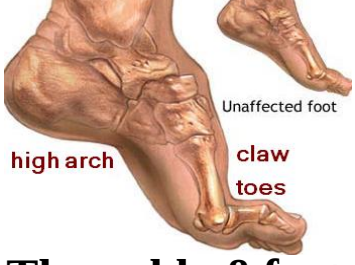
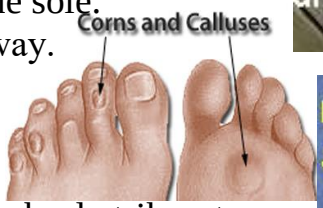
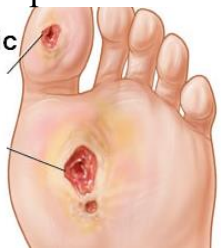


The ankle &foot

Clinical assessment

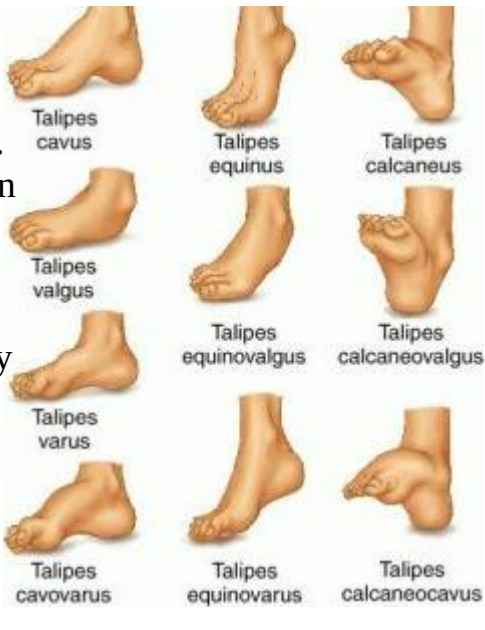
Symptoms: ***pain***→ localized or diffuse like metatarsalgia.
deformity→ in the ankle, foot or toes.
swelling→ localized or diffuse(unilat.→surgical or bilat.→medical).
Corns: keratosis on the dorsum &***callosities*** on the sole.
Instability of ankle→ causes episodes of giving way.
numbness→ either diffuse(DM) or localized(nerve root or peripheral nerve).
Signs: ***standing***→ front &back, tiptoes &heels.
Gait→ examine the components of walking cycle: heel-strike, stance, push-off &swing-through, that can be disturbed by pain, stiffness, deformity or muscle weakness like foot-drop or high –stepping gait.
Sitting or lying→ **look** for deformity &ulcers(ischemic or neuropathic).
Feel the skin temperature &pulses, tenderness, swelling &lumps.
Move: examine the movements of ankle, subtalar, midtarsal joints &toes.
Ankle instability: medial &lateral stress tests and anterior &posterior drawer tests.
Muscle power, shoes &general examination.
Imaging: ankle→ AP, lat. &mortise views. subtalar→ lat. view. calcaneum→ lat. &axial views. Foot &toes→ AP &lat. views.
Stress view for ankle stability.
CT→ for fracture &bony coalition.
MRI→ for tendons &ligament injury and soft tissue problems.



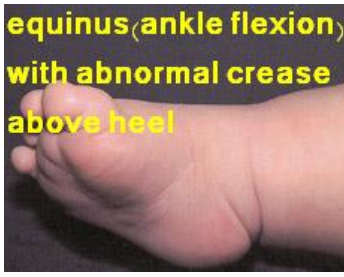


Congenital deformities: Talipes equinovarus :

(idiopathic club-foot**):** tali = talus (ankle) & pes = foot.
Incidence: 1/1000. ♂: ♀ ratio 2:1. Bilat. in 1/3 of cases.
Etiology: one or more of the following may have a role: 1-genetic defect; 2-NM disorder; 3-malposition in uterus.
The same(or even more severe) deformity may be seen in myelomeningocele &arthrogryposis.
Pathology: Calcaneum is small, inverted &in equinus. Talus neck is deviated medially while the body is rotated laterally. Navicular &forefoot are shifted medially &supinated.

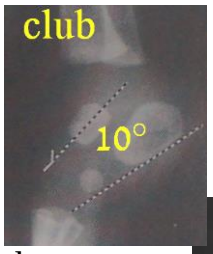


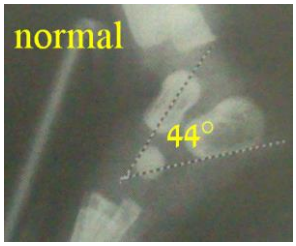
The skin &soft tissues of the calf &medial side of the foot are short &underdeveloped. If the deformity is not corrected early, secondary permanent bony deformity may occur. Even with Ṛ, foot may remain short &calf thin.



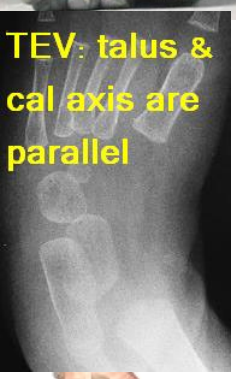
CF: the deformity is seen at birth(foot is turned &twisted inward) with equinus ankle, adducted &supinated forefoot, thin calf, small, high inverted heel with deep crease posteromedially.

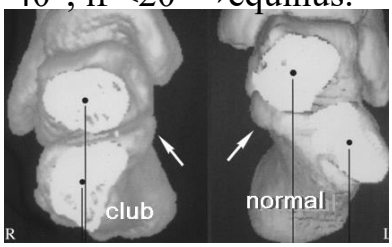
O/E: the deformity is fixed &cant be corrected passively, while in a normal baby(&those with ***postural*** club foot), the foot can be dorsiflexed &everted so the toes can touch the shin. The infant should be examined for DDH, spina bifida &arthrogryposis(absence of skin creases).



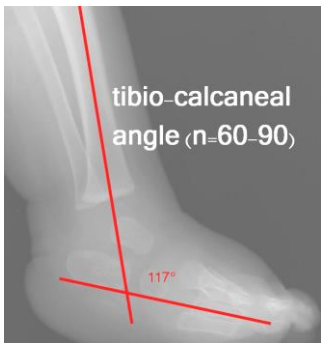


X-ray: to assess progress after Ṛ.
AP view: draw 2 lines, one through calcaneum &other through talus, they will form an angle(**kite's T-C angle)** between 20-40° normally but in club foot they are almost parallel.
Lateral view: **kite's** angle is normally 20-40°; if <20°→equinus.





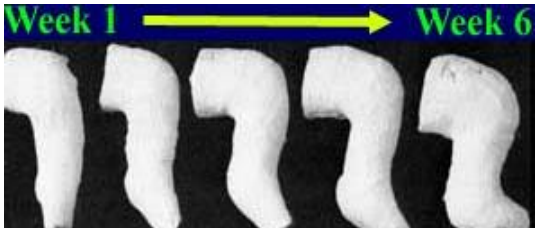
Differential diagnosis: look for the following possibilities:
1-***Spina bifida***: there is sensory &motor loss, so avoid pressure on the skin to prevent pressure sore.

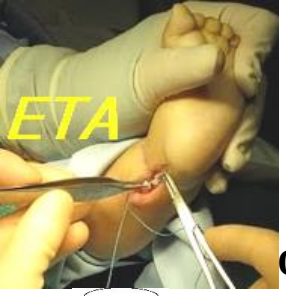


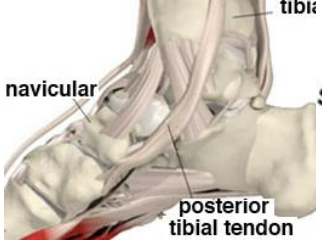
2-***Arthrogryposis***: congenital disorder in which there is failure of soft tissue &muscle differentiation leading to soft tissue contracture &limitation of joint movement with absence of skin creases.
3-***Poliomyelitis***: there is flaccid muscle paralysis with cold, blue limb due to poor circulation but sensation is normal. The limb is smaller than normal.
Treatment: the aim is: 1-early full correction of the deformity &2-hold the correction until the foot stop growing.

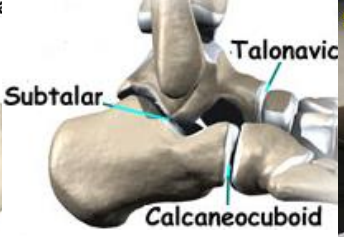
Club-feet are divided into: ***easy*** clubfoot which respond to conservative Ṛ & ***resistant***(need surgical correction) clubfoot characterized by: 1-small high heel; 2-thin calf & 3-severe forefoot adduction.

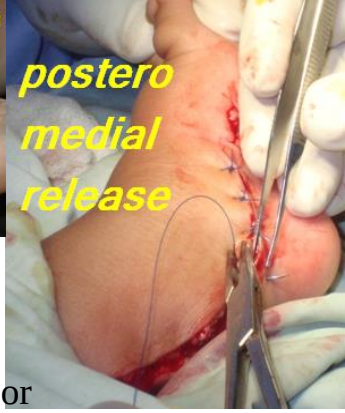
Conservative Ṛ(Ponseti serial casting):
Start on the 2nd or 3rd day after birth by stretching the foot to normal or near normal position &holding it by adhesive strapping or light cast. First, correct adduction, inversion &lastly equinus deformity. Repeat this process every week for 6-8wks until the foot is overcorrected then apply plastic splint until the child start walking.





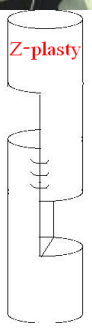




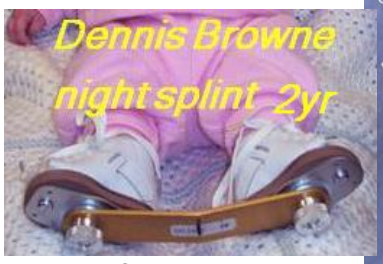


Operative Ṛ: best done at 2-6 mths. The idea is: 1-release joint tethers (capsule, lig. &fibrotic bands); 2-tendon lengthening.

Posteromedial release operation: for hindfoot **equinus**→ elongate tendo Achillis by Z-plasty; if still there is equinus→ divide posterior capsule of ankle &subtalar joints. The superficial deltoid &calcaneofibular lig. may need release. Sometimes, FDL &FHL need elongation.

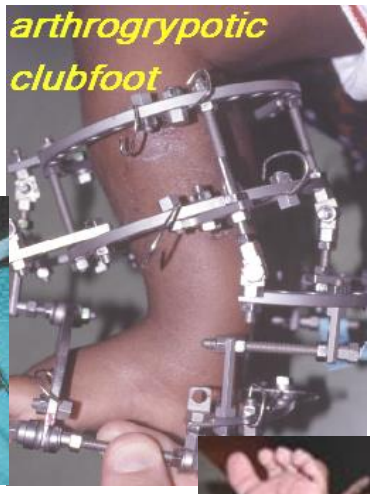


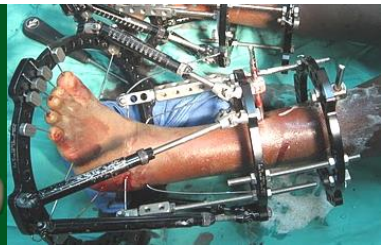
For forefoot **varus**→ elongate tibialis posterior tendon, divide talonavicular capsule. K-wires may help holding corrected position. Postoperative: cast for 2months, then splint(Dennis Browne or ankle-foot orthosis).



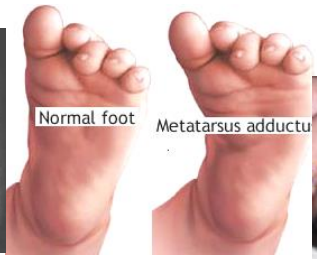
Relapsed clubfoot:

If the postoperative casting or splinting is poor, the deformity may recur; *For **<5yr** child, Ṛ→ the same soft tissue release. *For children > **5yr**→ soft tissue release + bony correction: 1-resect a small wedge of bone between calcaneum &cuboid (Evans operation). 2-calcaneal osteotomy to correct varus heel. *For those aged **>10yr**→ corrective osteotomy &fusion. *Gradual distraction by **Ilizarov** circular external fixator is used for difficult relapsed cases.

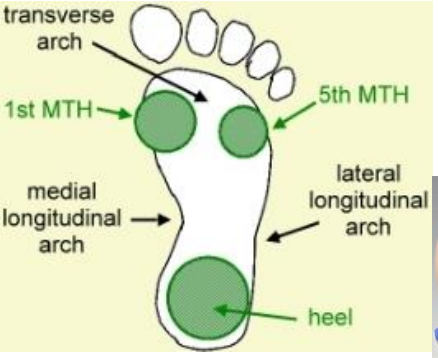




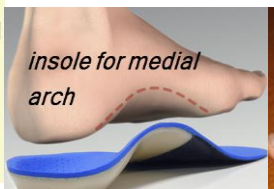
Metatarsus adductus: 90% will resolve spontaneously; the others may need serial casting, splint or surgery.

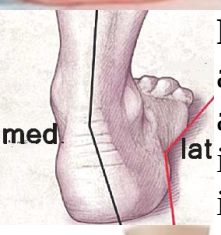


Talipes calcaneovalgus: presents as flexible foot dorsiflexion; may be associated with DDH; it often corrects spontaneously.

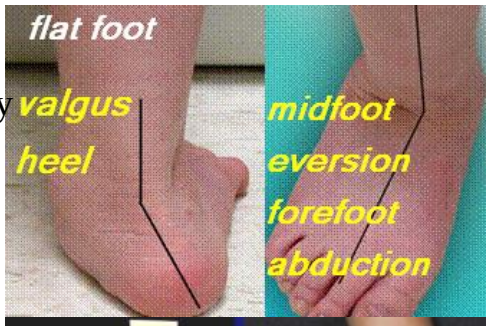


Arches of the foot: are 3:
1-medial arch: calcaneum, talus, navicular &medial cuneiform.
2-lateral arch: calcaneum, cuboid &lateral cuneiform.
3-anetrior arch: heads of metatarsals.



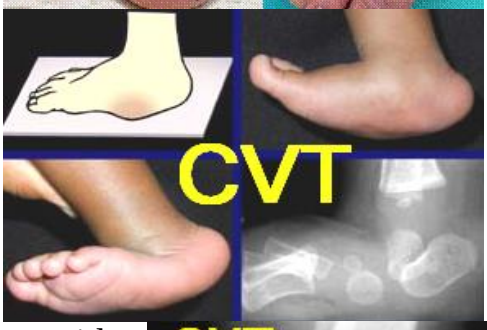


Flat foot(pes planus or pes valgus): in a normal foot the medial arch may be high or low but in flat foot, the apex of the medial arch is collapsed &medial border of the foot is (or nearly) in contact with the ground &the heel is in valgus &the foot is pronated at subtalar &midtarsal joints. Flat foot is usually asymptomatic but may cause chronic ache or foot sprain.



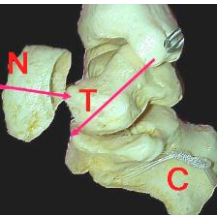
Etiology: one or more may be the cause:
1-development disorder; 2-ligament laxity;
3-loss of muscle power; &4-abnormal load distribution.

Pathological varieties: 1-congenital flat foot;
2-physiological FF; 3-joint hypermobility; 4-weak FF;
5-compensatory FF; &6-spasmodic FF.

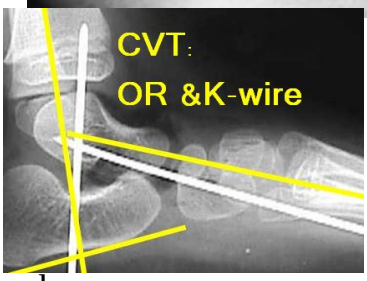


Congenital flat foot(congenital vertical talus): is rare & usually bilateral. The talus is vertical &pointing toward the sole with talo-navicular ≠. The foot is stiff &flat with boat-shape appearance(rocker-bottom). The hind-foot is in equinus with ligament &tendon shortening on dorsolateral surface.

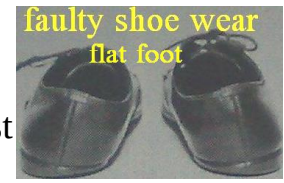
X-ray→ equinus calcaneum, vertical talus with dorsal navicular ≠.
Repeat x-ray with plantar flexion→ the talus will be unchanged while in flexible flat foot, the navicular return to normal position.

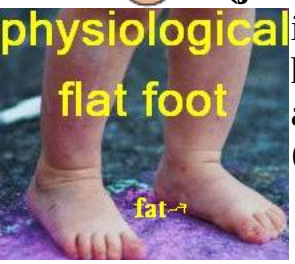


Ṛ→ conservative Ṛ by manipulation &casting usually will fail, so operation is more effective:
OR + soft tissue release→ 1-ETA + ankle & subtalar capsulotomy to correct equinus;
2-open reduction of talonavicular ≠ + transfer of tibialis anterior tendon to the neck of talus;
3-anteroateral release ± lengthening.

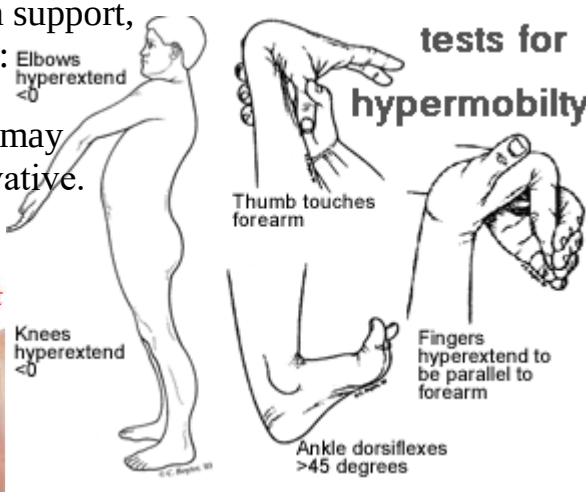


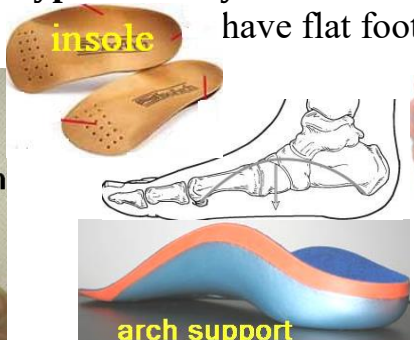
Flexible flat-foot: is quite normal below 6yr, after that the medial arch start to develop. Some have lig. laxity, overweight or family history of flat feet. **O/E:** the medial arch can be restored by great toe extension **(jack test)** or standing on tiptoe(**tiptoe test)**. Occasionally, it may persist into adult life which is often asymptomatic needs no Ṛ. Some may have pain after long standing or walking→ arch support, adapting shoes &muscle strengthening exercise: **(walking on: toe, heel, side foot &curved foot).**

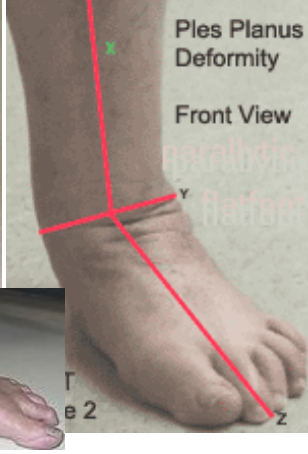




Joint hypermobility: like Marfan's syndrome may have flat foot; Ṛ→ conservative.







Weak flat foot: due to weak muscles as paralytic disorders; rupture of tibialis posterior tendon or synovitis(e.g. RA); or old age with obesity; Ṛ→ conservative(rarely operative).

Spasmodic flat foot: the foot is often stiff &flat.

Causes: some cases are idiopathic, others are caused by abnormality of subtalar joint like: tarsal coalition (bony bar between talus &calcaneum), subtalar injury(# &post-traumatic OA), inflammatory arthritis, gout or low grade infection.

CF: young adult have painful &stiff flat-foot; sometimes with spasm of extensor &peroneal muscles.

O/E: subtalar joint mvt(inversion/eversion) are painful &limited.

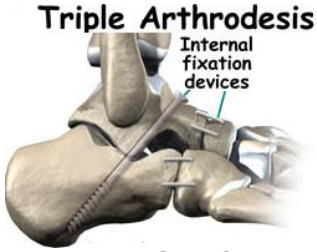
X-ray: look for a visible pathology e.g. OA, arthritis or tarsal coalition which appears as a bony bar(oblique view is better), though it may be cartilaginous or fibrous need **CT** or **isotope scan** for diagnosis.

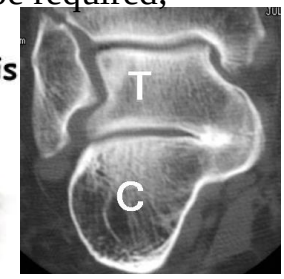
Ṛ→ some respond to NSAID, 6wks walking cast→ brace.

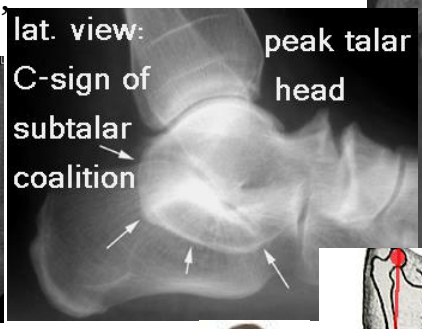
for tarsal coalition→ operative removal of bar;

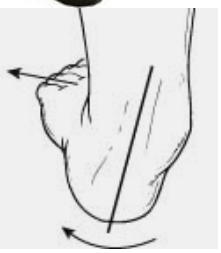
for OA→ arthrodesis may be required;

if suspect infection→ AB.









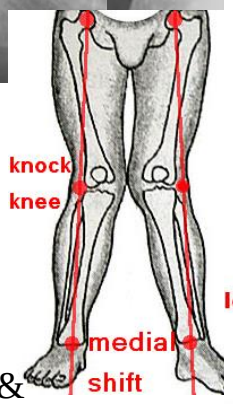
Compensatory flat foot: due to other deformity:

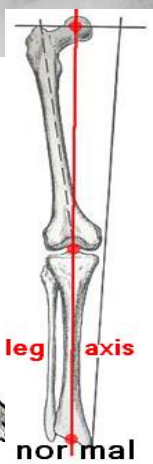
1-fixed ankle equinus or forefoot varus;

2-knock-knee: shifts body wt. medially→ arch collapse;

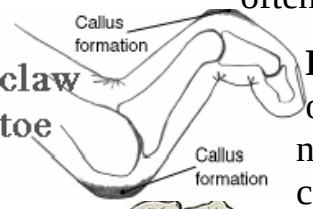
3-external limb rotation→ = = → arch collapse.

Ṛ→ correction of the anatomical defect.

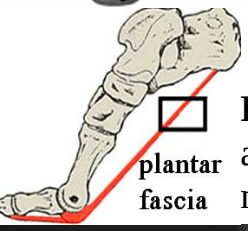




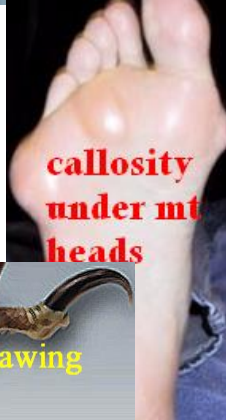
Pes cavus(high-arched feet): medial arch is higher than normal & often there is clawing of the toes(hyperextension of MPJ &flexion of IPJ).



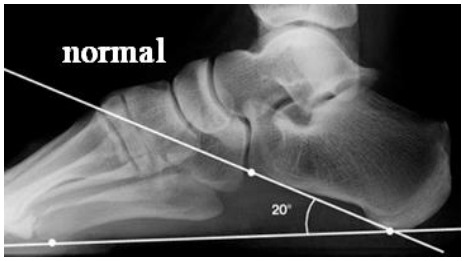
Etiology: most cases are due to intrinsic muscle weakness or paralysis from neuromuscular disorders like hereditary neuropathy, spina bifida, poliomyelitis; or post-traumatic compartment syndrome leading to Volkmann's contracture of the sole.

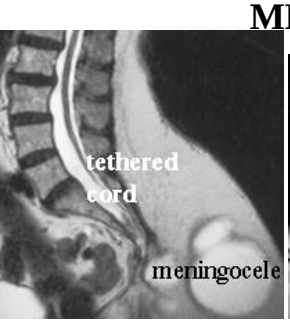


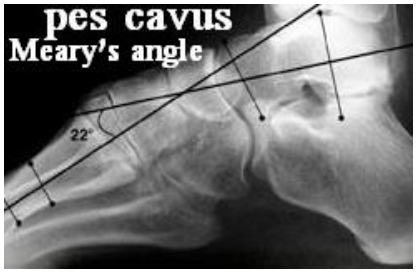
Pathology: 1-high medial arch; 2-claw toes; 3-metatarsal heads are pushed down into the sole; 4-callosities under metatarsal heads; 5-inverted heel; & 6-tight plantar fascia.

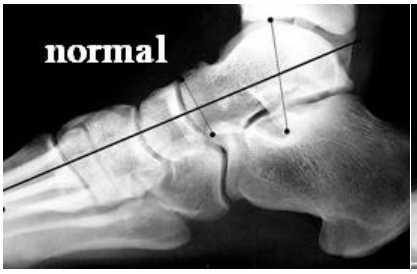


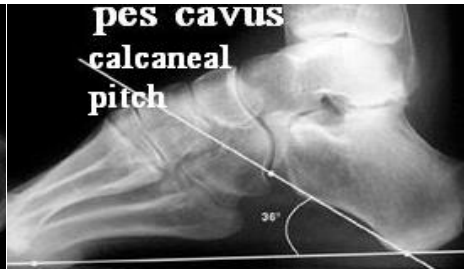
CF: a 10 yr old boy presents with bilateral deformity with pain &callosities under metatarsal heads &over IPJ of the toes. **O/E:** the deformity is clear; early, it can be corrected passively, but later it become fixed.
X-ray: weight-bearing lateral view to measure: calcaneal pitch(n=0-30°), if >30°= calcaneus deformity, & Meary's angle(n=0°), if >0°= plantaris deformity.
MRI: to exclude spine disorders(tethered cord).











R: conservative→ custom-made shoes.
Operative**(**soft tissue release, osteotomy, tendon transfer**):**
For varus heel, if mobile→ plantar fascia release;
if fixed→ calcaneal osteotomy.
For mid-foot cavus, if mobile→ Jones tendon transfer + transfer of peroneus longus to brevis;
if fixed→ corrective metatarsal osteotomy.
Severe cases→ triple arthrodesis.
Big toe clawing→ Jones tendon transfer +arthrodesis of IPJ.
Lesser toes→ flexor tendon transfer to the extensor hood;
if fixed clawing→ IPJ arthrodesis.
Jones operation: transfer the tendon of extensor hallucis longus to the neck of the 1st metatarsal to lift it up.