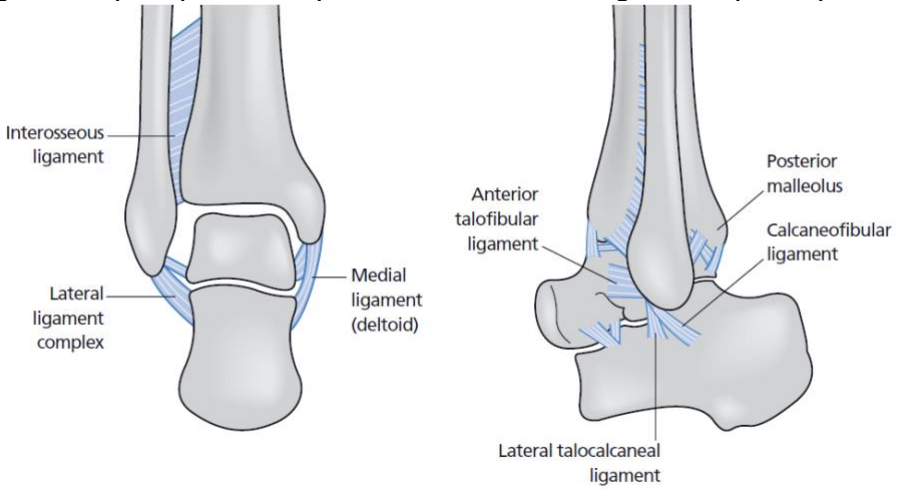
ORTHOPEDIC

Lec.16 **Dr. Hasan AbdulHadi**

THE ANKLE & THE FOOT

Functional anatomy:

Knowledge of the anatomy of the foot and ankle is key to understanding the disorders, which present. The ankle joint is more complex than a simple hinge. Most of the body weight is transmitted from the tibia through the talus. The fibula also plays a part in weight bearing through its articulation with the talus. Strong ligaments at the knee and at the ankle hold the tibia and fibula firmly together. On the medial side of the ankle, the deltoid ligament is a broad structure running from the tip of the medial malleolus distally to the talus, naviculum and calcaneus in a fan shape. On the lateral side, the lateral ligament complex consists of three bands, the anterior talofibular ligament (ATFL), the calcaneofibular ligament (CFL) and the posterior talofibular ligament (PTFL).



The syndesmosis ligaments hold the bottom ends of the tibia and fibula in place. This arrangement forms the upper surface of the ankle joint. The ankle joint is a hinge joint. The hinge is formed where the tibia and fibula sit above the talus bone. This connection is called a mortise and tenon, a stable connection that woodworkers and craftsmen routinely use to create strong and stable constructions.

The fracture also known as Pott's fracture it is a common injury, which involve various injuries in the bone & soft tissues of the ankle J (e.g. med. & lat. collateral ligament tear or med. & lat. malleoli fracture).

Clinical Assessment:

In humans, the foot and ankle serve as the primary interface between the ground and the body during ambulation. This requires that the foot and ankle complex be able to absorb impact loading forces, adapt to uneven ground, and allow efficient propulsion. To accomplish this task, the foot and ankle are usually composed of 26 primary bones, not including the tibia, fibula, accessory bones, and sesamoid bones. A good clinical examination can supplement the history and assist the examiner in making the diagnosis of any problem.

Exposure

Both shoes and socks off at least have trousers rolled up to the knees.

Look

1. **In standing:** look to the both feet from front, sides and from behind.
2. **During walking:** assess the patient gait.
3. **During sitting:** Patient seated on an examination couch and legs dangling, examiner sits in a chair and holds the foot.
   - General clues Age of patient, obvious rheumatoid disease, walking aids
   - Shoes: For raises, insoles, uneven wear.
   - Skin, ulcers, hairlessness, calluses
   - Nails
   - Swellings
   - Toe deformities: Hallux valgus, claw toe, hammer toe.
   - Look at soles of feet for callus formation.

Feel

Ask if there is a tender area. Don't forget to watch the patient face throughout. Feel with back of the hand for temperature difference.

• Ankle

Feel for tender areas, systematically checking:

1. The anterior joint line
2. The lateral gutter and lateral ligaments
3. The syndesmosis
4. The posterior joint line
5. The medial ligament complex
6. The medial gutter.
7. Feel for an effusion, synovitis, deformity, bony prominence and loose bodies.

• Hindfoot and midfoot

Lateral (from distal to proximal)

1. Styloid process of fifth metatarsal
2. Groove in the cuboid for Peroneus Longus tendon (just posterior to styloid)
3. The peroneal tubercle (a small lateral extension of the calcaneus, separating the peroneus longus & brevis tendons)
4. Sinus Tarsi - soft tissue depression just anterior to the lateral malleolus. (Sinus Tarsi is filled with EDB & fat pad & ligaments)
5. Dome of Talus (made prominent by plantar-flexing ankle).

Medial (from distal to proximal)

1. First Metatarso-cuneiform joint.
2. Navicular Tubercle - most obvious bony prominence in front of medial malleolus (insertion of Tibialis Posterior tendon)
3. Head of Talus - felt just behind the navicular, by everting & inverting the midfoot.

4. Sustentaculum Tali - one fingerbreadth below medial malleolus. (serves as an attachment for the spring ligament & supports the talus)
5. Medial Malleolus.

• Forefoot

Palpate the all bones and joints in a circle, paying particular attention to:

1. First Metatarsal head
2. First MTPJ
3. Metatarsal heads
4. Web spaces

• Feel for Dorsalis Pedis and posterior tibial pulses

Move

Compare both sides

- **Ankle:** ask the patient to lift foot up (dorsiflex) and down (plantarflex). Figure 16-1.

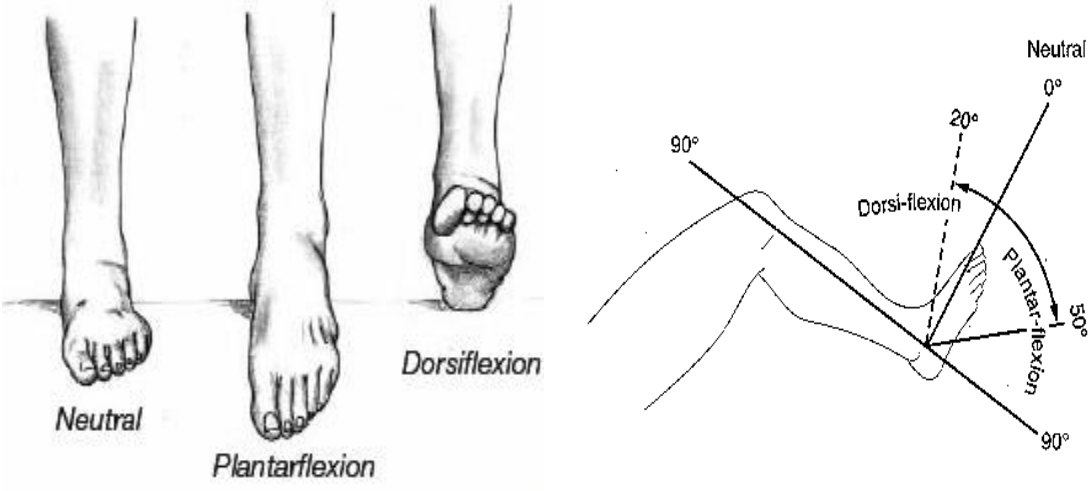


Figure 16-1: Range of movement of Ankle joint.

- **Subtalar:** Hold the calcaneus with one hand and the talar head/neck with the thumb & index finger of the other hand. Apply varus and valgus stress with the hand on the calcaneus feeling for movement of the talus (at extremes of subtalar motion) with the other hand. Holding talus rather than the tibia isolates subtalar from ankle motion. (Normal = 5 degrees in each direction). Figure 16-2.

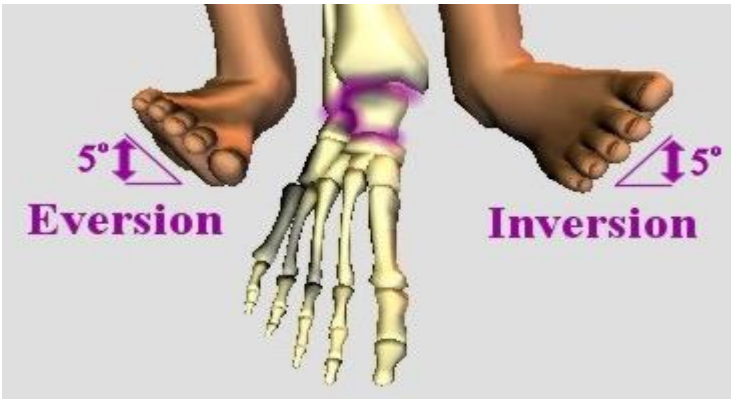


Figure 16-2: Range of movement of subtalar joint

- **Midtarsal (Talo-navicular & Calcaneo-cuboid joints):** Hold the calcaneus with one hand and move the forefoot medially & laterally with the other hand = adduction (20 degrees) & abduction (10 degrees). This movement cannot be seen, but can be felt.
- **Tarsometatarsal joints:** Active motion is zero, but test the joints for stability (by pushing each joint up & down)

- **1st MTP Joint:** Normal ROM = 70-90 degrees DF; 45 degrees PF. Normal toe-off requires 35-40 degrees DF.
- **Other toes:** Assess flexibility of any lesser toe deformities

Stability tests

Ankle Anterior Drawer Test: is used to assess for instability of the ankle. Laxity is typically due to a sprain of the anterior talofibular ligament. To administer the test the examiner stabilizes the lower leg of the patient with one hand while the other hand cups the heel. An anterior force is applied to the heel while attempting to move the talus anteriorly in the ankle mortise. This test is administered bilaterally and results are compared. (Figure 16-3)

The Talar Tilt Test: is used to examine the integrity of the Calcaneo-fibular or the deltoid ligament. The patient is seated comfortably on the end of an exam table. Possible alternate positions can be side lying or supine. The examiner grasps the foot and places it in anatomical position while stabilizing the tibia and fibula. To test the Calcaneo-fibular ligament the examiner will adduct and invert the calcaneus into a varus position. The deltoid ligament is examined by: abducting and everting the calcaneus into a valgus position. A positive test will result in laxity and/or pain. (Figure 16-4)

Figure 16-3: Ankle Anterior Drawer Test

Figure 16-4: The Talar Tilt Test

The Thompson (Simmond) Test: is used to examine the integrity of the Achilles' tendon. With the patient lying prone on the table with his or her foot extended beyond the end of the table the examiner squeezes the calf. A normal non-injured response to this maneuver is slight plantar flexion of the ankle. Lack of ankle movement can indicate a rupture of the Achilles' tendon. (Figure 16-5)

Figure 16-5: The Thompson Test

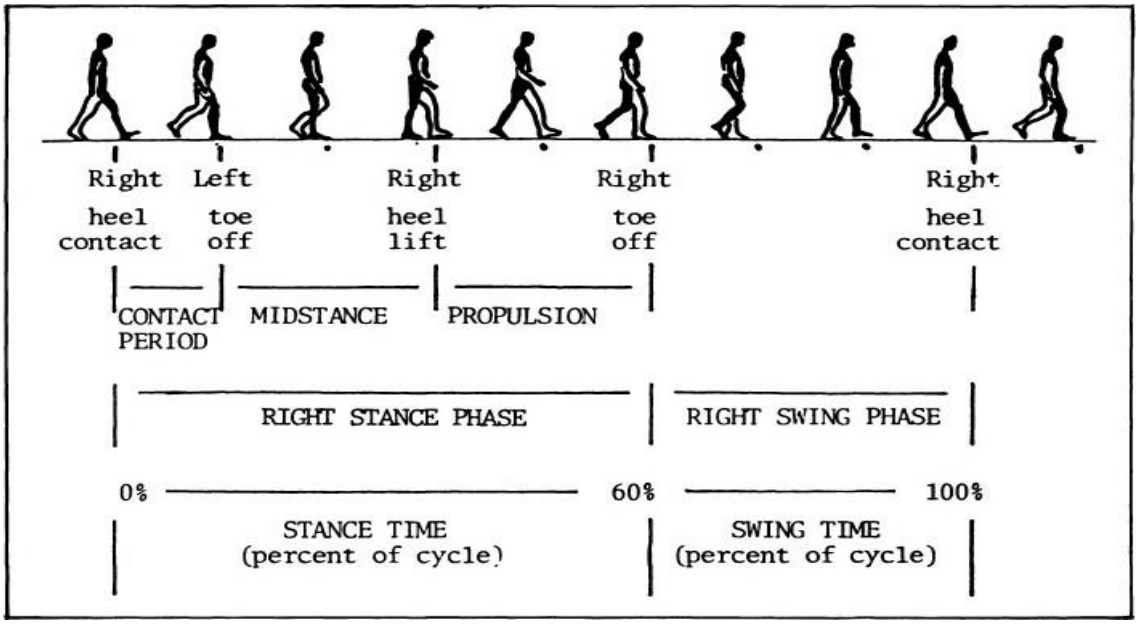


Figure 16-6: The Gait Cycle

CONGENITAL TALIPES EQUINOVARUS (CLUB-FOOT)

Clubfoot describes a range of foot abnormalities usually present at birth (congenital) in which the foot is twisted out of shape or position. The term "clubfoot" refers to the way the foot is positioned at a sharp angle to the ankle, like the head of a golf club. (Figure16-7).

In this deformity the *heel* is in equinus (pointing downwards), the entire *hindfoot* in varus (tilted towards the midline) and the *midfoot* and *forefoot* adducted and supinated (twisted medially and the sole turned upwards). It is relatively common; the incidence is 1 or 2 per 1000 births and boys are affected twice as often as girls. The condition is bilateral in one-third of cases. Clubfoot can be mild or severe, affecting one or both feet.

The skin and soft tissues of the calf and the medial side of the foot are short and underdeveloped. If the condition is not corrected early, secondary growth changes occur in the bones and these are permanent. Even with treatment, the foot is liable to be short and the calf may remain thin.

Causes:

The cause of clubfoot isn't known (idiopathic). In some cases, clubfoot can be associated with other congenital abnormalities of the skeleton, such as spina bifida, arthrogryposis(neuromuscular)

Risk factors:

- Sex: Clubfoot is more common in males.
- Family history.
- Genetic
- Compact syndrome during pregnancy.

Clinical features:

The deformity is usually obvious at birth; the foot is both turned and twisted inwards so that the sole faces posteromedially. The heel is usually small and high, and deep creases appear posteriorly and medially. Also, the calf muscles in child's affected leg are usually underdeveloped, and the affected foot may be up to 1 centimeter shorter than the other foot. Despite its look, however, clubfoot itself doesn't cause any discomfort or pain.

In a normal baby the foot can be dorsiflexed and everted until the toes almost touch the front of the leg. In clubfoot this maneuver meets with varying degrees of resistance and in severe cases the deformity is fixed.

The infant must always be examined for associated disorders such as congenital hip dislocation and spina bifida(don’t forget to asses C.A.V.E deformity and its pathoanatomy)

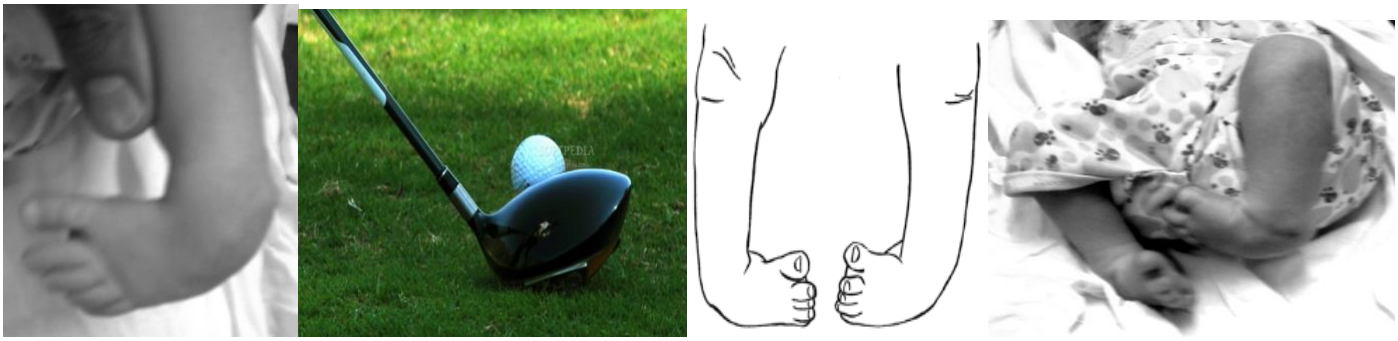


Figure 16- 7: clinical feature of clubfoot

X-rays:

The tarsal bones are incompletely ossified at this age and the anatomy is therefore difficult to define. However, the shape and position of the tarsal ossific centers are helpful in assessing progress after treatment..Ap/ lat view asses talocalcaneal and talometatarsal angle(turco and mearyes view)..

Treatment:

The aim of treatment is to produce and maintain a plantigrade, supple foot good function.

Nonoperative treatment:

Treatment should begin early, preferably within a day or two of birth. This consists of repeated manipulation and POP cast every 1wk, which will maintain the correction (Ponseti Method).

Operative treatment(posteromedial release)…

Resistant cases will need surgery. The objectives are:

1. The complete release of joint tethers (capsular and ligamentous contractures and fibrotic bands).
2. Lengthening of tendons.

After operative correction, the foot is immobilized in its corrected position in a plaster cast. K wires are sometimes inserted across the foot and ankle joints to augment the hold. The wires and cast are removed at 6 - 8 weeks, after which a customized orthosis are used to maintain correction (e.g. Dennis Browne shoes). Figure 16-8.**complication** include(recurence,relapse,over or undercorrection,talus necrosis,bad followup,low family education)

Figure 16-8: Dennis Browne shoes.

INFANTILE FLAT-FOOT (CONGENITAL VERTICAL TALUS)

This rare neonatal condition usually affects both feet. In appearance it is the *very* opposite of a clubfoot. The foot is turned outwards (valgus) and the medial arch is not only flat, it actually curves the opposite way from the normal, producing the appearance of a 'rocker-bottom' foot. Passive correction is impossible; by the time the child is seen, the tendons and ligaments on the dorsolateral side of the foot are usually shortened. Figure 16-9.

Figure 16-9: clinical feature of CVT

X-ray features: are characteristic the calcaneum is in equinus & the talus points into the sole of the foot, with the navicular dislocated dorsally onto the neck of talus. Figure 16-10

Figure 16-10: X-ray of CVT

Treatment: The only effective treatment is by operation, ideally before the age of 2 years.