

THE FOOT

ANATOMY

The foot can be divided into three segments

- (1) Hindfoot (Talus and calcaneus)
- (2) Midfoot (Remaining five tarsal bones)
- (3) Forefoot (Metatarsal and phalanges)

The bones of the foot are arranged in such a way as to form 3 arches.

- Medial longitudinal arches
- Lateral longitudinal arch
- Transverse or anterior arch.

The foot print gives some idea of the arched structure of the foot. The arches are resilient and they add springiness and buoyancy to the movement of the foot.

FUNCTION

The ankle and foot function as an integrated unit and together provide stable support, proprioception, balance and mobility.

Movements

- *Plantarflexion and dorsiflexion* occur in the ankle joint.
- *Adduction and Abduction* (turning toes towards or away from the midline) are produced by rotation of the entire leg below the knee. if either movement is

forced at the ankle, the ankle mortise will fracture.

- *Pronation and supination* occur at intertarsal and tarsometatarsal joints; the foot rotates about an axis running through the 2nd metatarsal, the sole turning laterally (Pronation) or medially (supination).
- *Inversion* – This is the combination of plantarflexion, adduction and supination.
- *Eversion* – A combination of dorsiflexion, abduction and pronation.

The last two movements are necessary for walking on rough ground or across a slope.

FOOT POSITION & DETORMITIES

Equinus is a downward – pointing (plantarflexed) foot

Calcaneus is an upward-pointing (dorsiflexed) foot.

Plantaris is when only the forefoot points downwards

Varus foot refers to supination and adduction deformity of the foot.

Valgus foot (Pes Valgus) is pronation and abduction deformity of the foot

Pes cavus refers to an unusually high arch of the foot

Pes planus is flatfoot.

CLINICAL ASSESSMENT

HISTORY

Pain over a joint or bony prominence is usually due to local disorders. Pain across the fore foot is called *metatarsalgia* and, is usually diffuse; it is typically due to uneven loading and muscle fatigue.

Deformity may be in the ankle, foot or the toes. The chief complaint may be of having difficulty with fitting shoes.

Swelling: May be localized (e.g. bunion), diffuse or bilateral. Bilateral causes are usually due to systemic illnesses.

Corns & Callosities: May be due to shoe pressure or constant irritation. This may give rise to pain

Instability – of the ankle or subtalar joints produces episodes of the Joint “giving way” while the patient is walking especially on an uneven ground or a slope.

Numbness & Paraesthesia are usually due to nerve irritation.

EXAMINATION

1. **Gait**
2. **Look** for foot deformities, corns, callosities and ulcers
3. **Feel** for skin temperature, pulses, tenderness, edema, lumps and sensation.

4. Move

- Active
- Passive
- Stress
- Muscle Power

Examine the shoes – They can provide valuable information about stance or gait.

Then do a general and systemic examination.

THE DISEASES

(a) Congenital foot disorders

1. Talipes equinovarus

Tali (Talus = Ankle), Pes (Pes = foot) equino (Equine = horse). In this deformity, the heel is in equinus, the hindfoot in varus and the forefoot supinated and adducted.

Incidence – 1-2 / thousand births. Boys are affected more than girls and it is bilateral in 1/3 of the cases.

Causes

Majority is idiopathic.

But it may be associated with the following:

- Spinal disorders e.g. spina bifida.
- CNS disorders e.g. cerebral palsy.

Neuro-muscular e.g. Arthrogryposis Multiplex congenita

Congenital limb deformities e.g. Tibia deficiency and constriction rings.

Acquired disorders

- Neuromuscular e.g. Poliomyelitis

- Soft tissue contracture e.g. Burns
- Malunion

Pathological anatomy

- The skin and soft tissues of the calf and the medial side of the foot are contracted and underdeveloped, if the condition is not corrected early, secondary growth changes occur in bones and the bones too become deformed. These bone changes are permanent.

Clinical features

- Deformity is usually obvious at birth; there is equinus, inversion and forefoot adduction.
- Ankle dorsiflexion is reduced. Foot cannot be put in the plantigrade position.
- The calf may be atrophic
- In unilateral cases, the ipsilateral foot is smaller
- Look for associated disorders in other regions:
 - *Back* – spina bifida
 - *Other joints* – arthrogryposis multiplex congenita
 - *Head* – cerebral palsy.

Imaging

These are used mainly to assess the progress after treatment.

Because the bones of the foot are not well ossified at this age, it is the relationship of the bones to each other rather than the shape of individual bones which is useful for assessing the deformity.

Treatment

Aim: To produce a plantigrade, supple foot that will function well.

1. Conservative Treatment

- Treatment must start early (within a day or two of birth). It consists of repeated manipulation followed by adhesive strapping or P.O.P application

2. Operative Surgery

- May be done early (before child begins to walk) or late (when the child has started walking).
- All contracted soft tissue elements are released and the tendons elongated.
- The foot is held in the corrected position with Kirchner wires and plaster cast.

Follow – up

This must be till skeletal maturity (18 yrs or more) because the deformity may recur.

LATE OR RELAPSED TEV

These often have severe deformities with secondary bony changes. They also have

callosities on the weight bearing part of the foot which is usually the lateral aspect of the ankle and the dorsum of the foot.

Treatment offered depends on the age

Four to twelve yrs ... Soft tissue release and osteotomies may be successful.

>12 yrs – Triple arthrodesis.

Other congenital deformities

* **Talipes Calcaneovalgus**

The foot is dorsiflexed with a deep crease just on the front of the ankle. It is usually bilateral. Most correct spontaneously, the remaining need serial casts for correction.

* **Flat foot (Pes Planus)**

This occurs when the apex of the planter arch has collapsed and the medial side of the foot is now in contact with the floor.

* **High arched foot (pes cavus)**

The arch is higher than normal. It is usually secondary to neuromuscular disorders with poliomyelitis the commonest worldwide.

(b) Acquired foot disorders.

Hallux valgus.

Commonest foot deformity in the west. Usually secondary to habitual footwear. The hallux assumes a valgus position. If this becomes pronounced, shoe pressure on the

prominent 1st metatarsophalangeal joint leads to pain, and development of a bunion. Osteoarthritis may finally develop in the joint.

Treatment

- In moderate cases, an osteotomy is done to reduce the angle of the metatarsophalangeal joint.
- In severe cases in which osteoarthritis has developed either an excision arthroplasty (Keller's operation) or arthrodesis is done.

Hallux Rigidus

Rigidity of the 1st metatarsophalangeal joint. May be secondary to trauma, gout, pseudo – gout or osteoarthritis.

Initial treatment is by providing a rocker – bottom shoe. Operative treatments include osteotomy or arthrodesis.

The paralysed foot

Causes

Upper motor neuron lesions

- Cerebral palsy
- Stroke

Lower Motor neuron lesion

- Poliomyelitis
- Spinal cord lesions
- Peroneal muscular dystrophy

Peripheral nerve injuries

- Injuries to sciatic, common peroneal or Tibial nerves.

Clinical features

- Difficulty with walking
- Unsteady gait

Treatment

- * Calipers
- Tendon transfer
- Tendon release / elongation
- Arthrodesis

The Painful foot

This may be due to:

1. Mechanical pressure especially in deformed foot.
2. Joint inflammation or stiffness.
3. Localized bone lesions
4. Peripheral ischaemia
5. Muscular strain

It may be a part of a systemic disorder e.g. diabetic mellitus.

Pain may also be localized to specific regions of the foot as follows:

1. **Posterior heel pain**

- (a) It is seen in adolescent boys. Rest and simple analgesics is all that is necessary

(b) Calcaneal bursitis

- Common in young women usually due to irritation by high heeled shoes. Treatment is by changing footwear

2. **Inferior heel pain.**

(a) Calcaneal bone lesions

- Any bone lesion e.g. osteomyelitis, stress fracture etc can cause this

(b) Plantar fasciitis

- Seen in 30 – 60 yrs age group. Treatment is with analgesics or corticosteroid injection.

(c) Painful fat pad.

- Due to direct trauma to the heel over the calcaneal fat pad. Treatment is conservative.

(d) Nerve entrapment

- Due to entrapment of the 1st branch of the lateral planter nerve.

Pain Over Midfoot:

- * Kohler's disease (Osteochondritis of the Naviculus) seen in children below 5 years, self-limiting.

Pain in the forefoot

1. Metatarsalgia

- Usually generalized in the fore foot and is found in conditions that give rise to faulty weight distribution prolonged or unaccustomed walking or standing.

2. Stress fractures

- Of the 2nd or 3rd metatarsals. Common in young adults after unaccustomed activity or in postmenopausal women with osteoporosis. Initial x - ray is usually normal, but a repeat 10/7 – 2/52 later reveals the fracture.

3. Morton's metatarsalgia

- Due to entrapment of one of the digital nerves between the metatarsals
- Treatment .

Treatment is by using protective footwear initially. Surgical release is a later option.