Unique feature- The arches of human foot

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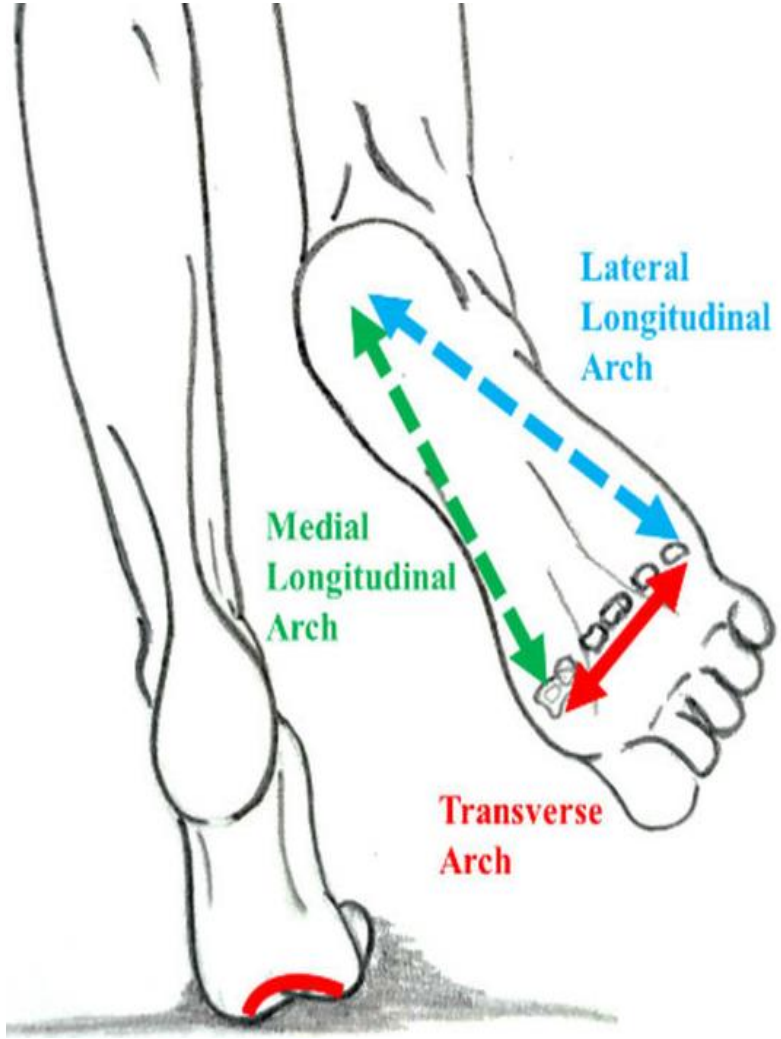
The arches of foot

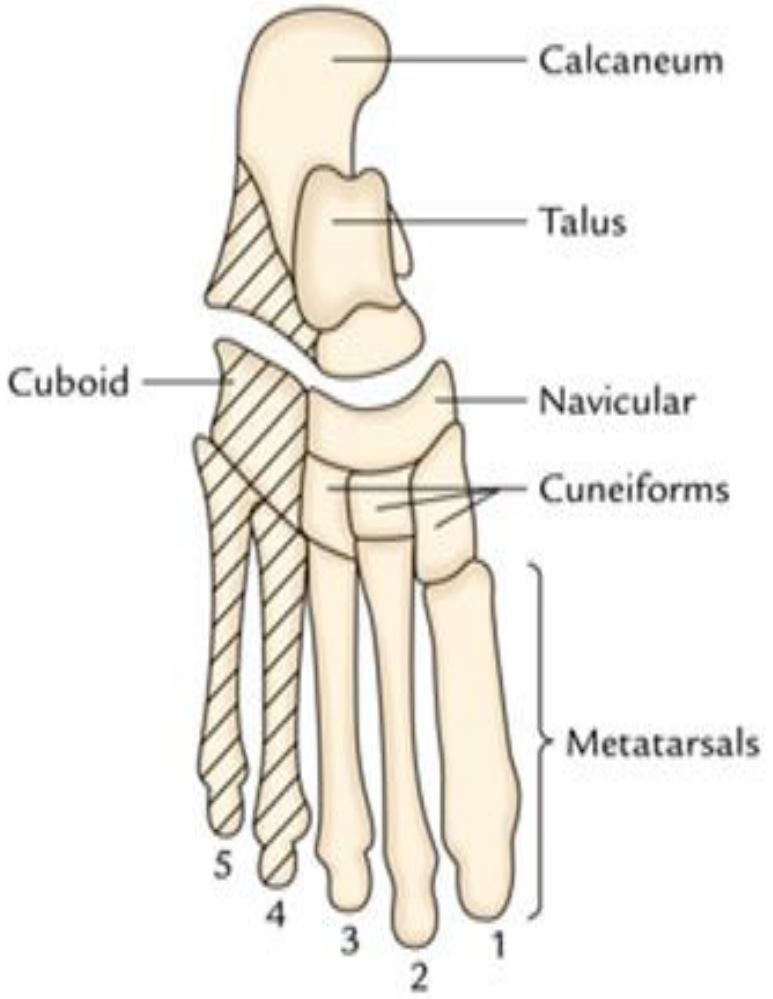
The unique arch structure of the foot plays a role in

- distributing weight
- promoting stability
- balance
- mobility



The human foot is a complex, flexible and strong structure made up of

- 26 bones
- 33 joints
- over 100 muscles, tendons, and ligaments

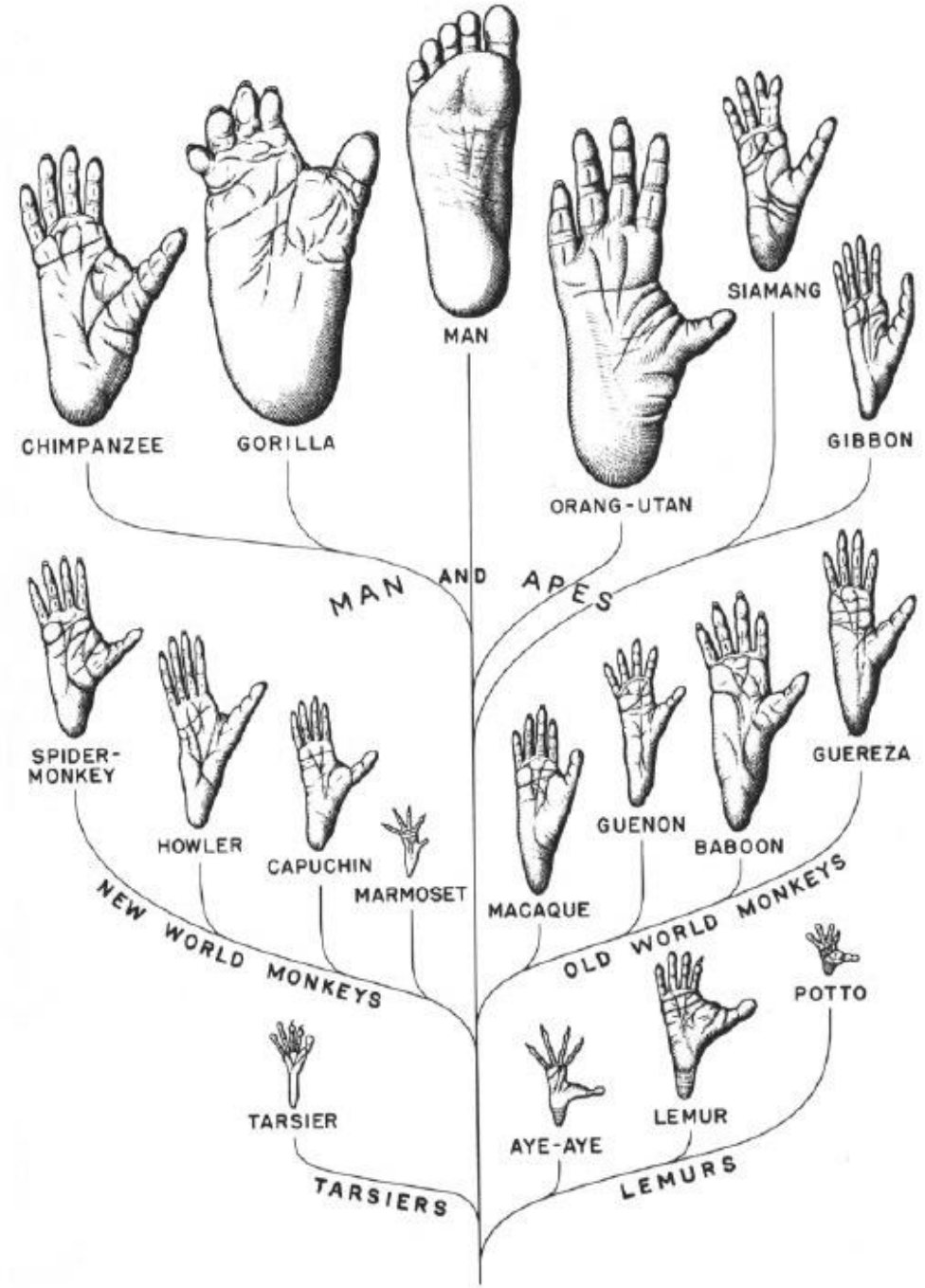


Evolution of human foot

In **1699 Edward Tyson** came up with an anatomical assessment of modern chimpanzees foot and labeled them quadrumanous

In **1863 Thomas H. Huxley** made comparisons with gorilla foot

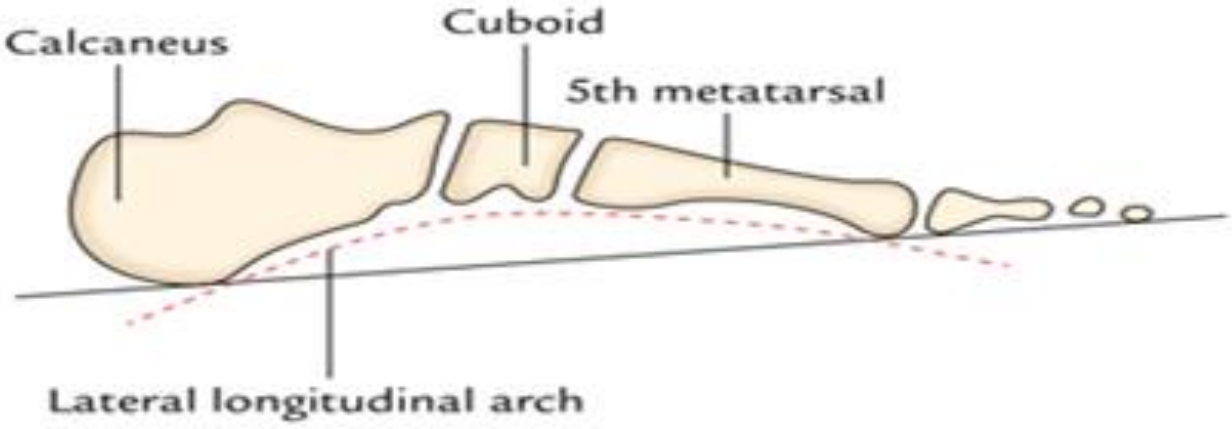
In **1995**, scientists proposed that the human foot evolved independently of other developments within human evolution

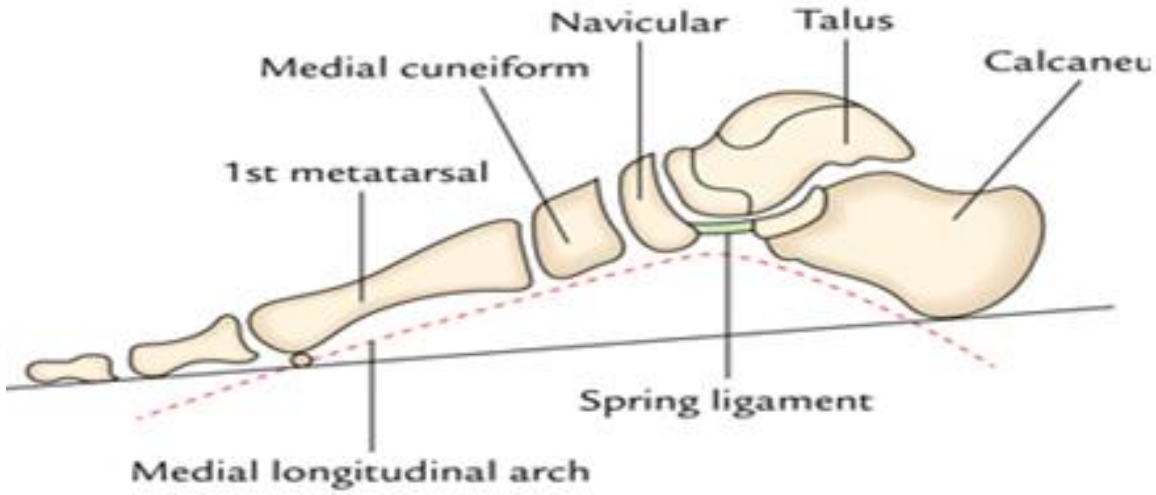


Ref: Mc Nutt EJ, Zippel B, DeSilva JM. 2018:27: 197-217

Arches of Foot

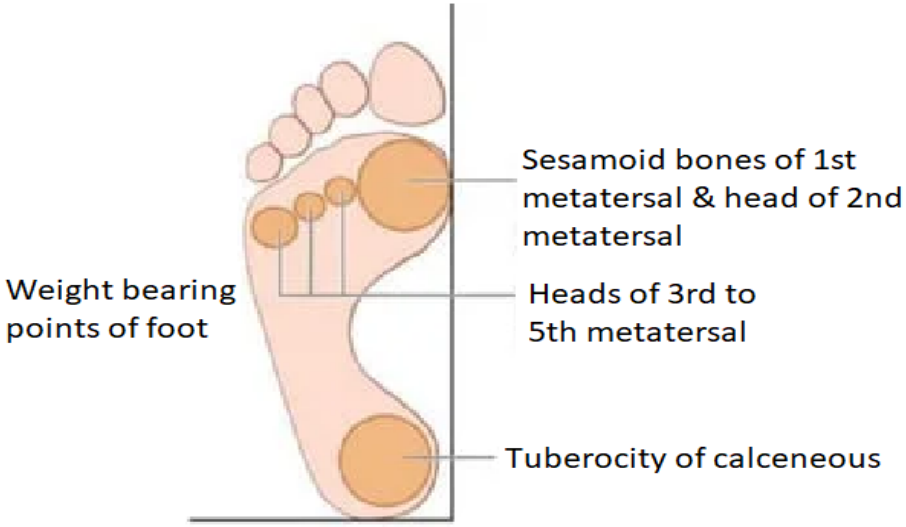
- Tarsal and metatarsal bones
- Strengthens by ligaments and tendons
- Supports the weight of the body in erect posture
- Makes the plantar surface concave



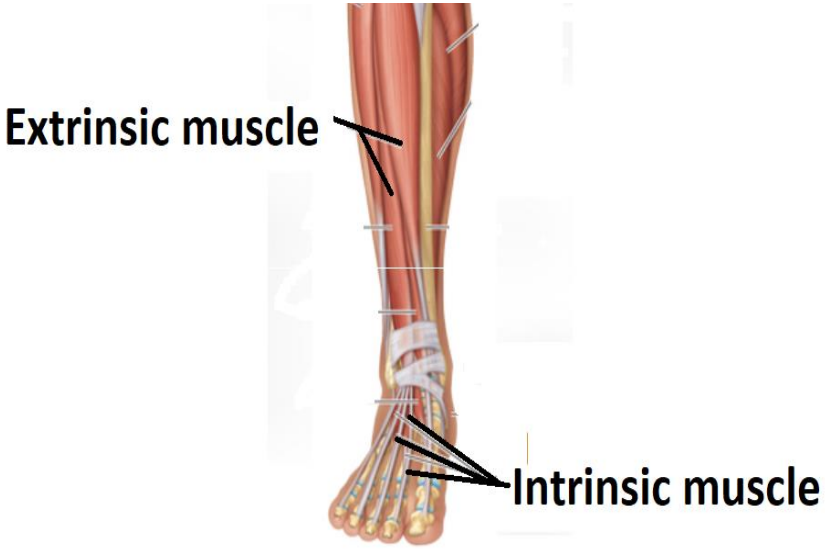


Functions of Arches

Running ,Walking & Jumping



Plantar view

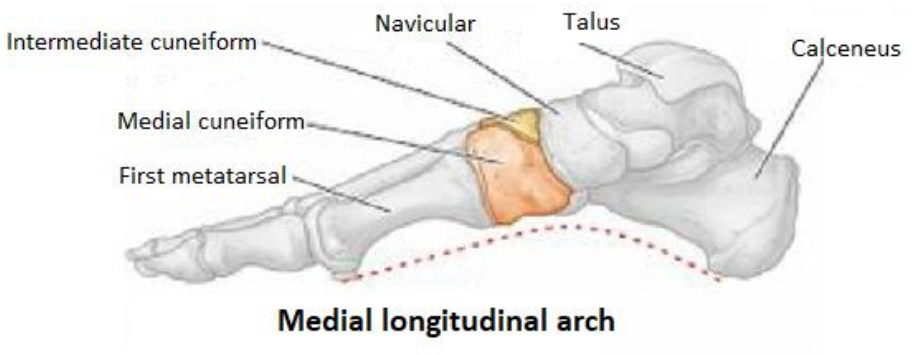


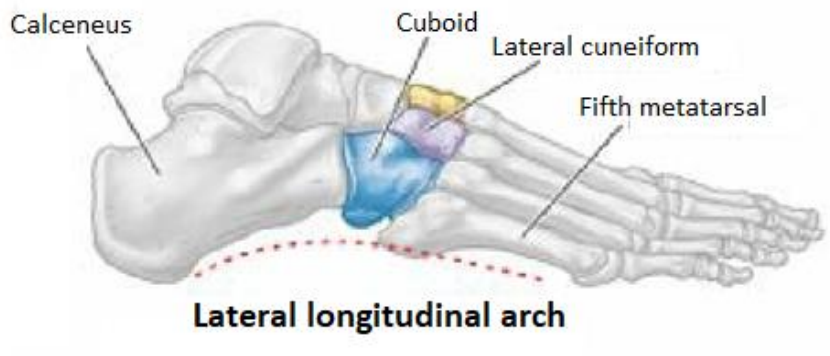
Sole is concave

Classification of Arches

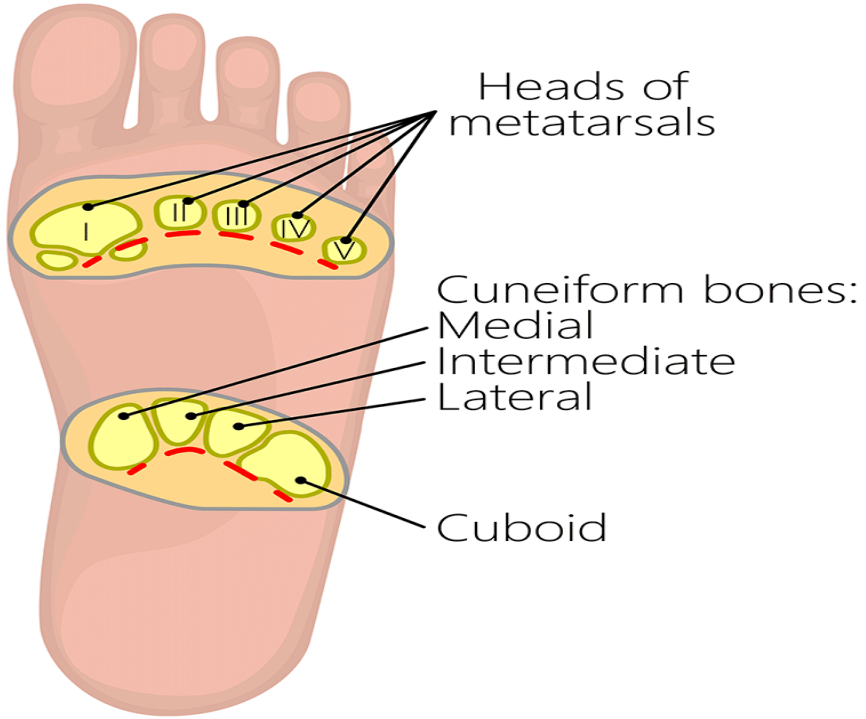
Arches are mainly of 2 types

- Longitudinal arch





- Transverse arch

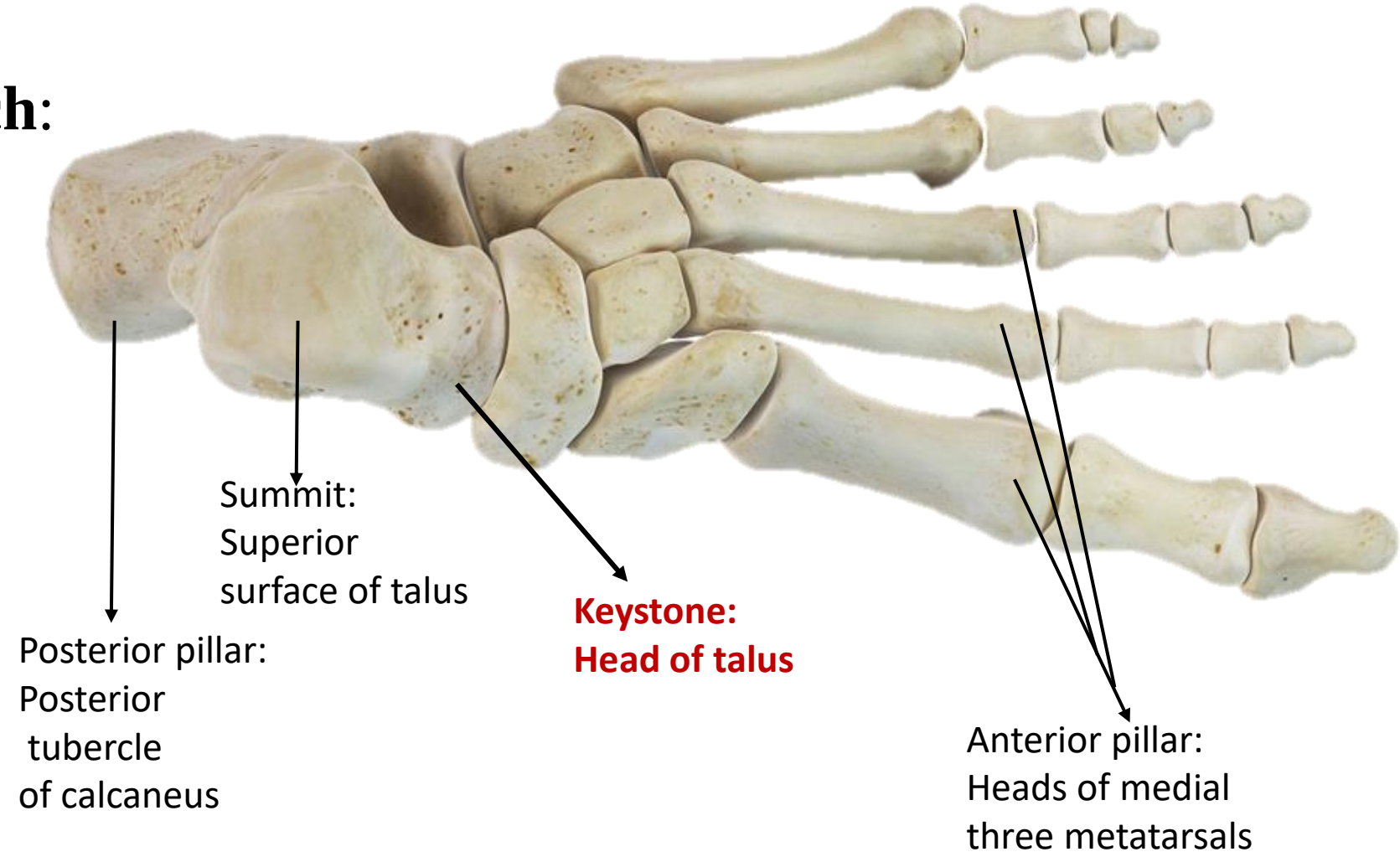


Formation of Arch

Medial longitudinal Arch:

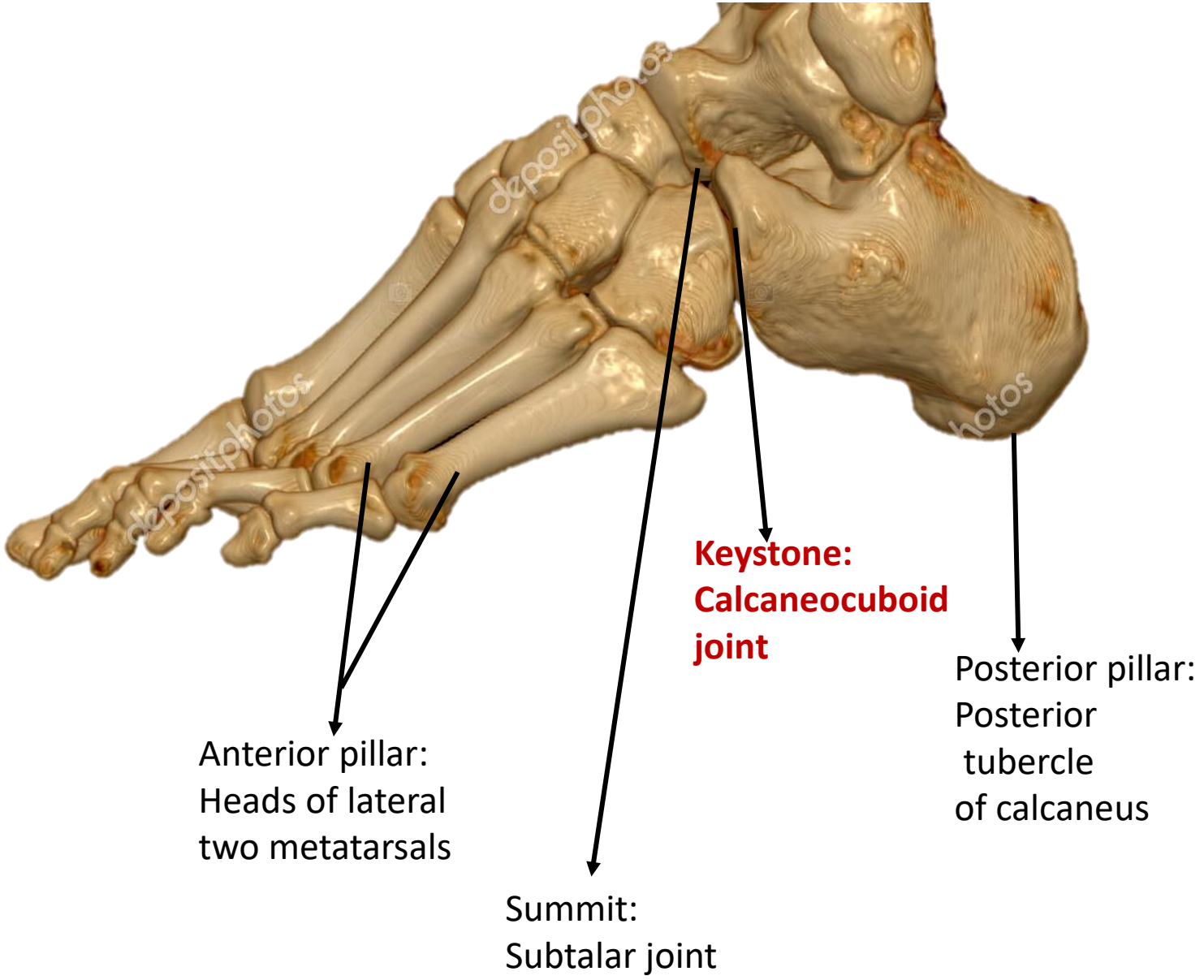
formed by-

- Calcaneus
- Talus
- Navicular
- Medial 3 metatarsals



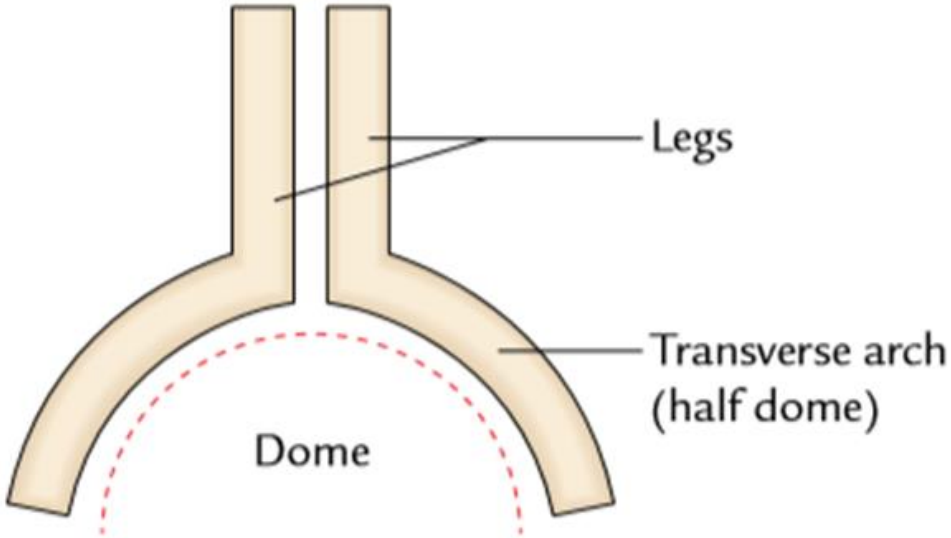
Lateral longitudinal Arch

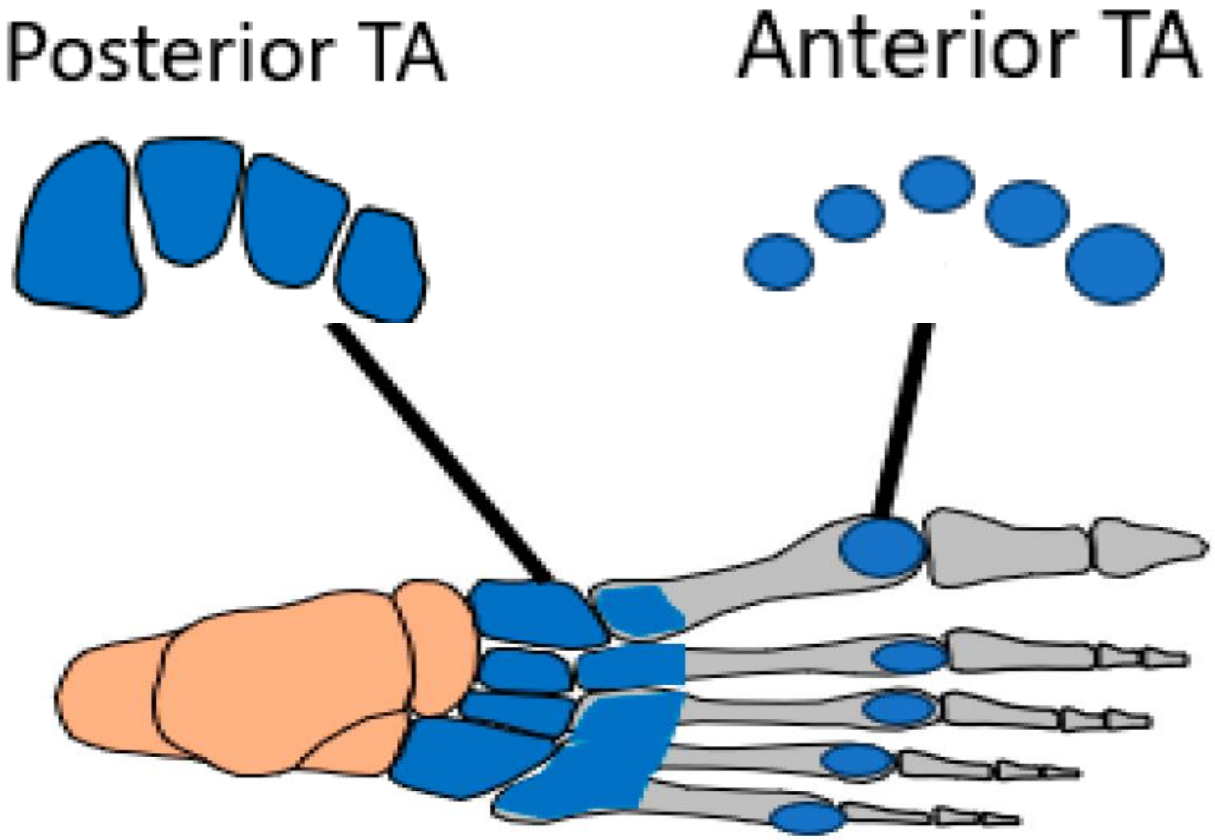
- Calcaneus
- Cuboid
- Lateral 2 metatarsals



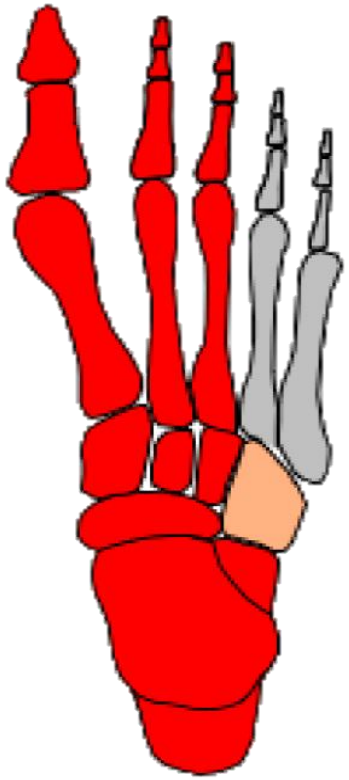
Transverse Arch

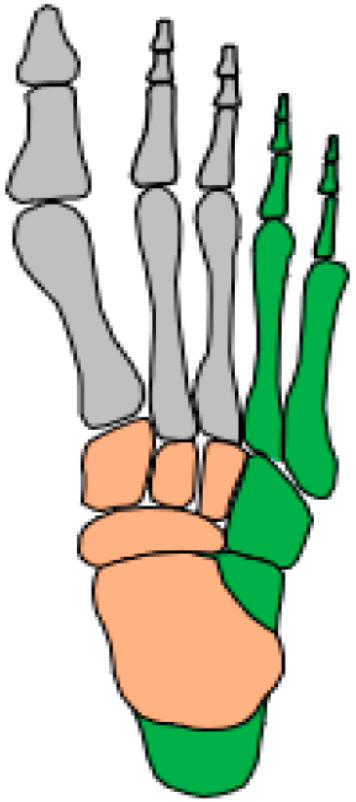
- Tarsals &
- Metatarsals



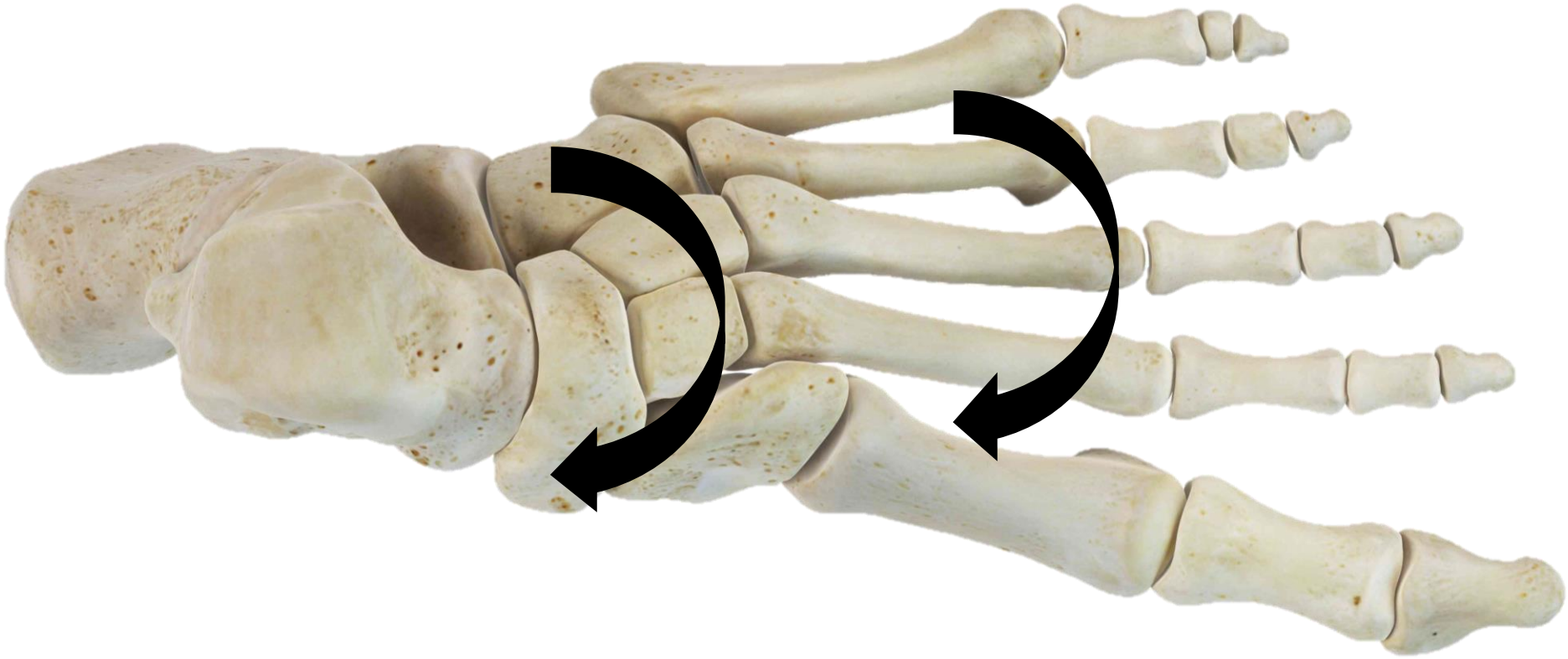


Longitudinal arch





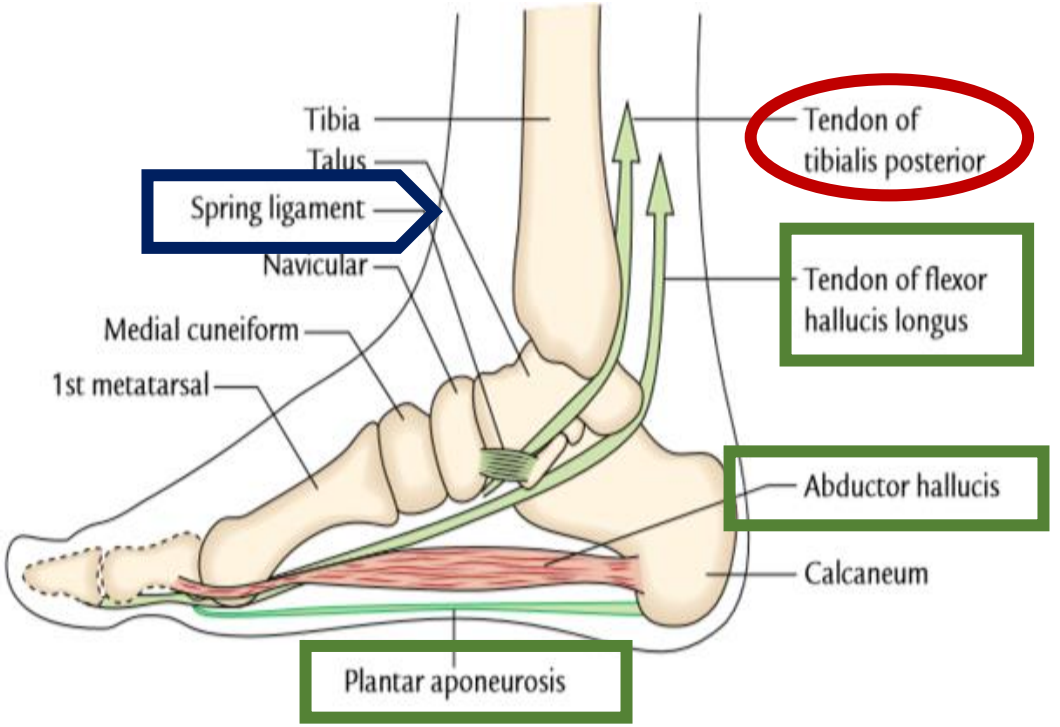
Transverse Arch

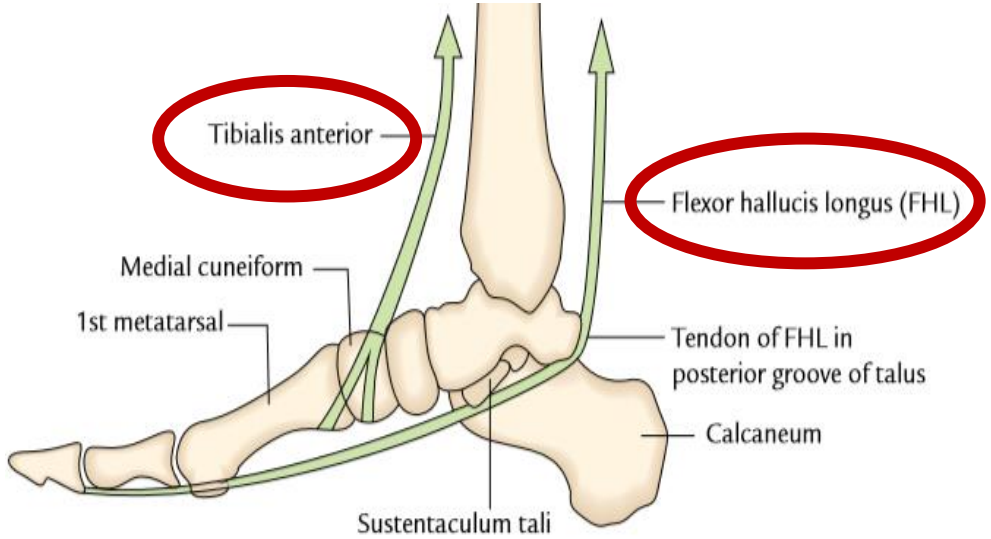


Factors maintaining the Arch

Medial Longitudinal Arch

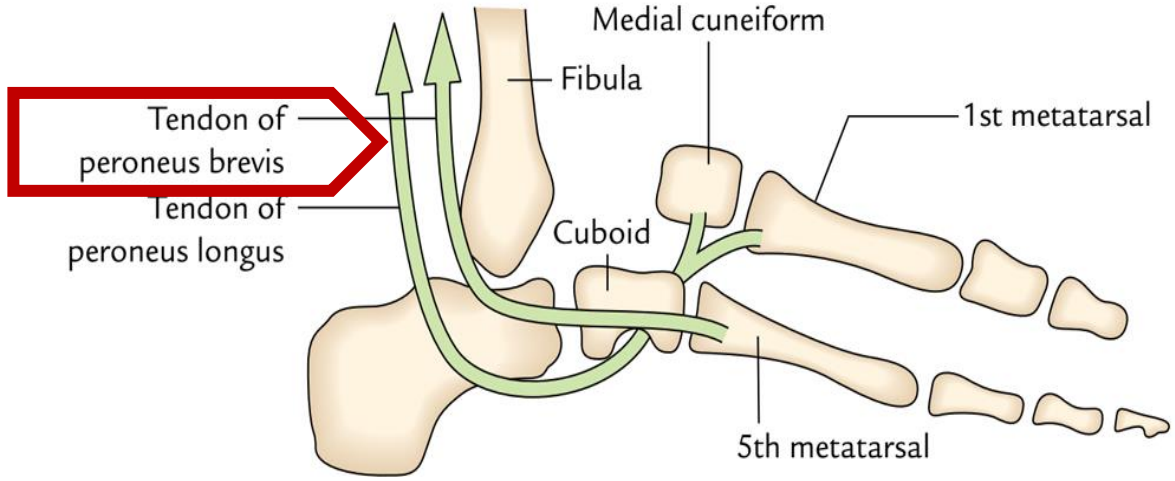
- Shape of bones
- Intersegmental tiers
- Factors acting as tie-beams
- Suspending the arch from above

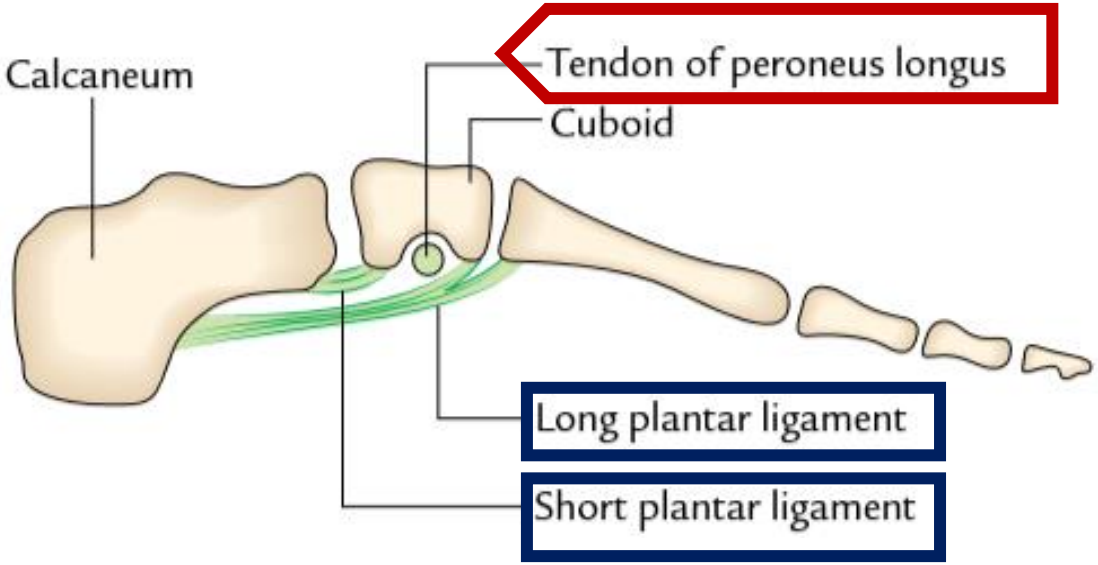




Lateral Longitudinal Arch

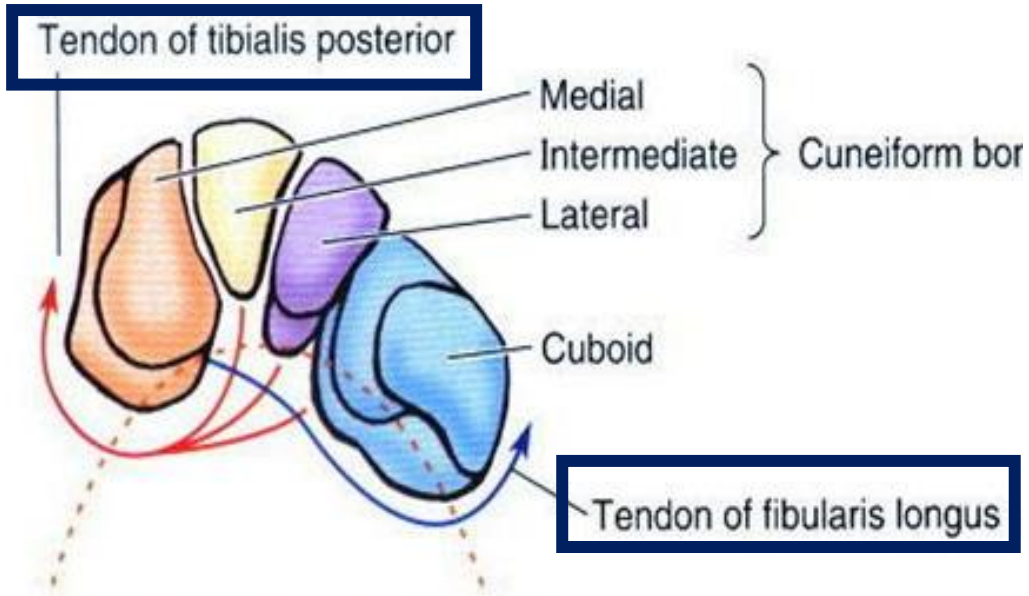
- Shape of bones
- Intersegmental tiers
- Factors acting as tie-beams
- Suspending the arch from above



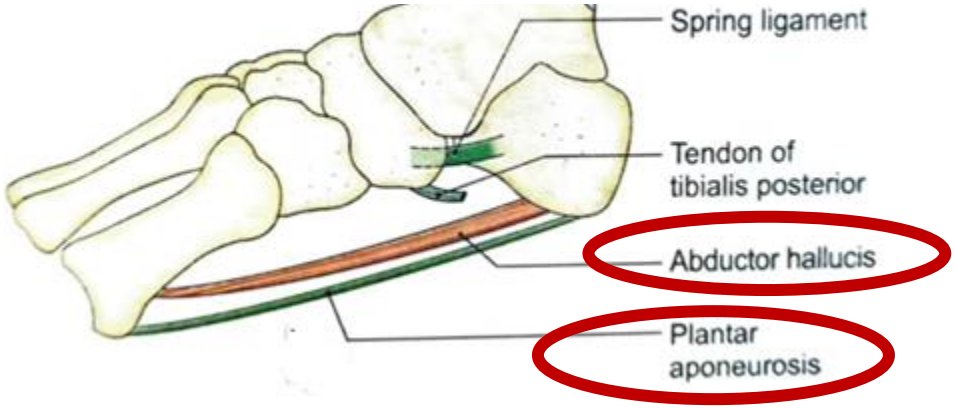


Transverse Arch

- Shape of bones
- Intersegmental tiers
- Factors acting as tie-beams
- Suspending the arch from above



(C) Transverse arch (anterior view)



Ossification of foot bones

Tarsals

2-3 years after birth except (talus, calcaneus & cuboid they ossify intra uterine life)

Metatarsals

Ossify from 1 primary (for shaft)
& 1 secondary centre (directed towards head in all except 1st directed towards the base)

Phalanges

They ossify from 1 primary
& 1 secondary centre

- (a,b)- At 1 year, the talus, calcaneus, cuboid & lateral cuneiform have ossified

- (c,d)- At 5 year, all tarsal bones have ossified

- (e,f)- At 9 year, the foot has an adult configuration

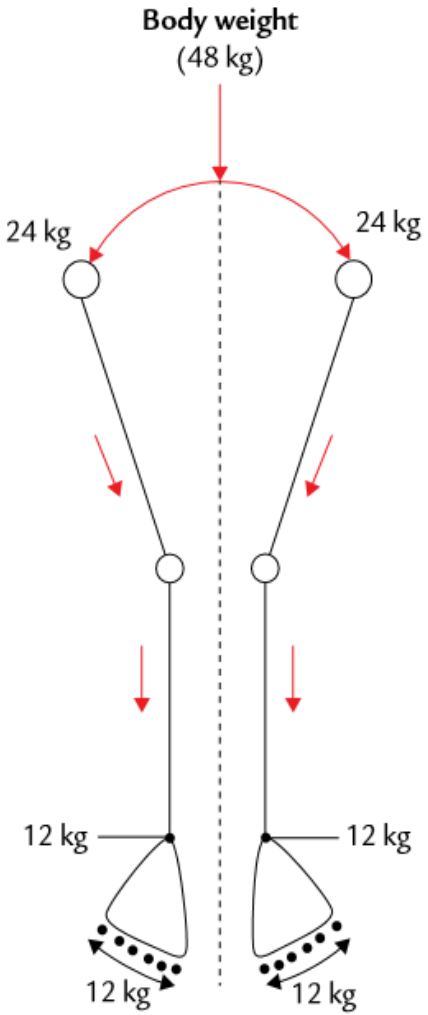
Development of arch

In children

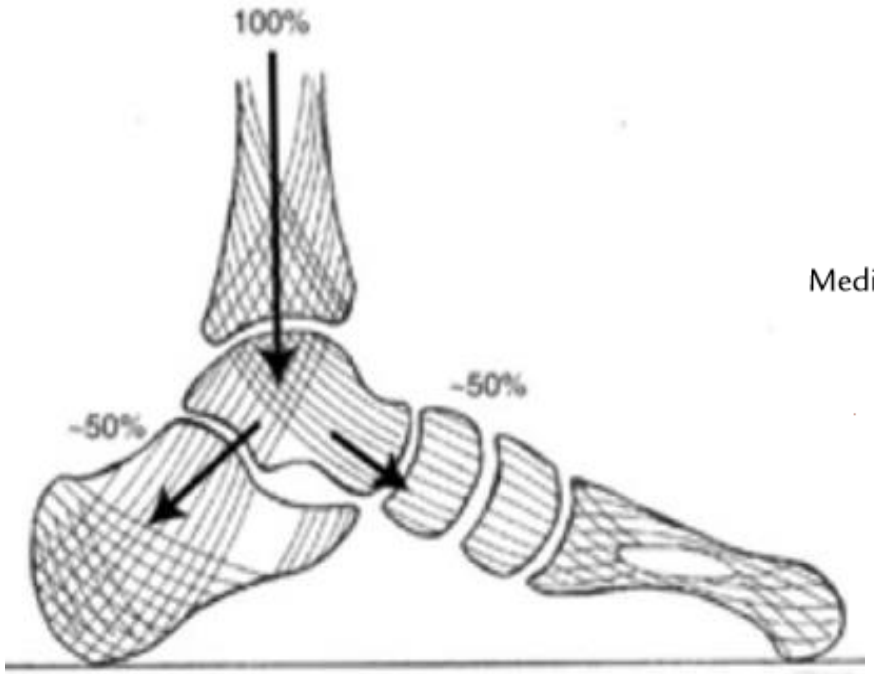
Flat feet is common in nearly all infants under 4 years due to the fat pad in the infant foot

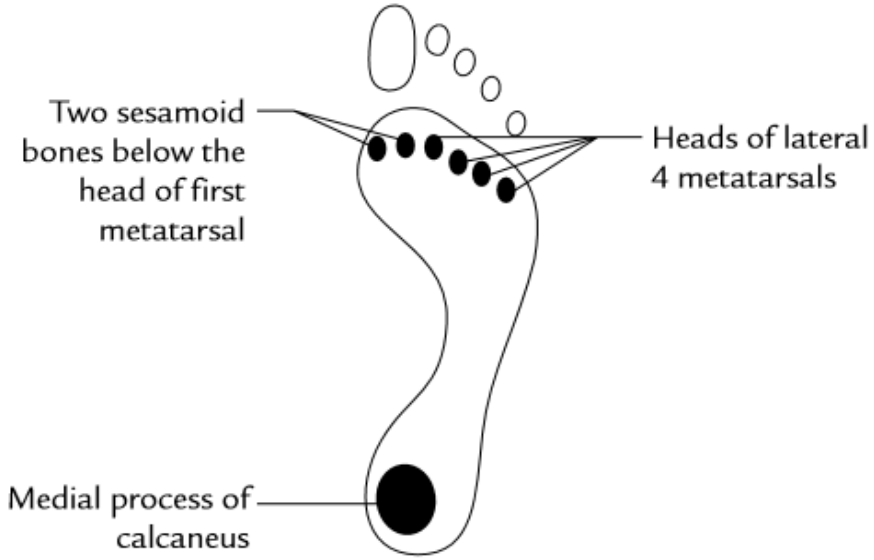
By age 6, most children will have developed an arch in standing

Weight transmission through lower limb



Distribution of weight to the feet.





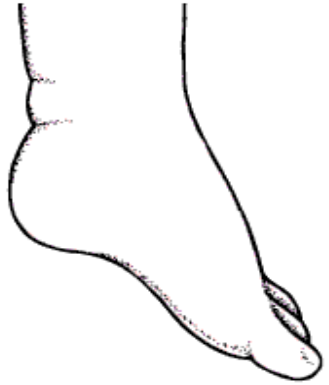
Weight-bearing points of the foot.

Congenital anomalies of foot

Club foot or Talipes

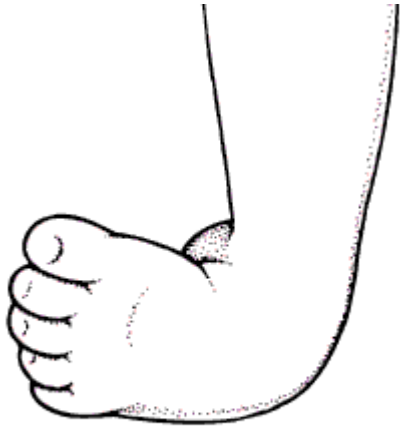
- These are the primary foot deformities
- Due to mechanical force that mold a part of fetus for a prolonged period

Club foot or Talipes



Talipes Equinus

Equinus- foot is fixed in plantar flexion and the person walks on the toes

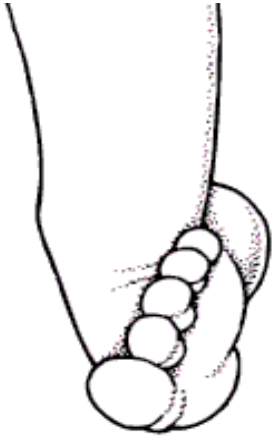


Talipes Varus

Varus- foot is fixed in inverted and adducted

Talipes Calcaneus

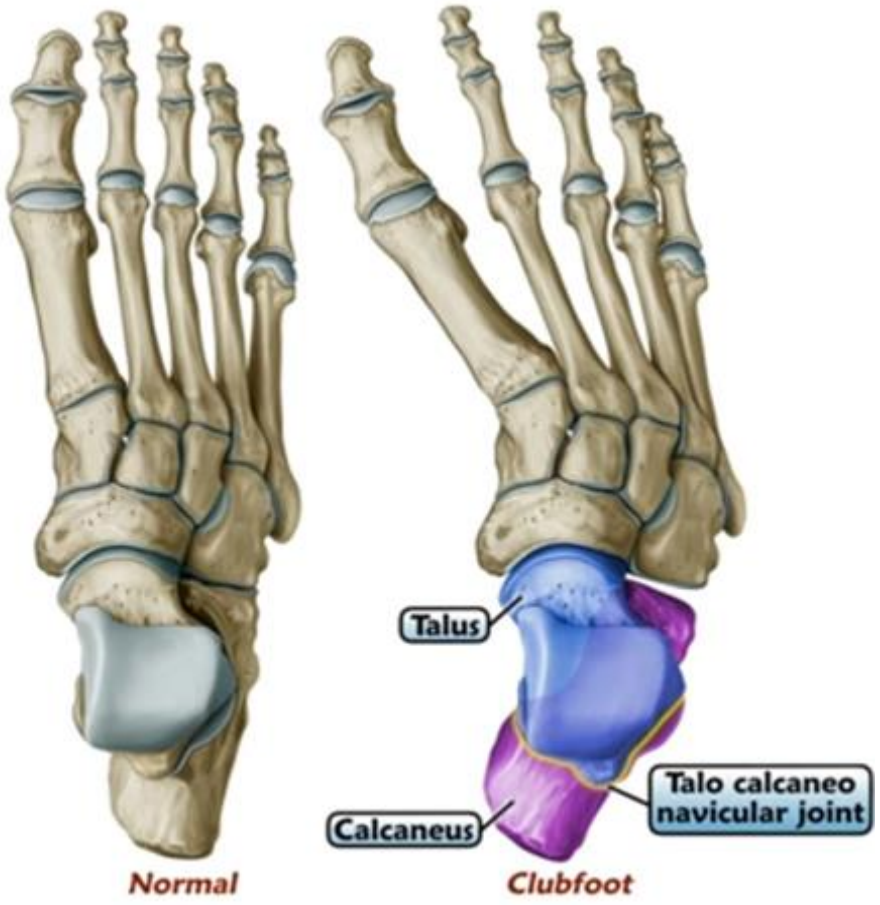
Calcaneus- foot is fixed in dorsiflexed and the person walks on the heel



Talipes Valgus

Valgus- foot is fixed in everted and abducted

Talipes equinovarus (Congenital Club foot)



Anatomical abnormality

Talipes equinovarus- Most important congenital anomaly of foot

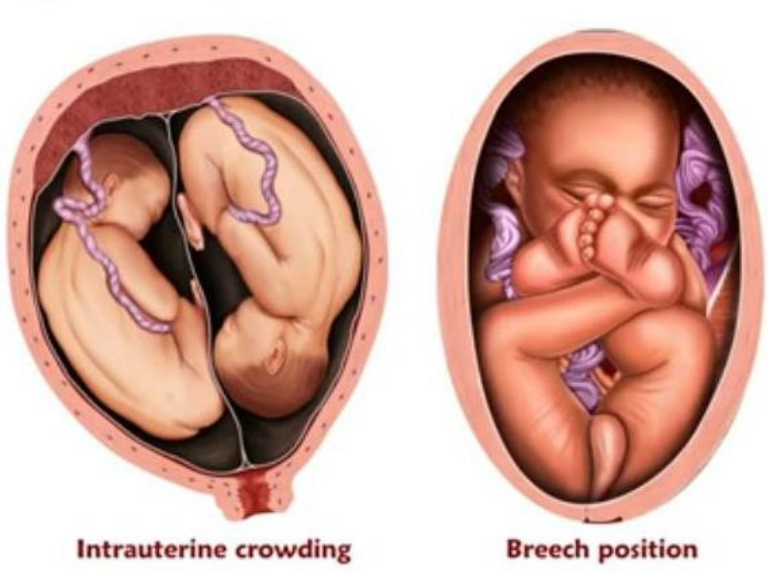
Incidence rate is 1-2/ 1000 birth, boys are twice than girls

Characterized by-

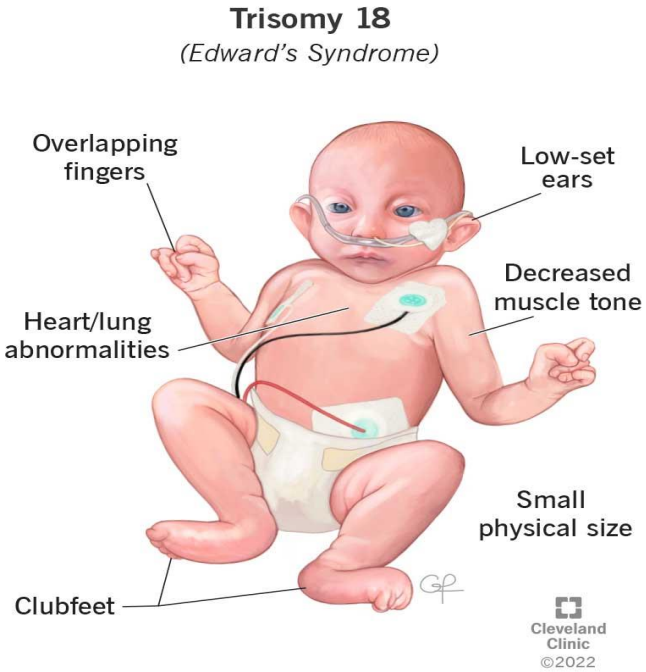
- Foot is planter flexed
- Forefoot turn medially
- Sole facing inwards

Congenital Club foot (Talipes equinovarus)

Etiology of club foot



Congenital club foot



- Amniotic constricting ring
- Neural tube defect
- Genetic disorder

Positional club foot

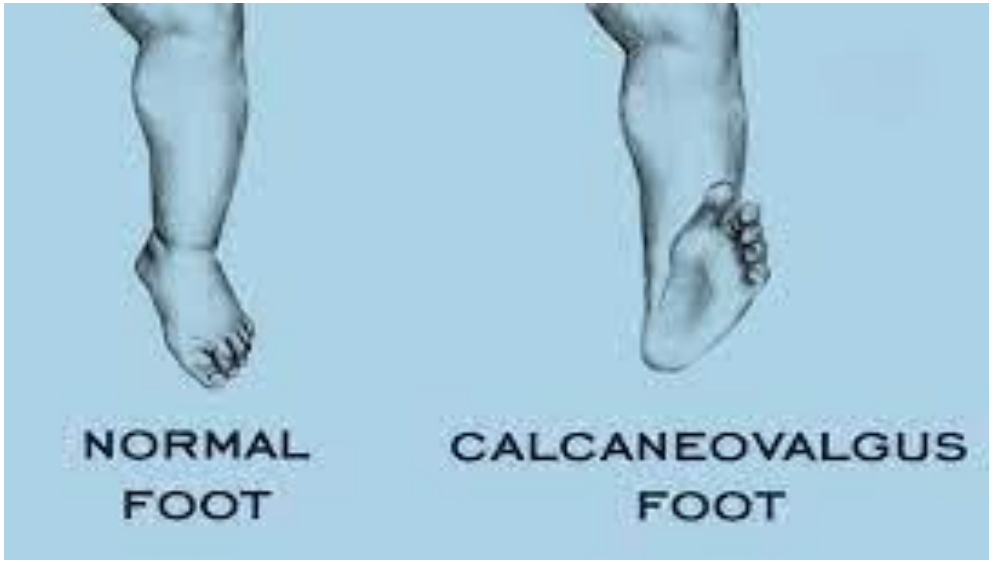
- Not a true club foot
- Corrected with mild manipulation

Talipes calcaneovalgus

- Common deformity
- Usually bilateral
- Acutely dorsiflexed foot
- Deep crease in front of the ankle
- Calcaneus juts out posteriorly

Causes

- Abnormal intrauterine position
- Spinal dysraphism
- Posteromedial bow of tibia



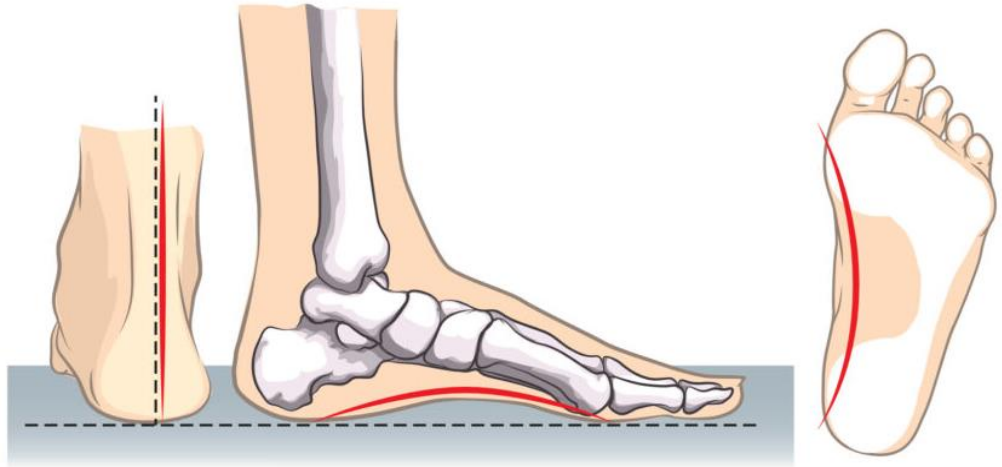
Common deformities of the foot

Flat foot or pes planus- is commonest of all foot deformities associated with disappearance of medial longitudinal arch

Flat foot or pes planus

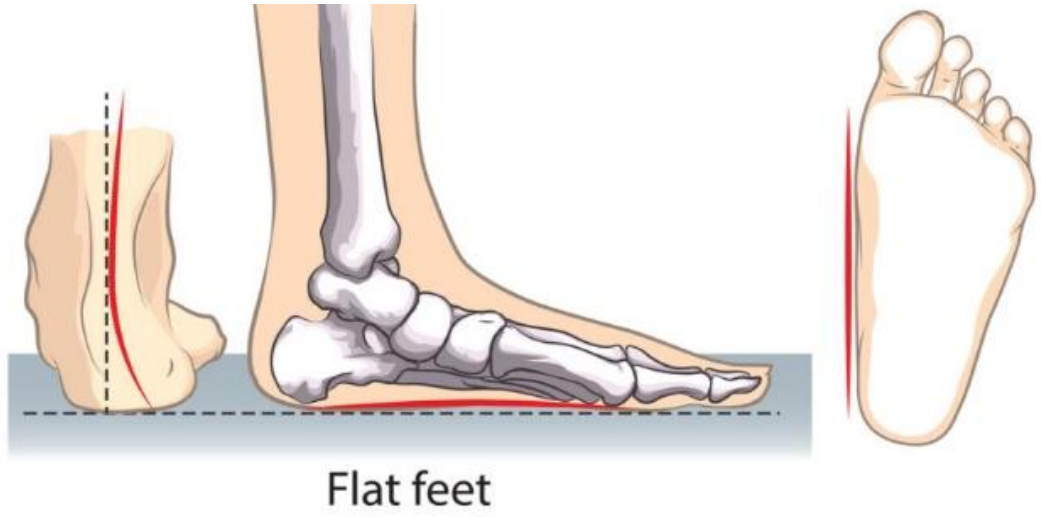
Causes of flat foot

- Rapid increase of weight
- Loss of tone in leg muscle
- Faulty foot wear

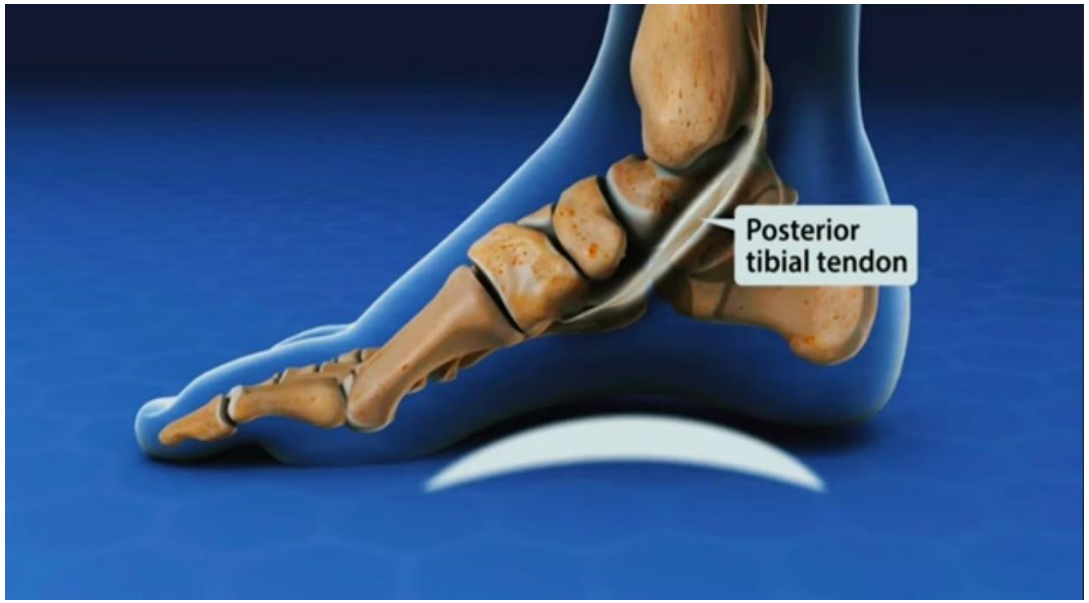


Painful acquired flat foot is the commonest

- Posterior tibial tendon dysfunction
- It is most common in women
- Insidious onset
- Associated with obesity, diabetes and steroid



Mechanism of formation of flat foot

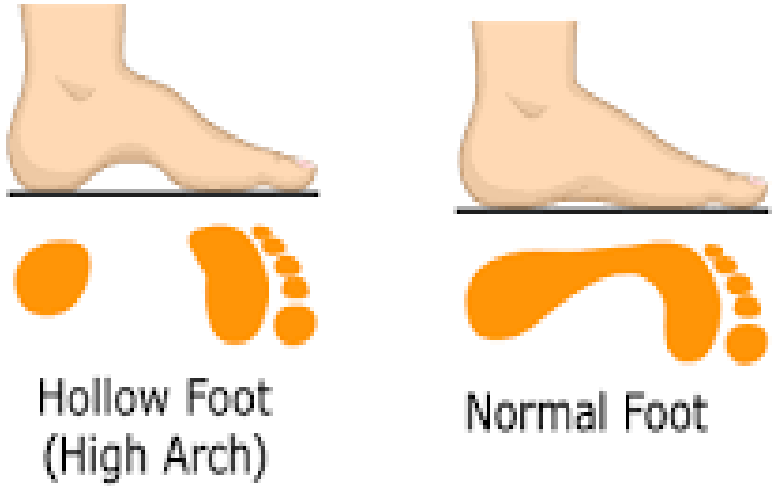

Posterior
tibial tendon


Visual Surg

High arch foot or pes cavus

- **High arch foot or pes cavus-** exaggeration of longitudinal arch

High arch foot



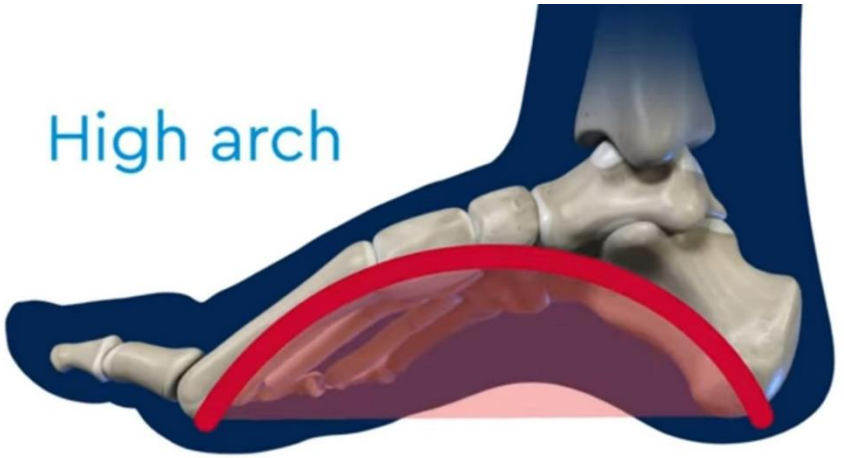
Also known as Claw foot, Hollow foot or Pes Cavus

This usually occurs because of contracture at the transverse tarsal joints

Causes of high arch foot

- Muscular dystrophies
- Hereditary motor sensory neuropathies
- Cord lesion (poliomyelitis)
- Cerebral palsy

High arch foot



Health issue associated with pes cavus

- Metarsalgia
- Plantar fasciitis
- Ankle instability/ ankle sprains
- Hammer toe
- Metatarsal fracture

References

- Mc Nutt EJ, Zippel B, DeSilva JM. The evolution of human foot. Evolution Anthropol. 2018:27: 197-217

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Thank
you