining of right heel pain

- What is you differential diagnosis?
- How would you evaluate this patient?
- Outline the management options for each condition?

What is you differential diagnosis?

- *Plantar fasciitis*
- *Central heel pain (fat pad atrophy)*
- *Calcaneal stress fracture*
- *Entrapment of the 1st branch of the lateral plantar nerve(anatomy?)*
- *Tarsal tunnel syndrome*
- *Tumor (osteoid osteoma-giant cell…)*
- *Infection*

How would you evaluate this patient?

❖**History**

- *Start up pain that lessen with ambulation and then increases with activity → plantar fasciitis.*
- *Pain when walking on hard surfaces → fat pad atrophy.*
- *Insidious onset of pain that improves with rest and intensifies with activities or recent H/O recent increase in physical activity + athlete → calcaneal stress fracture.*
- *Pain radiating distally and proximally (Valleix phenomenon) from the medial aspect of the heel +/- paraesthesia → Entrapment of the 1st branch of the lateral plantar nerve- TTS*
- *Night pain + constitutional symptoms → tumor- infection*

How would you evaluate this patient?

❖**Physical examination**

➢*Obesity (risk factor for plantar fasciitis)*

➢*Flat foot (tib post dysfunction) associated plantar fasciitis.*

➢*The point of maximal tenderness*

✓*Medial origin of plantar fascia → plantar fasciitis.*

✓*Central → fat pad atrophy*

➢*Increase in tenderness with dorsiflexion of the toes and ankle*

➢*Increased pain with medial and lateral compression test → calcaneal stress fracture*

➢*Increased pain with dorsiflexion and eversion of the ankle → nerve entrapment*

Viva 14

- What is the diagnosis?
- How can you classify it?
- Treatment options?

What is a bunionette?

- *A bunionette (or "tailor's bunion") is a prominence of the lateral aspect of the fifth metatarsal head. It is often associated with a varus MTP joint and with pes planus.*

How are bunionettes classified? What type of imaging is necessary for classification?

- Bunionettes are classified on weight-bearing AP plain radiographs of the foot. There are three categories in the radiographic classification:
- *Type 1: Enlarged 5th MT head (normal <13mm) or lateral exostosis*
- *Type 2: Congenital lateral bowing of the 5th MT, normal 4/5 IMA*
- *Type 3: Increased inter-metatarsal angle between 4th and 5th MT (>8°) – most common*

What is the best surgical option for this patient?

- Type I: Lateral condylectomy, which involves excision of the lateral bony prominence and reefing of the lateral MTP joint capsule
- Type II: Distal chevron osteotomy with resection of the lateral prominence
- Type III: Oblique mid-diaphyseal metatarsal rotational osteotomy

Viva 15

- Describe the anatomy of the lateral ankle ligamentous complex?
- How are ankle sprains classified?
- How can you assess the stability of the lateral ligamentous structures?
- Indications for X-ray?
- What is the treatment for an acute ankle sprain? How effective is this treatment?
- How would you manage a patient with chronic ankle instability?

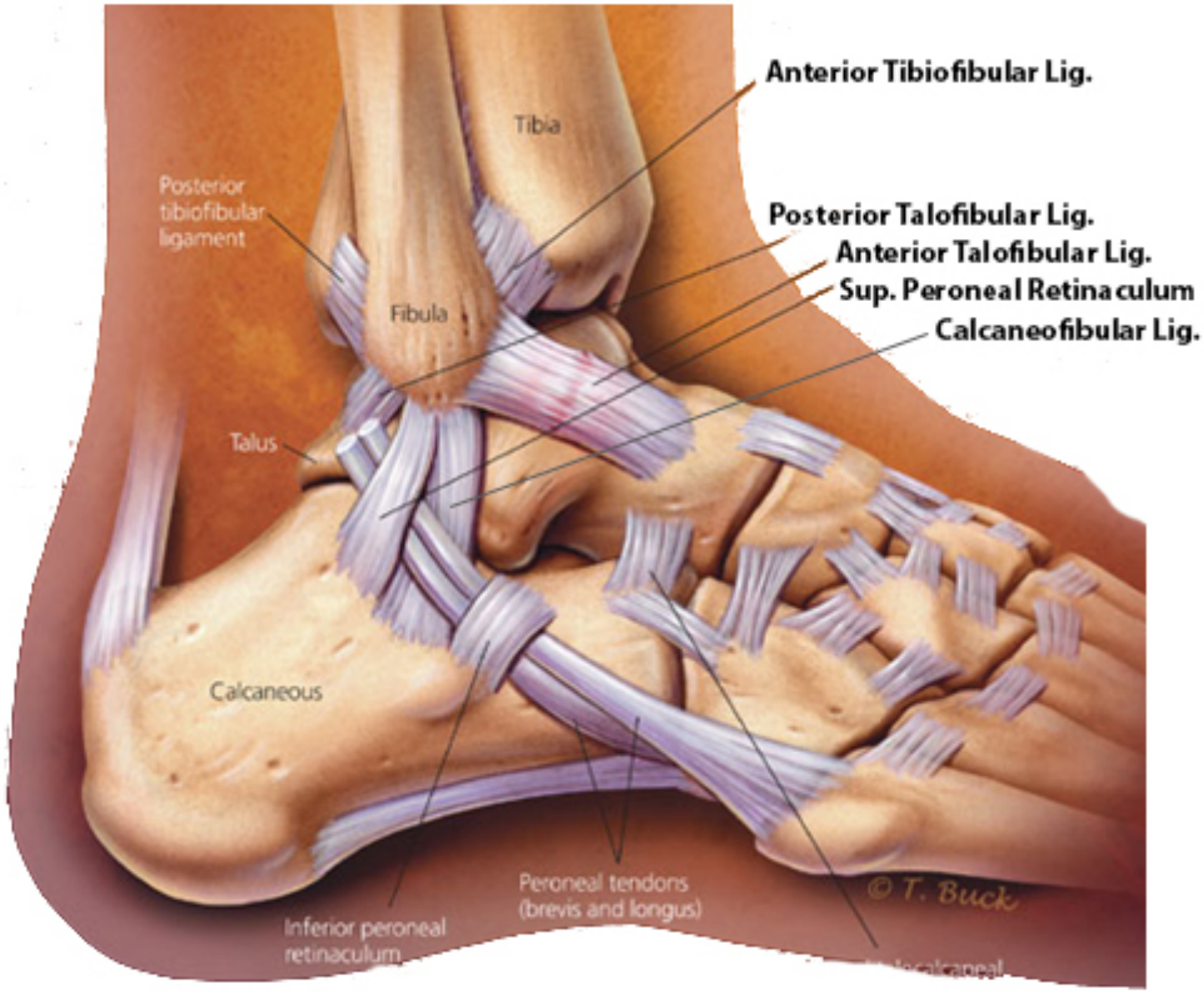
Describe the anatomy of the lateral ankle ligamentous complex?

- *The lateral ligamentous complex is made up of three ligaments:*

➢ *Anterior talofibular ligament (ATFL): extends from the anterior aspect of distal fibula (10 mm proximal to the tip of fibula) to the body of the talus. The most commonly injured ligament in ankle sprain. the weakest ligament. Resists anterior translation of the talus. Strain in the ATFL increases with plantar flexion 20 degrees and inversion. (ATFL is perpendicular to the long axis of the tibia, with ankle plantar flexion, ATFL becomes more parallel to the tibia)*

➢ *Calcaneofibular ligament (CFL): extends from the tip of the fibula to the lateral wall of the calcaneus. Strain in CFL increases with dorsiflexion and inversion. (CFL is parallel to the tibia in neutral ankle flexion)*

➢ *Posterior talofibular ligament (PTFL): originates from the posterior fibula and inserts in the **posterolateral tubercle** of the talus. It is the strongest ligament. Under strain in dorsiflexion.*


Anterior Tibiofibular Lig.
Tibia
Posterior tibiofibular ligament
Posterior Talofibular Lig.
Anterior Talofibular Lig.
Sup. Peroneal Retinaculum
Fibula
Calcaneofibular Lig.
Talus
Calcaneous
Peroneal tendons (brevis and longus)
Inferior peroneal retinaculum
© T. Buck

How are ankle sprains classified?

- *Ankle sprains are broadly classified into:*
- *High ankle sprain (Syndesmotic injury)*
- *Low ankle sprain (ATFL – CFL)*

Classification of Low Ankle Sprains			
	Ligament disruption	*Ecchymosis and swelling*	*Pain with weight bearing*
Grade I	none	minimal	normal
Grade II	stretch without tear	moderate	mild
Grade III	complete tear	severe	severe

How can you assess the stability of the lateral ligamentous structures?

- *The anterior drawer test*
  - *stabilizing the distal tibia with one hand and grasping the posterior heel with the other. An anterior force is applied to the posterior heel in an effort to displace the talus anteriorly.*
- *Anterior drawer test reflects injury to ATFL +/- CFL. A large shift anteriorly, or even a palpable clunk in severe cases, indicates a positive anterior drawer test. The uninjured ankle should always be examined for comparison.*

How can you assess the stability of the lateral ligamentous structures?

- *The talar tilt test (radiologically) examines the integrity of the CFL and the ATFL. It is performed by grasping the foot and heel while attempting to invert the talus on the tibia. It is considered positive if there is an absolute talar tilt > 10° , or when it is >5° compared with the contralateral ankle.*

Indications for X-ray?

- *Per the Ottawa rules (1990), x-rays should be obtained if any of the following conditions are present:*
  - *Bone tenderness along the distal 6 cm of the posterior edge of the medial malleolus*
  - *Bone tenderness along the distal 6 cm of the posterior edge of the lateral malleolus*
  - *An inability to bear weight immediately or upon presentation for 4 steps*
  - *Bone tenderness at the base of the 5th metatarsal*
  - *Bone tenderness at the navicular. In most cases, this patient's presentation does not warrant x-rays.*

What is the treatment for an acute ankle sprain? How effective is this treatment?

- *Treatment of an acute ankle sprain involves rest, ice, compression, and elevation (RICE) and early functional rehabilitation (early weight bearing, peroneal strengthening exercises(because it is lateral ankle), ROM, proprioceptive training)*
- *90% of ankle sprain injuries resolve with this treatment*

How would you manage a patient with chronic ankle instability?

- *History:*

➢*Frequent episodes of giving way*

➢*Sensation of instability*

➢*Pain exists between episode of instability suggests possible additional pathology*

How would you manage a patient with chronic ankle instability?

- *Physical examination:*

➢ *Look for hindfoot varus deformity. It present, do Coleman block test to differentiate between fixed or flexible.*

➢ *Exclude generalized ligament laxity. (Beighton scoring system)*

➢ *Anterior drawer test*

➢ *Talar tilt test*

How would you manage a patient with chronic ankle instability?

- *Exclude associated injuries*

➢ *Peroneal pathology*

➢ *Osteochondral lesion of the talus*

➢ *Lateral process fracture of the talus*

➢ *Anterior process fracture of the calcaneus*

➢ *5^{th} MT fracture*

➢ *Tarsal coalition*

How would you manage a patient with chronic ankle instability?

- *Surgical treatments are broadly grouped into anatomical repair of the ligaments and non-anatomical repairs.*

- *Superior results have been found in anatomical reconstruction compared to tenodesis in regards to stability (anterior drawer test, talar tilt, and anterior talar subluxation on stress XR) and degenerative changes.* *Kibs 2001*

How would you manage a patient with chronic ankle instability?

❖***Anatomical repair***

- *Brostrom Gould (preferred):*

➢*Original Brostrom: direct repair of attenuated ligaments.*

➢*Gould modification: direct repair of attenuated ligaments (ATFL – CFL) + augmentation with inferior extensor retinaculum.*

➢*Good results in 90%.*

How would you manage a patient with chronic ankle instability?

❖***Non-anatomical repair***

- *Evans:*

➢*Utilizes the entire peroneus brevis tendon with tenodesis to the fibula from the tip emerging posteriorly 3cm proximal, suturing it onto peroneus longus.*

➢*It limits inversion, but doesn't restrict anterior translation*

How would you manage a patient with chronic ankle instability?

❖***Non-anatomical repair***

- *Watson - Jones:*

➢*PB through fibula from posterior to anterior then into talus*

➢*Limits anterior translation and inversion.*

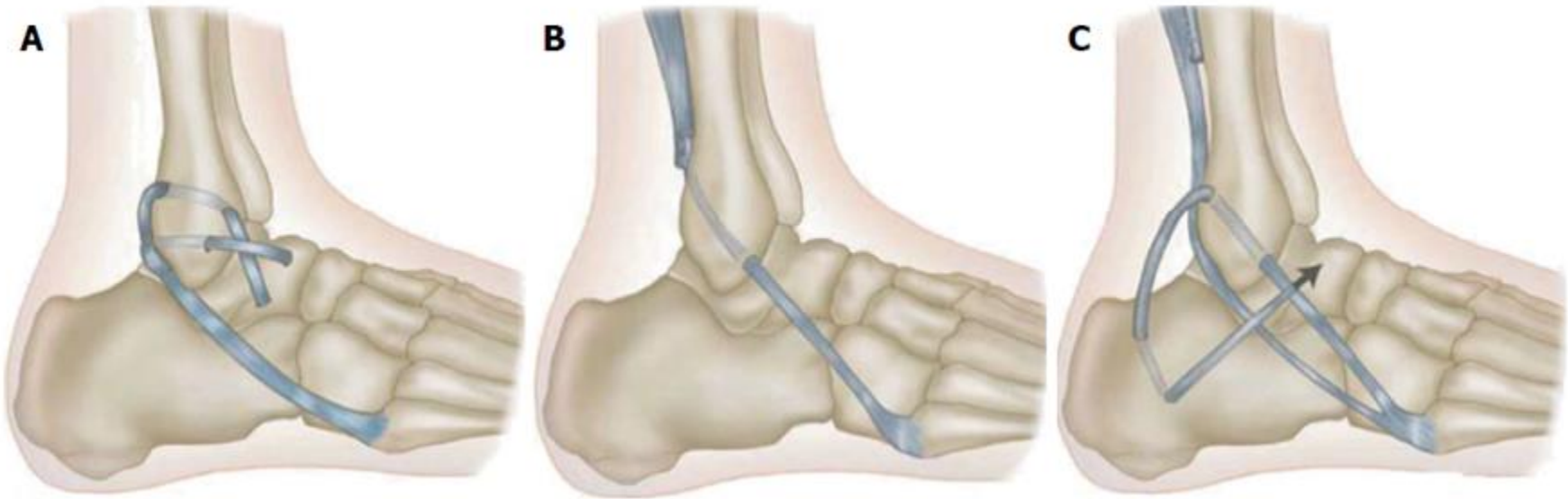
How would you manage a patient with chronic ankle instability?

❖***Non-anatomical repair***

- *Chrisman - Snook:*

➢*Utilizes a split of PB through talus, fibula from anterior to posterior, then to calcaneus.*

A: Watson – Jones B: Evans C: *Chrisman - Snook*



How would you manage a patient with chronic ankle instability?

- *If there is varus malalignment, consider Dwyer lateralizing calacanel osteotomy if it is fixed. 1st MT osteotomy if flexible.*

How would you manage a patient with chronic ankle instability?

❖***When would you allow a patient to return to playing football?***

- *Most athletes should continue to use a tape or brace during sport activities (after 3months). But a brace is not routinely used after 3 months for work related activities or activities of daily livings.*

Viva 16

- What is Morton's neuroma (interdigital neuroma)?
- What are the symptoms of a Morton's neuroma?
- What is Mulder's sign?
- What diagnostic and/or radiographic tests are helpful in diagnosing Morton's neuroma?
- How would you treat it?

What is Morton's neuroma (interdigital neuroma)?

- *Morton's neuroma is a perineural thickening of the common digital nerve at the webspace of the foot.*
- *It is most commonly seen in women (4 : 1, female-to-male ratio).*
- *It is most commonly found between the third and fourth toes (third web space). It receives branches from both medial & lateral plantar nerves, followed by second and fourth webspaces.*

What is Morton's neuroma (interdigital neuroma)?

- *The etiology is uncertain*
- *Several causative factors have been suggested, although none is universally accepted:*

➢*Anastomosis between the medial and lateral plantar nerves in third webspace*

➢*High heeled shoes with narrow toebox: Forced toe dorsiflexion*

➢*Compression by the transverse intermetatarsal ligament*

➢*Bursal hypertrophy*

What are the symptoms of a Morton's neuroma?

- *Morton's neuroma usually presents as sharp pain on the plantar aspect of the foot between the metatarsal heads, which is often associated with burning or tingling of the involved toes.*
- *Pain increases with activity, sometimes at night, and when wearing shoes with a narrow toe box.*
- *Typically the pain is resolved with removal of the shoe and massage of the foot.*

What is Mulder's sign?

- *The Mulder sign is elicited by squeezing the foot while palpating the web space.*
- *A tangible "click" can be felt that indicates the presence of a Morton's neuroma.*

What diagnostic and/or radiographic tests are helpful in diagnosing Morton's neuroma?

- *The diagnosis of a Morton's neuroma is based on history and physical examination.*
- *In one-third of patients the nerve and its neuroma can be palpated.*
- *It is important to differentiate metatarsal phalangeal joint tenderness from interdigital tenderness*
- *An injection of local anesthetic into the web space between the metatarsal heads causing resolution of the patient's symptoms favors a diagnosis of Morton's neuroma. If no relief is obtained, a second injection can be administered to the MTP joint, with a repeat exam noting any improvement in the patient's symptoms.*

What diagnostic and/or radiographic tests are helpful in diagnosing Morton's neuroma?

- *Standing AP and lateral weight-bearing films to exclude other forefoot pathology.*
- *MRI (preferred over ultrasound scan but has false positive rate).*

How would you treat it?

- *Approximately **80%** of patients will have complete resolution of symptoms with non-operative treatment.*
- *The goals are to alleviate pressure on the nerve by decreasing tension on the inter-metatarsal ligament and to reduce compression of the forefoot, which may be accomplished through:*
  - *Use of shoes with a wide toe box, firm sole, and a more rigid arch support*
  - *Metatarsal pads also may help to relieve pressure on the nerve*
- *Anti-inflammatory medication rarely offers any benefit.*
- *Local corticosteroid injection may be helpful in relieving symptoms, but repeated injections are contraindicated.*

How would you treat it?

- *Surgery should only be reserved for patients who fail non-surgical treatment. Very few patients consider the operation to be either a failure or only marginally beneficial.* ***It is important to inform the patient that surgical excision does not always provide relief and recurrence is possible.*** *(Recurrence mainly due to left over plantar branches)*
- *Dorsal incisions typically recommended for resection of primary neuroma.*
- *Plantar incisions are used for recurrent neuromas. (it has better visualization as nerve plantar to deep transverse ligament and, hence, easier exposure with plantar exposure but results in painful scar)*

How would you treat it?

- *Divide transverse inter meta-tarsal ligament*
- *Excise nerve 2–3 cm proximal to the bifurcation*

Viva 17

What associated underlying condition increases the risk of developing an ulcer in a patient with diabetes mellitus?

- Peripheral neuropathy is the greatest cause of foot pathology in diabetic patients. It is present in 50–80% of all diabetic patients.
- Sensory neuropathy: most prevalent nerve dysfunction seen in diabetic patients (approximately 70% of patients).
- The typical pattern of sensation disturbance is in the “glove and stocking” distribution, meaning the loss affects the entire distal extent of the limb rather than following a specific nerve dermatome.
- decreased sensation starts distally and progresses proximally as axons “die off.” This places the patient at increased risk of injury with lack of protective sensation.

- Motor neuropathy: Weakness of the intrinsic muscles leads to the development of claw toes. Additionally, contracture of the Achilles tendon places the foot in the equinus position. These deforming forces lead to areas of increased pressure on the foot that accelerate skin breakdown and ulcer development.
- Autonomic neuropathy:The autonomic nervous system is responsible for control of blood vessel tone and sweat gland function. A decrease in this neurologic control leads to increased drying of the skin and decreased oxygenation of the tissues. Combined, these two changes in autonomic function place the foot at increased risk of gangrene and infected wounds.

What physical exam tests are best suited to assess a patient's sensory exam?

- Skin sensation in the diabetic foot can be assessed both qualitatively and quantitatively.
  - Qualitative studies of light touch and pin-prick are quick and easy to get a general understanding of sensory neuropathy severity.
  - More quantitative measures include the use of Semmes–Weinstein monofilaments that gradually increase in diameter and force needed to bend against a patient's skin. The size of the smallest filament felt against the skin is considered the patient's threshold of sensation. Typically, protective sensation is considered intact if the patient can feel a 5.07 monofilament.

How do you classify the ulcer?

- *Brodsky classification*
- *Depth classification*
  - 0 At-risk foot; previous ulcer or neuropathy that may cause ulceration
  - 1 Superficial ulceration, no infection
  - 2 Deep ulceration exposing tendon/joint (infection may exist superficially)
  - 3 Extensive ulceration with exposed bone and/or deep infection
- *Ischemic classification*
  - A No ischemia
  - B Ischemia without gangrene
  - C Partial gangrene (forefoot)
  - D Complete gangrene of foot

How do you classify the ulcer?

- *Wagner Classification*
- 0 Skin intact
- 1 Superficial
- 2 Deeper, full-thickness extension
- 3 Deep abscess formation or osteomyelitis
- 4 Partial gangrene of the forefoot
- 5 Extensive gangrene

What would you expect the cultures to show?

- polymicrobial with aerobic gram-positive skin flora (Staphylococcus aureus) being the most common bacteria (46% incidence).
- The second most common organism is Streptococcus species (35% incidence).
- However, patients with chronic wounds and prior treatments of antibiotics aimed at gram-positive flora can also present with gram-negative infections (Enterococcus, Proteus).
- Patients with advanced disease (ischemic feet, gangrene) are also at risk for anaerobic infections.

What antibiotic choice would best suit the treatment of this patient's infection?

- First-generation cephalosporins are great for coverage of MSSA. However, with the growing incidence of MRSA, vancomycin or a similar agent is often chosen as the initial antibiotic.
- Coverage of gram-negative organisms can often be achieved with a fluoroquinolone (e.g., ciprofloxacin).

What other studies could help determine the cause, prognosis, and pathology of the patient's disease?

- history, including medical co-morbidities, prior treatments, and smoking history.
- physical examination should include lower extremity vascular status, such as peripheral pulses and capillary refill, and skin integrity.
- Further vascular testing includes the studies of ABI (ankle–brachial index). An ABI of 0.45 is the minimum considered necessary for adequate healing of diabetic wounds.
- absolute toe pressures and flow waveforms can be more specifically analyzed. The minimum absolute toe pressure needed for healing an ulcer is 60 mmHg. Meanwhile, a pressure of 45 mmHg is considered necessary for healing of an amputation.

What imaging studies are most helpful in evaluating the diabetic foot?

- plain radiography is the first imaging study ordered.
  - Plain films are useful in evaluating for foreign bodies, fractures, and progression of bony deformity.
  - In rare cases, bony changes consistent with osteomyelitis can be appreciated on plain film radiography.
- Often, the use of MRI can be helpful to reveal soft-tissue infection and abscesses. It is more sensitive for detecting oteomyelitis than plain films. However, it can be difficult to differentiate Charcot arthropathy from infection on MRI.

What are the goals in the operating room?

- The goals of surgical debridement of diabetic foot ulcers are to remove any area of infected or devitalized tissue and lavage areas in need of drainage.
- Wounds may be packed open with wet-to-dry dressings or a vacuum-assisted dressing can be applied.
- The wound care that follows surgical debridement should accomplish the following goals:
  - Provide a moist environment
  - Absorb any drainage or exudates
  - Serve as a sterile barrier to the outside environment
  - Relieve any pressure points.

What is the purpose of a total contact cast (TCC)?

- TCC is considered the gold standard for off- loading pressure ulcers on the plantar aspect of the foot.
- The goal of TCC is to evenly distribute the pressure and sheer forces over the foot so that relief of the ulcer allows it to heal.
- The casts have little padding inside to allow for proper formation of the plaster around the contours of the foot in order to distribute forces equally.
- TCC should be changed every 2–4 weeks with constant reassessment of the wounds until the erythema, drainage, and edema have resolved.
- At the time of cast change, the ulcer wounds can be debrided as needed for further healing. TCC can be used as treatment anywhere from 6 weeks up to 6 months.

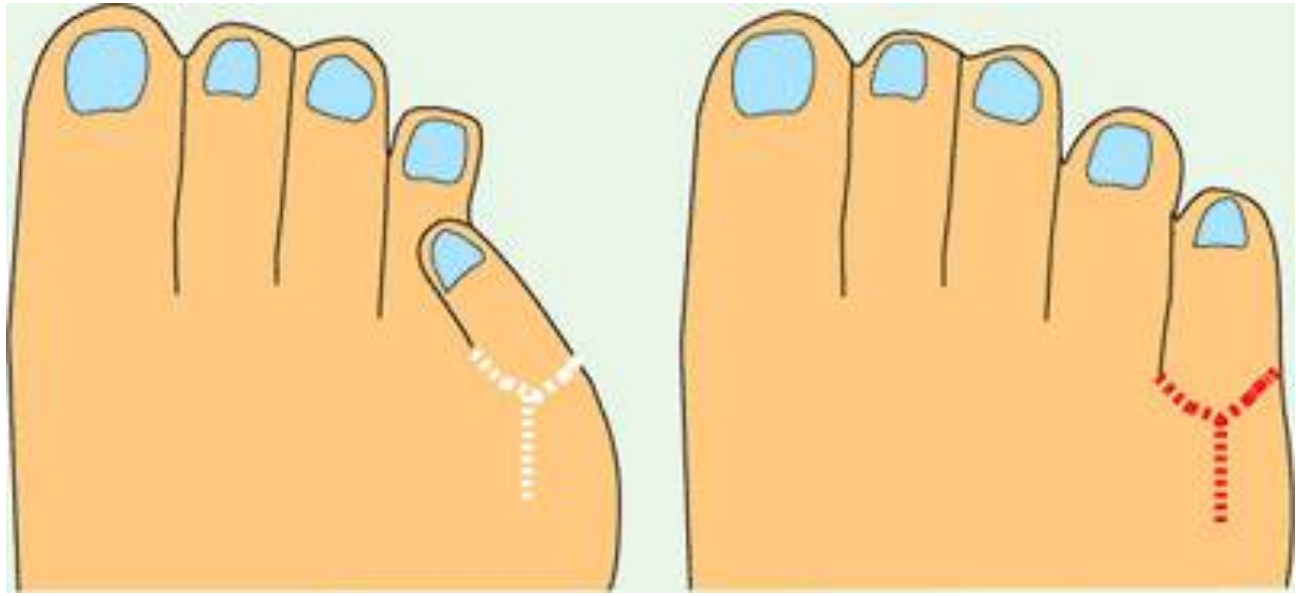
What is the end-stage bony change often seen in patients with diabetes and neuropathy?

- Charcot arthropathy
- It is typically seen in the weight-bearing areas of the body, such as the foot and ankle.
- Up to 7.5% of patients with diabetes and neuropathy develop Charcot arthropathy.

Viva 18

What is congenital overlapping fifth toe? When is it operative and what options are there?

- Congenital overlapping fifth toe is a common familial trait in which the small toe is dorsiflexed and rests on top of the fourth toe.
- In severe cases, the capsule and extensor tendon on the dorsal aspect of the fifth MCP joint are shortened and prevent passive correction of the deformity.
- Stretching of mild deformities is often enough to correct the problem. Only symptomatic cases require surgery in the form of realignment or even amputation.
- Butler's procedure: racket handle procedure, release extensor tendon



Viva 19

- Describe the different types of lesser roes deformities
- How would you treat it?

Deformities of lesser toes result from an imbalance between the intrinsic and extrinsic musculotendinous unit of the toes

	Claw Toe	Hammer Toe	Mallet Toe
			
DIP	flexion	extension	flexion
PIP	flexion	flexion	normal
MTP	hyperextension	normal (slight extension)	normal

How would you treat it?

- *Hammer toes (the most common) & Mallet toes*
- *Non-operative → wide toe box, toe sleeves*
- *Flexible deformity → transfer of FDL to EDL*
- *Fixed deformity with no MTP pathology → resection of the distal condylar of PP + FDL tenotomy + pinning of DIP, PIP & MTP*
- *With MTP pathology → extensor tendon Z-plasty lengthening + MTP capsular release + Girdlestone – Taylor tendon transfer (FDL to EDL)*
- *Claw toes*
- *Non-operative → same*
- *extensor tendon Z-plasty lengthening + MTP capsular release + Girdlestone – Taylor tendon transfer (FDL to EDL)*