

CTEV



PEDIATRIC PHYSICAL THERAPY

- **Congenital talipes equinovarus (CTEV)**, commonly known as **club foot**, is a common deformity in which the foot is pointing **downwards and inwards**

CLUB FOOT

Definitions

Talipes: Talus = ankle

Pes = foot

Equinus: (Latin = horse)

Foot that is in a position of
planter flexion at the ankle,
looks like that of the horse.

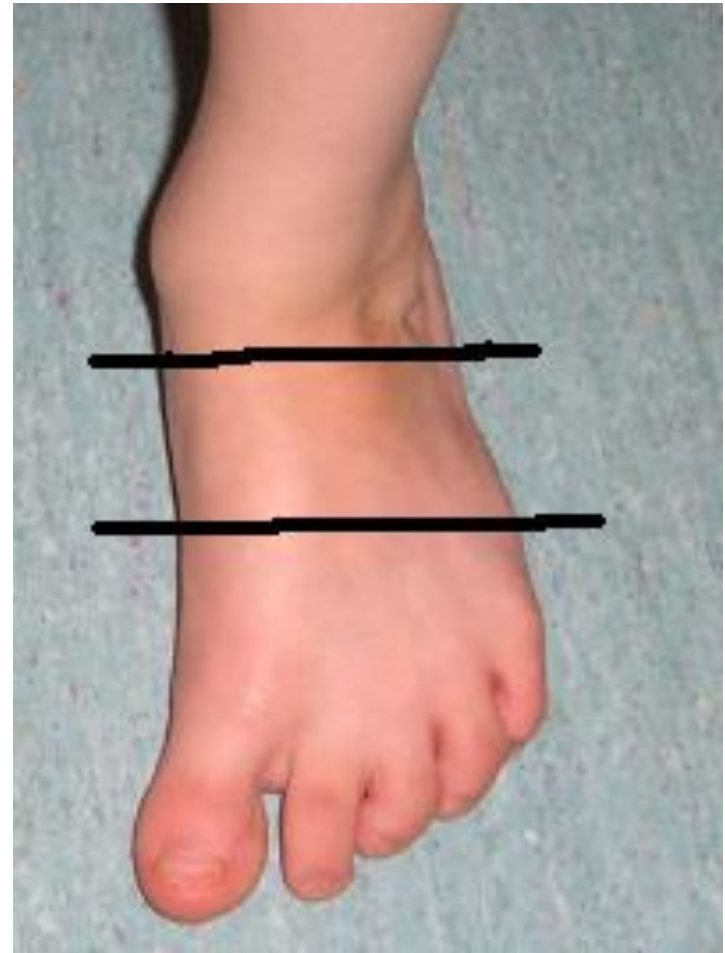
Calcaneus: **Full dorsiflexion** at the ankle

Talipes

- Club foot is sometimes known as **talipes**.
There are two types of talipes:
- congenital talipes **equinovarus** (club foot, foot is twisted inward and down)
- talipes **calcaneovalgus** – where the foot points upwards and outwards

Location of deformity

- **Forefoot**-phalanges and metatarsal
- **Midfoot**-cuboid navicular cuneiforms
- **Hindfoot**-talus calcaneus



Characteristic Deformity :

Hind foot

- Equinus (Ankle joint)
- Varus (Subtalar joint)

Fore foot

- Adduction (Med tarsal joint)
- Supination fore foot
- Cavus



**“ Hind foot “
Equinus, Varus**



**“ Fore foot “
Adduction, Supination, Cavus**

Equinus deformity



Supination & heel varus



Forefoot adduction





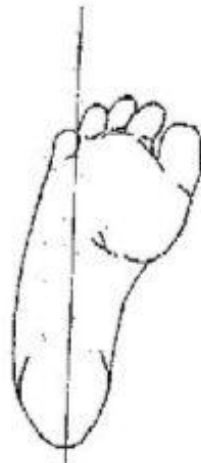
NORMAL



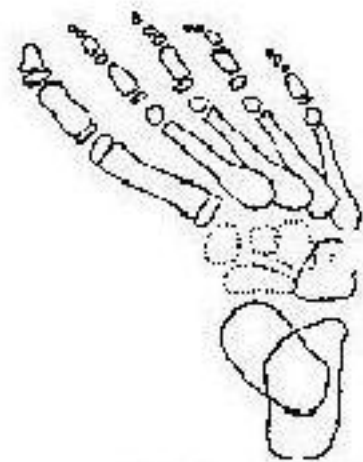
MILD



MODERATE



SEVERE



Metatarsus Adductus

- **Short Achilles tendon**
- **High and small heel**
- **Abnormal crease in middle of the foot**
- **Foot is smaller**
- **Callosities at abnormal pressure areas**
- **Internal torsion of the leg**
- **Calf muscles wasting**
- **Deformities don't prevent walking**

Pathological Anatomy

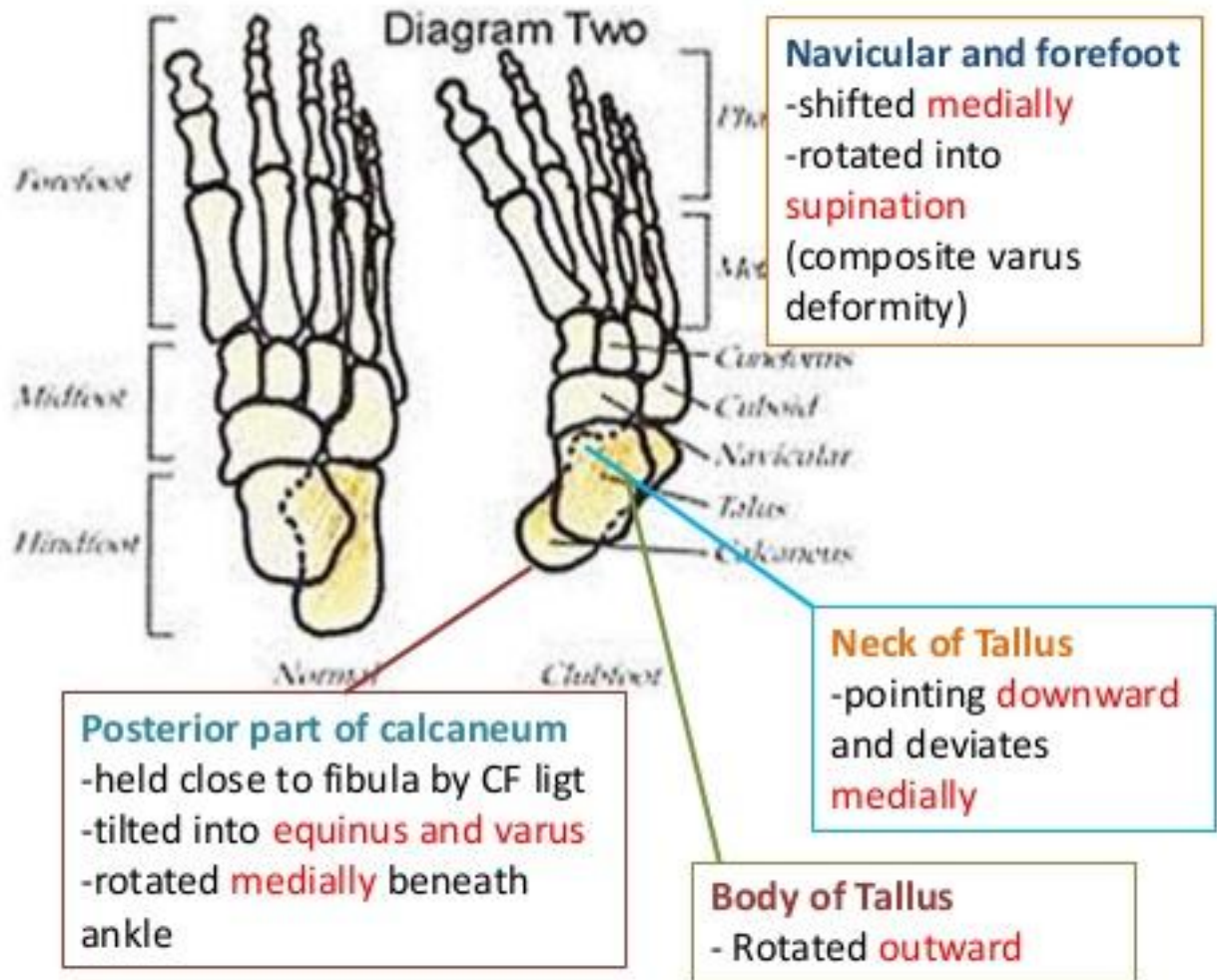


Diagram Three: Drawn from actual x-rays.



Normal angle of the calcaneus-to-talus axes upon dorsiflexion of a baby's normal foot.



Abnormal parallel calcaneus and talus axes upon dorsiflexion of the baby's clubfoot.



Normal

Clubfoot

CLUB FOOT

Planus: flatfoot

Cavus: highly arched foot

Varus: heel going towards the midline

Valgus: heel going away from the midline

Adduction: forefoot going towards the midline

Abduction: forefoot going away

From the midline



Talipes cavus



Talipes equinus



Talipes calcaneus



Talipes valgus



Talipes equinovalgus



Talipes calcaneovalgus



Talipes varus



Talipes equinovarus



Talipes calcaneocavus



Talipes cavovarus

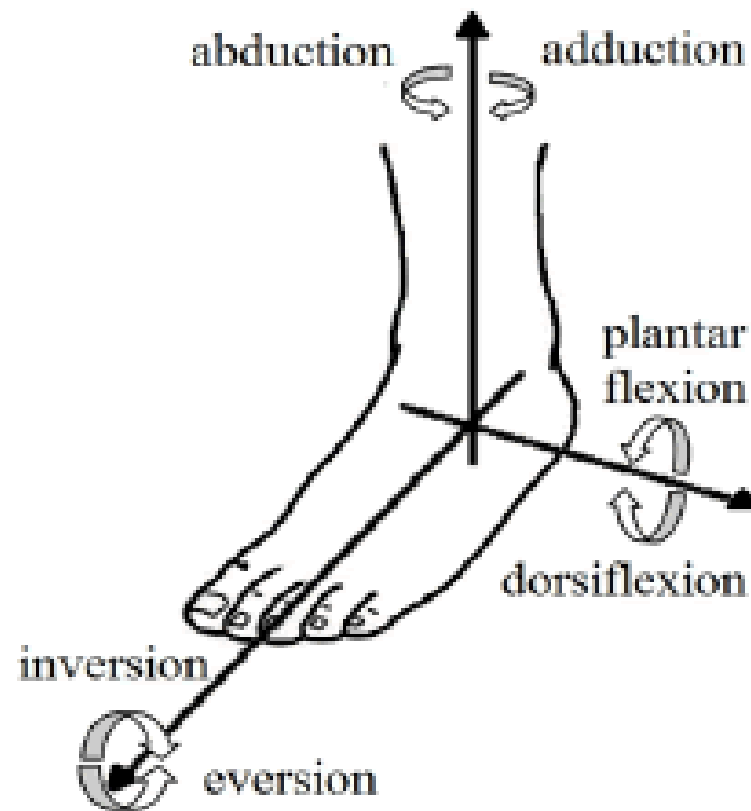


Figure 4. Basic ankle movements.

Types

- **Positional** – this is a normal foot, which was held in an **abnormal position in utero**. The bony anatomy of the foot is normal and the foot will usually correct spontaneously or with appropriate passive stretches carried out regularly by the carer
- **Teratogenic** – this is club foot associated with neurological conditions such as **spina bifida or sacral agenesis**
- **Syndromic** – syndromic club foot is associated with conditions such as arthrogryposis, and congenital myopathy
- **Congenital** – there is abnormal bony anatomy which is not associated with a neuromuscular cause or syndrome.

Aetiology

- The prevalence of CTEV is said to be **1–3 per 1000 live births**
- Club foot is **commoner in boys than girls**,
- Effects of intrauterine moulding and environmental factors such as **first pregnancy**, oligohydramnios and **twin pregnancy** may be contributory factors
- The high incidence of familial club foot suggests an **inherited abnormality**, which could be of neurological or vascular origin

- A number of studies have established that the foot in utero develops in an equinovarus position, moving into a calcaneovalgus position as the pregnancy progresses
- It has been postulated that an incident at around the **10–13-week gestational stage** prevents the foot position from progressing

- Impairment in **blood supply**
- neurological causes such as **spinal dysraphism** may explain the muscle imbalance, calf wasting and small foot and are now considered to be a major factor in the high recurrence rate of the deformity with growth in some cases

- **Differences in muscle fibre type** have been identified with a high proportion of type 1 fibres, increased fibrosis and reduced excursion in the lower-limb muscles of club foot, as well as changes in the structure of ligaments, particularly on the medial side of the foot compared to the norm

Pathology

Bony changes

- **fixed joint deformities** throughout the foot and ankle,
- many bones in the foot are of **abnormal shape and size.**
- Disturbances in the growth of the bones of the whole affected limb may become apparent later, resulting in a **limb-length discrepancy**, which is more common in girls with club foot than boys

Joint deformities

- In the ankle joint the head of the **talus points downwards and medially** and there may be anterior subluxation in severe deformities.
- Fixed deformity will also be present in the **talonavicular and calcaneocuboid joints** with possible subluxations
- **cavus deformity** at the tarsometatarsal joints caused by shortening of the plantar fascia and long and short plantar ligaments

Muscle changes

- calf muscle wasting
- The amount of wasting appears to be directly related to the severity and stiffness of the foot deformity.
- Muscle fibers size are decreased (peronei)
- There are more type 1 fibres and increased fibrosis in the muscles themselves, especially in the calf muscles and tibialis posterior, and less so in the long-toe flexors.

- Muscle imbalance is particularly noticed between the peronei, elongated and weaker because of the foot position, and tibialis anterior, which is tight and apparently stronger because of reduced excursion of the foot

Effects of growth

- The foot doubles in size in the first year of life. As the soft tissues must grow at the same rate, the underlying abnormal changes inherent in these structure, as well as disturbances in bony and cartilaginous growth, explain the recurrence of deformity at times of rapid growth.



A 6-year-old boy with untreated bilateral club feet, surprisingly able to walk, run and play football.

MANAGEMENT OF CTEV

AIM

- **The aim** of club foot management should be to **correct the foot position carefully**, without injuring the soft **cartilaginous structures** of the foot, and retain mobility.
- The foot should be **plantargrade**, have a normal **load-bearing** area and fit into normal shoes.

INITIAL TREATMENT

Initial treatment for club foot should be some form of **serial splintage**

Ponseti method

- serial **full-leg plaster casts**,
- early **Achilles tendon tenotomy**
- and the use of **boots and bar** to maintain the corrected position
- Feet treated with this regime **have improved long-term outcomes** compared to feet treated by more traditional means

ASSESSMENT TOOLS

- **Pirani scale**
- The Pirani scale records the salient features of the deformity as follows:

Hindfoot deformity

- The rigidity of the **equinus deformity**
- The depth of the **posterior crease**
- The ability to **palpate the calcaneus** at the posterior aspect of the heel.

Midfoot deformity

- The depth of the **medial crease**
- The position of **the head of the talus**
- The curvature of the **lateral border** of the foot

SCORING

These six items are each scored **from 1 (most severe) through 0.5 to zero** for full correction of each item.

A score of 6 denotes a foot with severe deformity.

METHOD

- Careful full-leg plasters are applied immediately afterwards with the foot in **dorsiflexion of 20° and everted to at least 50°**
- Approximately **3 weeks** later the plaster is removed and boots attached to a bar, keeping the feet in **70° eversion and 20° dorsiflexion**, are applied
- Ponseti recommends that these are worn full-time for the **first 3 months**, apart from when bathing, and then at nighttime until the **child is 4 years of age**

FOLLOW UP

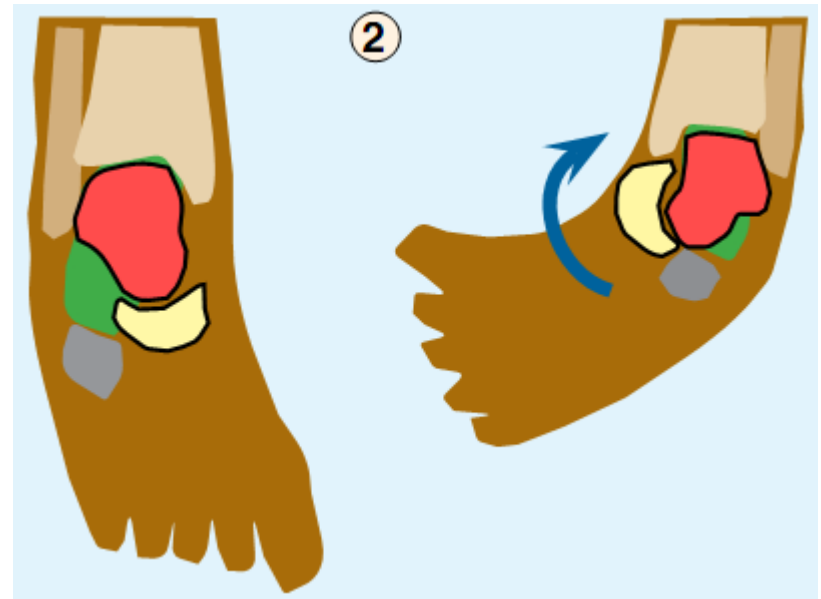
- Further **serial casting or soft-tissue surgery** may be needed and **therapy** input following procedures will be to reduce **joint stiffness, reeducate gait patterns and, in the case of muscle transfer, encourage and strengthen the muscle in its new action**
- Children with stiffness at the ankle and subtalar joint often complain of problems with balance and still find standing difficult.

SURGERY

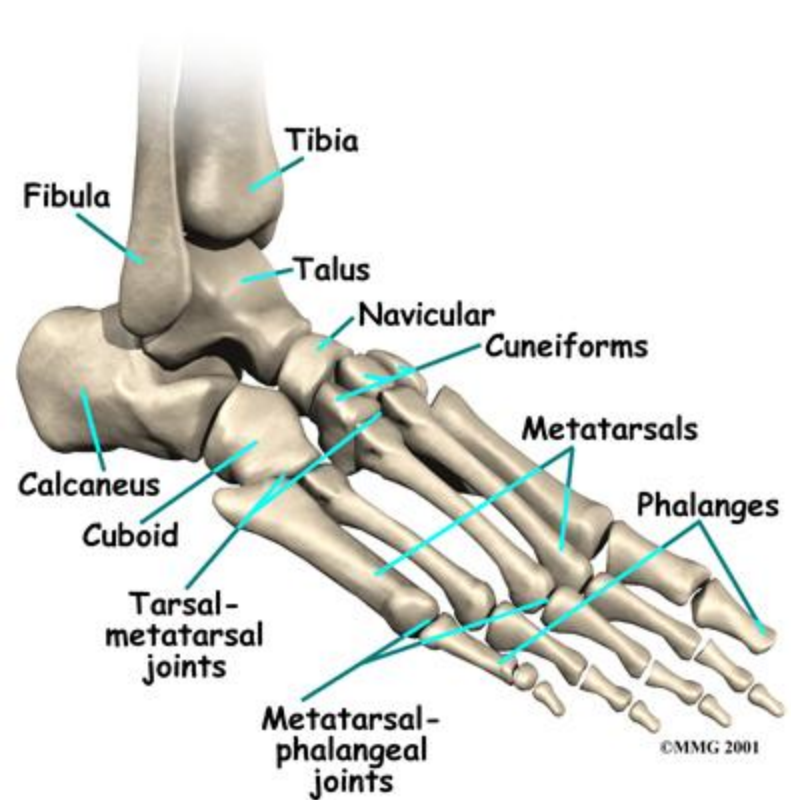
- Severe recurrent deformities, as the child gets older, will need **corrective bony surgery**, either carried out conventionally or with the use of **external fixators such as the Ilizarov frame**.
Physiotherapy input will again be needed

Deformities of tarsus bones

- The **talus** is in severe plantar flexion, its neck is medially and plantarly deflected, and its head is wedge-shaped.
- The **navicular** is severely medially displaced, close to the medial malleolus, and articulates with the medial surface of the head of the talus
- The **calcaneus** is adducted and inverted under the talus.



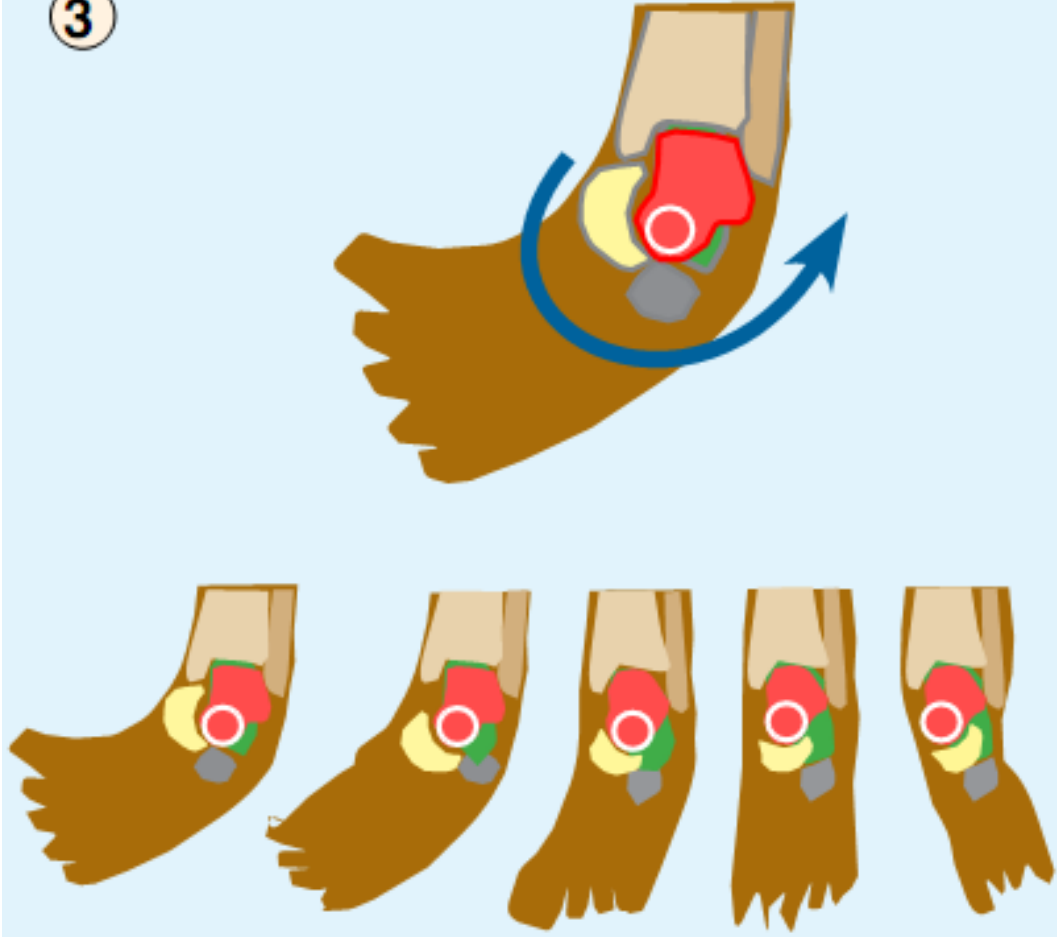
- The **cuneiforms** are seen to the right of the navicular, and the cuboid is underneath it. The **calcaneocuboid joint is directed posteromedially**. The anterior two-thirds of the calcaneus is seen underneath the talus. The tendons of the tibialis anterior, extensor hallucis longus, and extensor digitorum longus are medially displaced

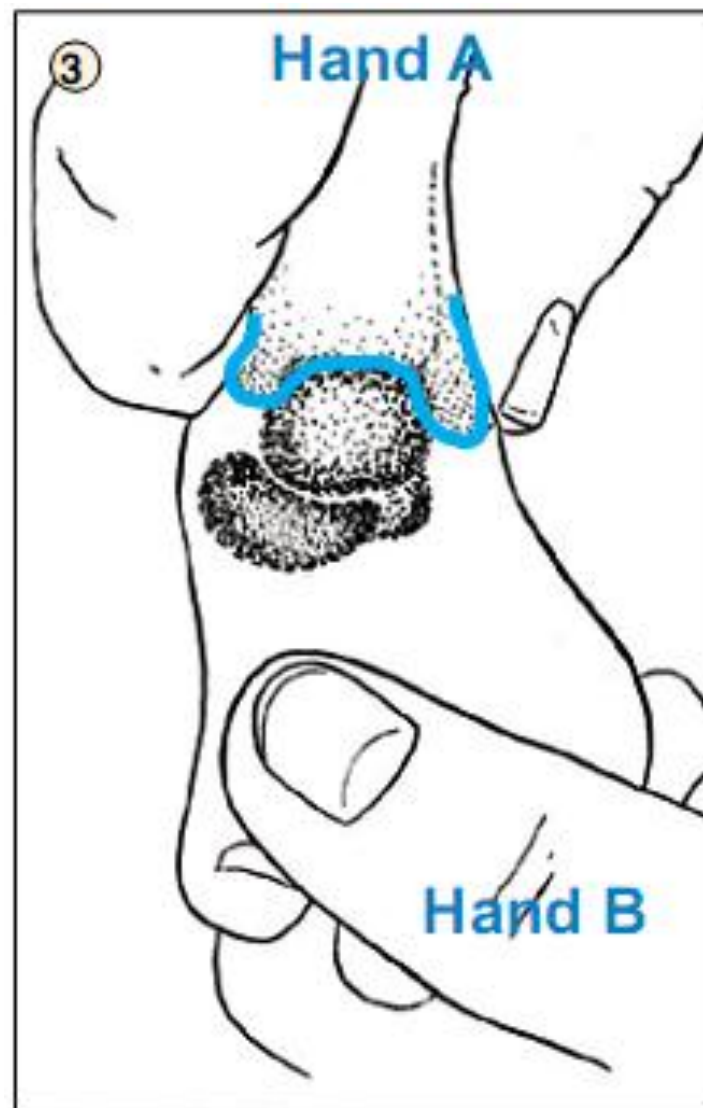


procedures

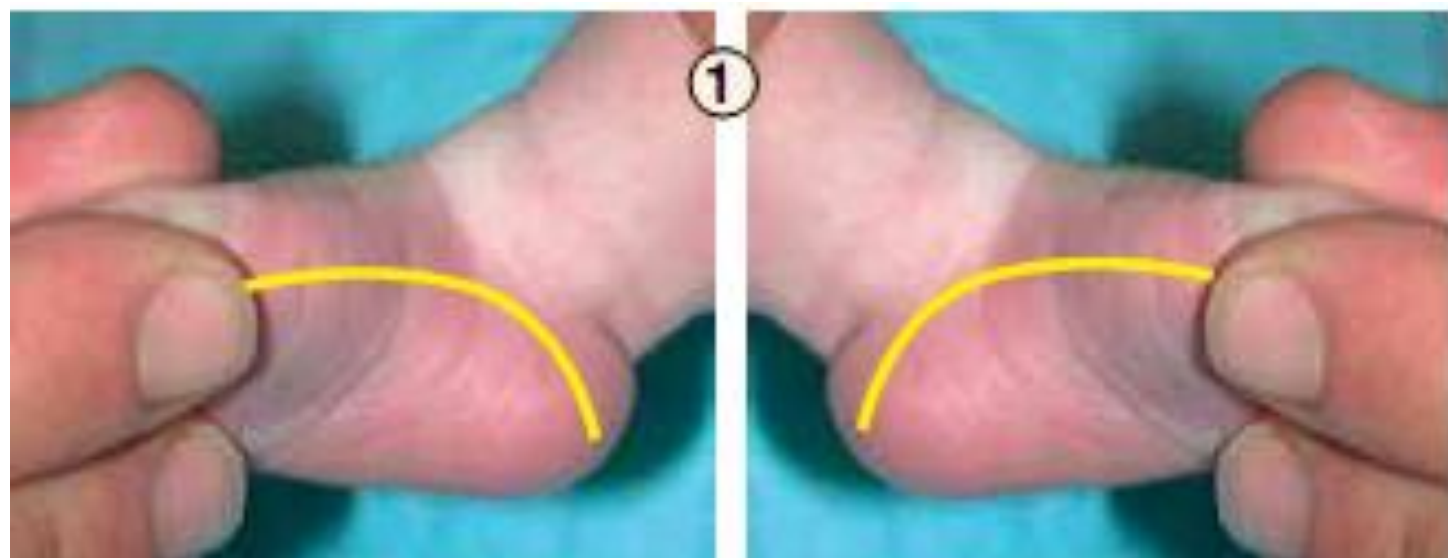
- Correction of clubfoot is accomplished by abducting **the foot in supination** while counterpressure is applied over the lateral aspect of the head of the talus to prevent rotation of the talus in the ankle
- A well-molded plaster cast maintains the foot in an improved position. The ligaments should never be stretched beyond their natural amount of give. **After 5 days**, the ligaments can be stretched again to further improve the degree of correction of the deformity.

3













3











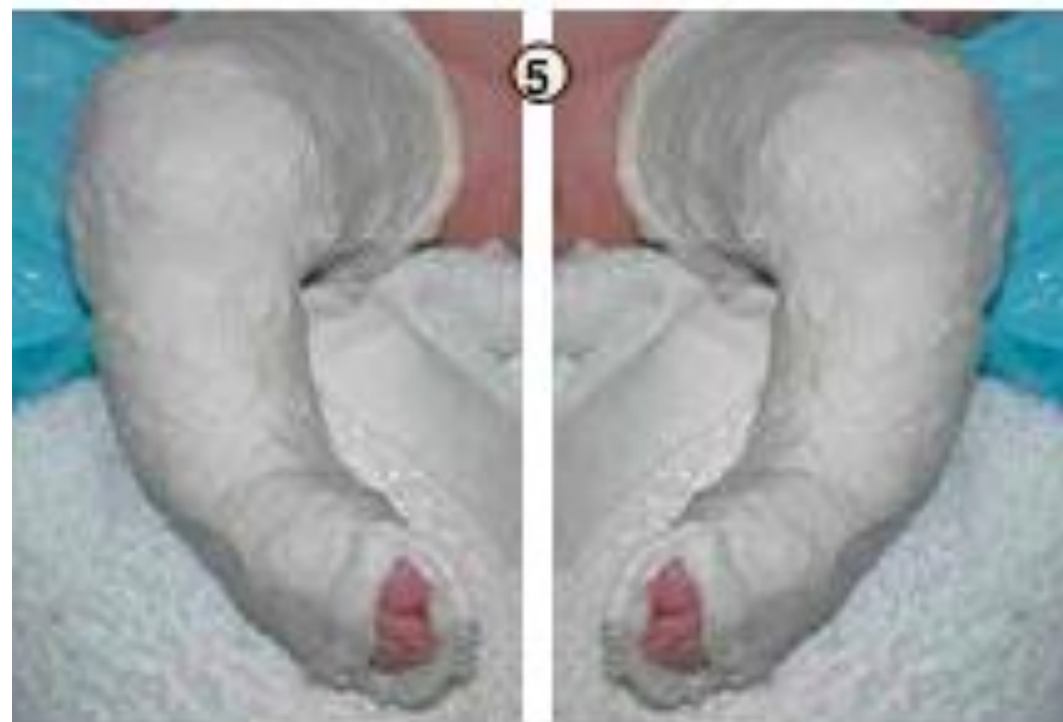
Molding the cast











Cast removal



Complications

- **Rocker-bottom:** deformity is due to poor technique by dorsiflexing the foot too early against a very tight Achilles tendon.
- **Crowded toes:** are due to tight casting over the toes.
- **Flat heel pad:** will occur if, while casting, pressure is applied to the heel rather than molding the cast above the ankle.
- **Superficial sores:** are managed by applying a dressing and a new cast with additional padding.
- **Pressure sores:** are due to poor technique. Common sites include the head of the talus, over the heel, under the first metatarsal head, and popliteal and groin regions.
- **Deep sores:** are dressed and left out of the cast for one week to allow healing. Casting is then resumed with special care to avoid relapse.

Common errors

- **Pronation or eversion of the foot**
- This position worsens the deformity by increasing the cavus. Pronation does nothing to abduct the adducted and inverted calcaneus, which remains locked under the talus. It also creates a new deformity of eversion through the mid and forefoot, leading to a beanshaped foot.





- QUESTIONS ARE WELCOME

THANK
YOU!