Feet deformity illustrations

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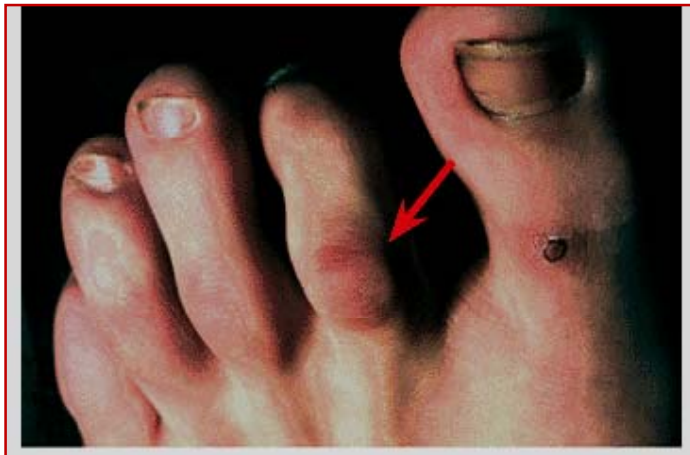
Site	Motion	Deformity
Ankle joint	Flexion Extension	Equinus Calcaneus
Subtalar joint	Inversion Eversion	Heel varus Heel valgus
Midtarsal joint	Adduction Abduction Flexion Extension Pronation Supination	Adductus Abductus Cavus deformity Rocker-bottom Pronation deformity Supination deformity
Great toe	Abduction Adduction Flexion Extension	Hallux varus Hallux valgus Flexion deformity Extension deformity
Toes	Flexion Extension	Flexion deformity Extension deformity

Nomenclature for normal joint motion and deformity

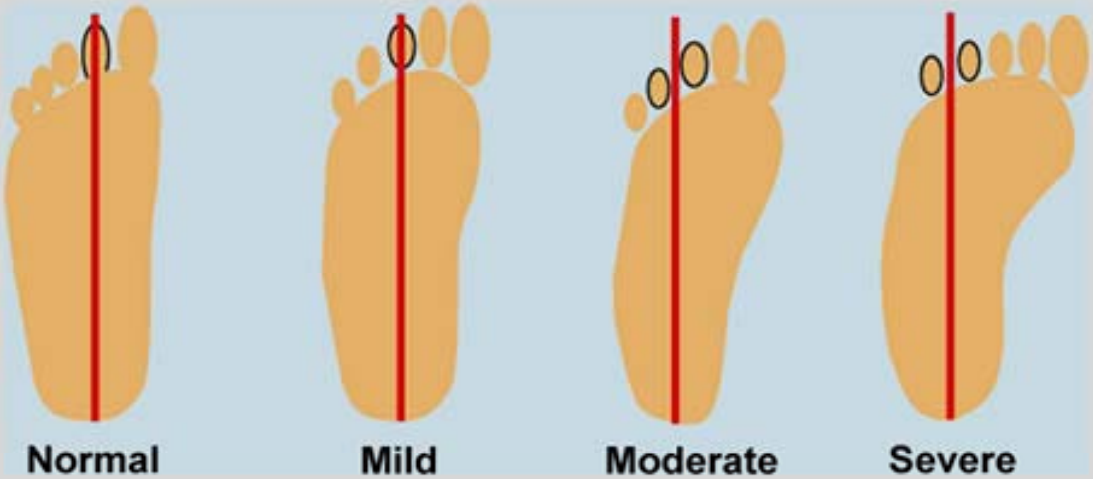
A Curly toes This deformity may involve one or more toes and usually resolves spontaneously.



B Hammer toe The fixed flexion deformity of the PIP joint toe causes a callus (arrow) to form over the toe.

C Overlapping toe This overlapping fifth toe persisted and

A Metatarsus adductus A convexity of the lateral border of the foot (red line) is the most consistent feature of this deformity.



A Grading severity of forefoot adductus Project a line that bisects the heel. Normally it falls on the 2nd toe. The projected line falls through toe 3 in mild, between toes 3–4 in moderate, and between toes 4–5 in severe deformity. From Bleck (1983).

	Adductus	Varus
0 – 6 Months	Observation	Observation
6 – 24 Months	Observation	Cast treatment
24+ Months	Observation as necessary	May try casting

B Great toe abduction This is a dynamic deformity that resolves with time.

A Vertical talus Note the convexity to the sole of the foot (red arrow) and the near vertical orientation of the talus on the radiograph (white line) and the plantarflexion of the calcaneus (yellow line).

VERTICAL TALUS

A Typical appearance of bilateral clubfeet The deformity includes equinus, cavus, adductus, varus, and internal rotation.

CTEV

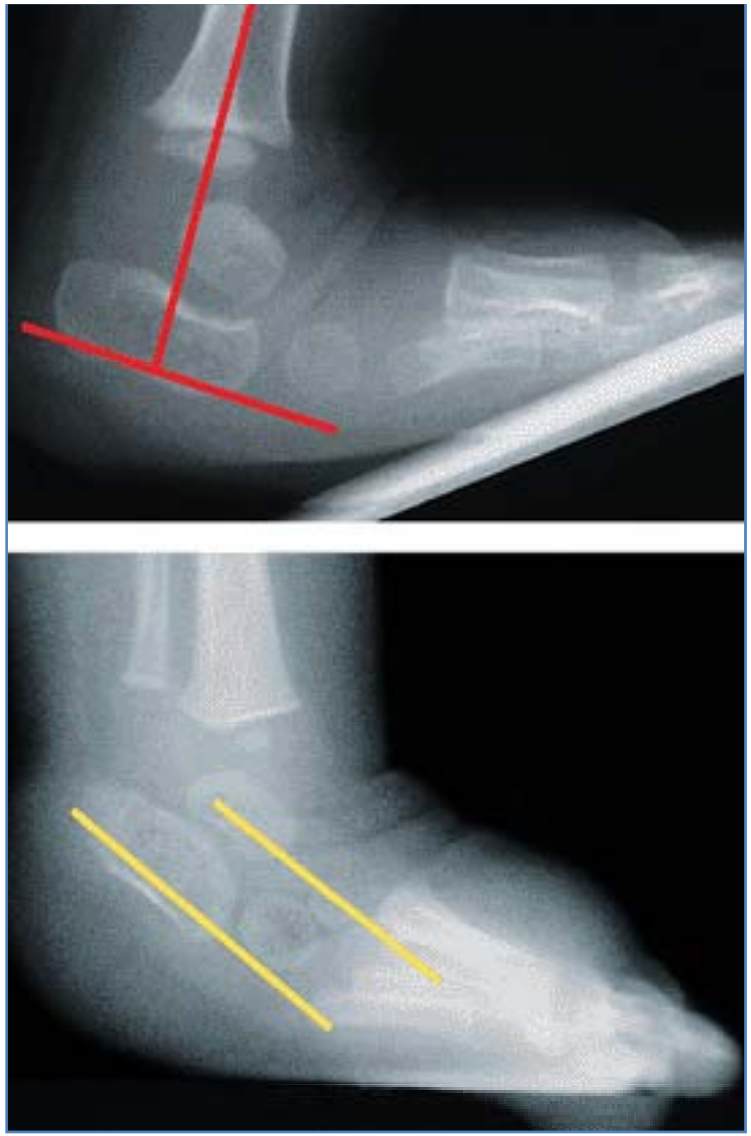
Severe clubfoot Note the prominent medial crease (arrow).

CTEV


Neglected CTEV

Neglected CTEV

D Reduction in leg size (Left) This girl with bilateral clubfeet has bilateral calf hypoplasia. (Below) The left clubfoot is more severe (red arrow) and is significantly shorter than the right foot with mild deformity. The degree of hypoplasia parallels the severity of the clubfoot deformity.



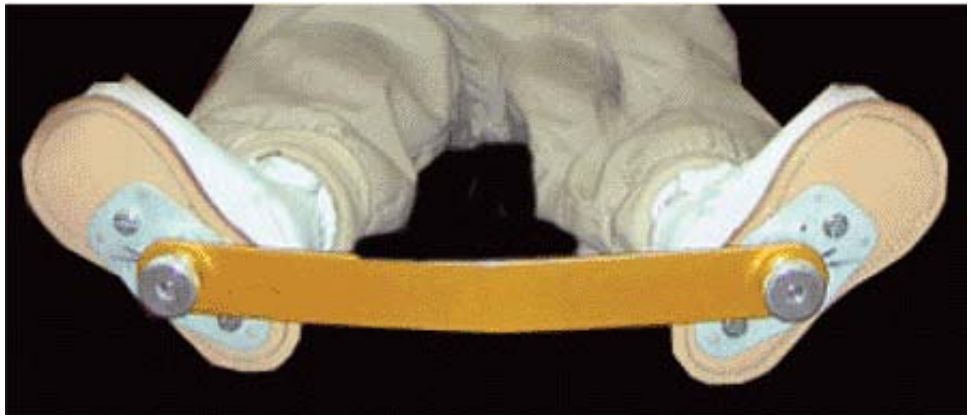
C Radiographic evaluation of clubfoot On a maximum dorsiflexion radiograph, measure the tibial calcaneal angle (red lines). On resting or standing radiographs, note the parallelism between the axes of the talus and calcaneus (yellow lines).

BOX 26-2 • Normal Range of Roentgenographic Angles for Comparison to Clubfoot

Talocalcaneal angle
- Anteroposterior view: 30 to 55 degrees
- Dorsiflexion lateral view: 25 to 50 degrees

Tibiocalcaneal angle
- Stress lateral view: 10 to 40 degrees

Talus–first metatarsal angle
- Anteroposterior view: 5 to 15 degrees



Dennis Browne boot for post correction of CTEV

Toe walker

A Idiopathic toe walking These girls have contractures of the gastrocnemius, causing an equinus gait.

Category	Diagnosis
Congenital	Clubfoot
Idiopathic	Gastrocnemius contracture Accessory soleus muscle Generalized triceps contracture
Neurologic	Cerebral palsy Poliomyelitis
Myogenic	Muscular dystrophy
Functional	Habitual toe walking
Vestibular dysfunction?	Autism

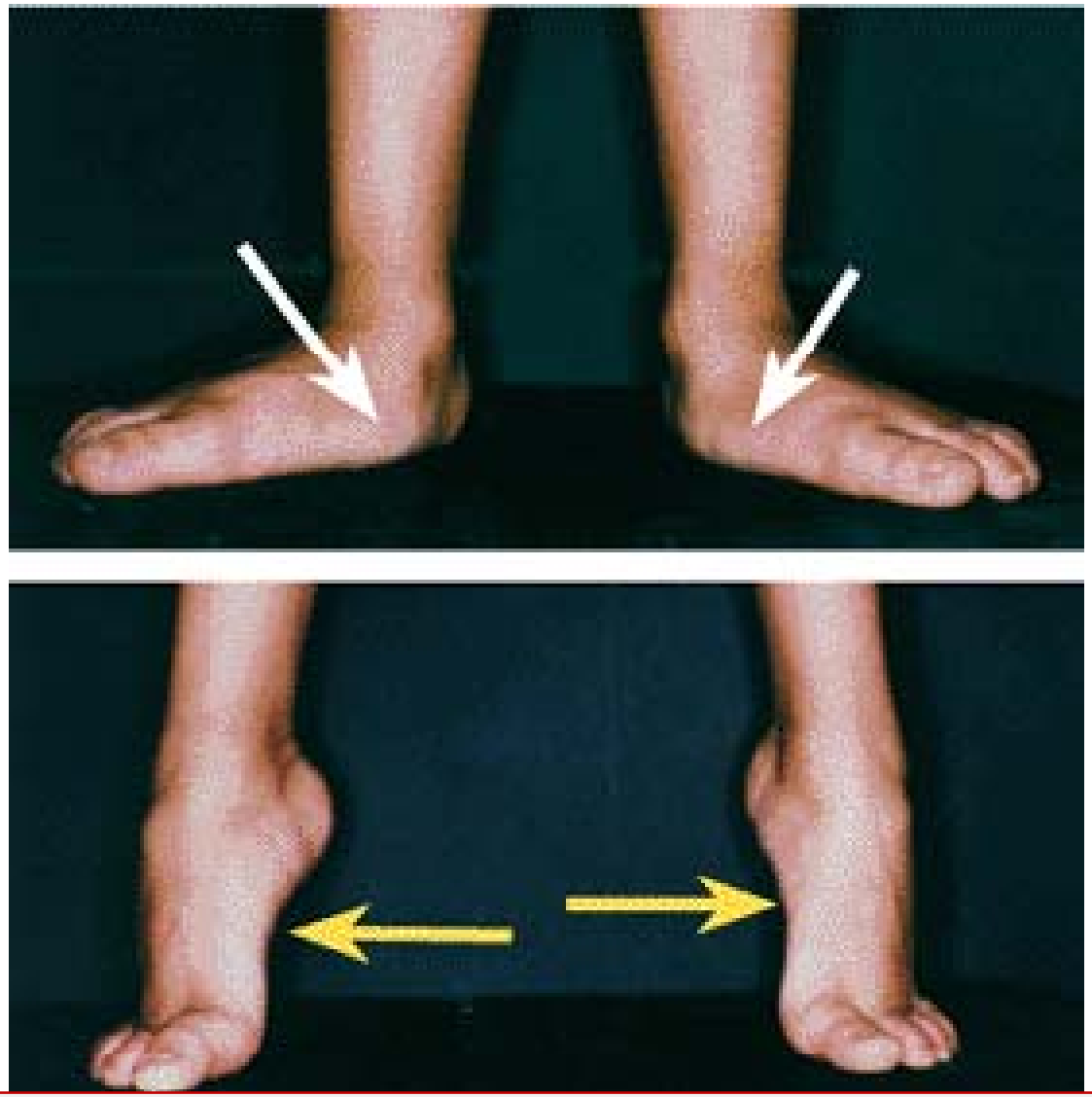
B Toe walking classification This classification includes the common causes of an equinus gait.

Flat Feet

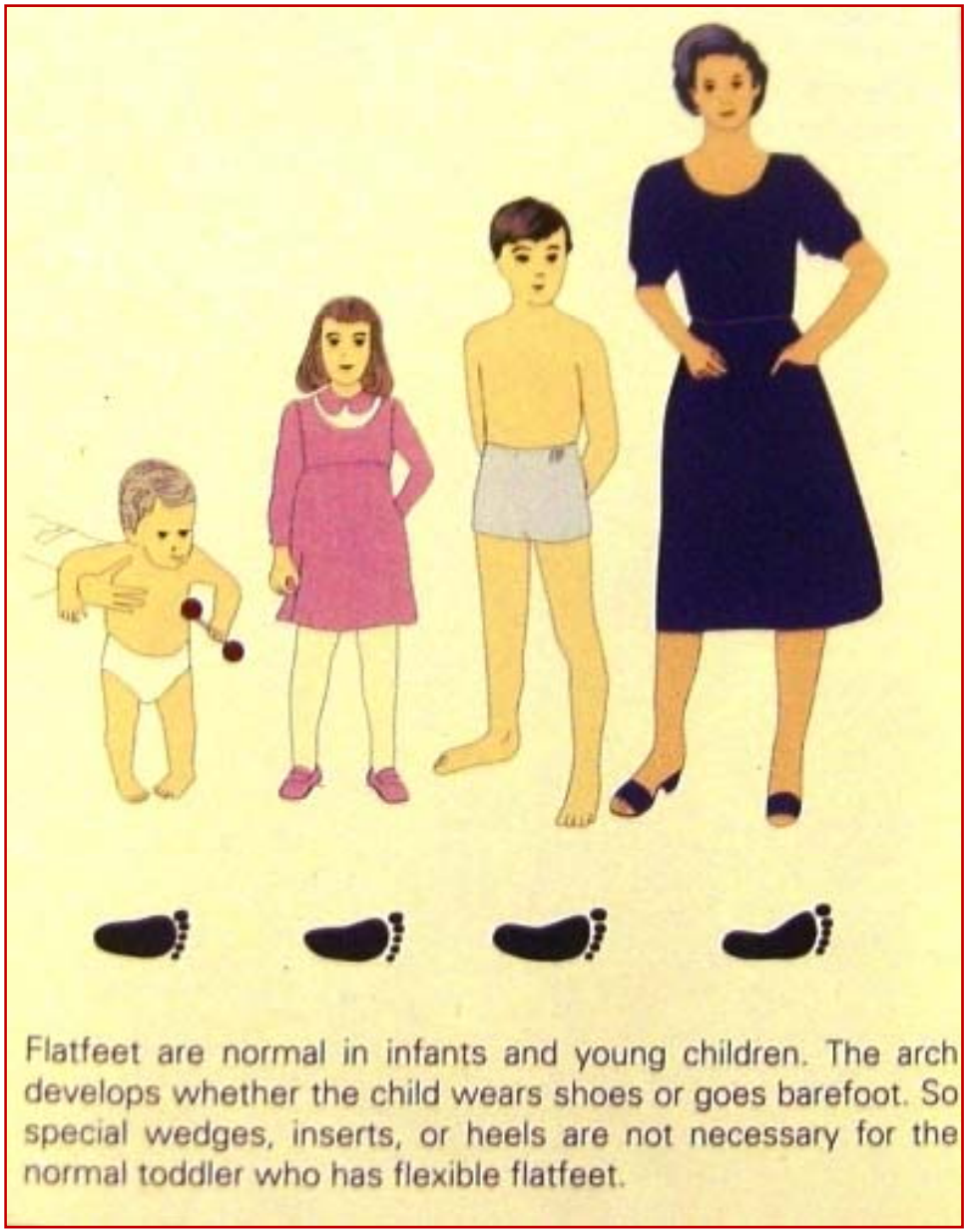
No Longitudinal arch of the foot

C Developmental flatfeet Most infants and many children have flatfeet. Infants' flatfeet are often due to their thick subcutaneous plantar fatpad and joint laxity.

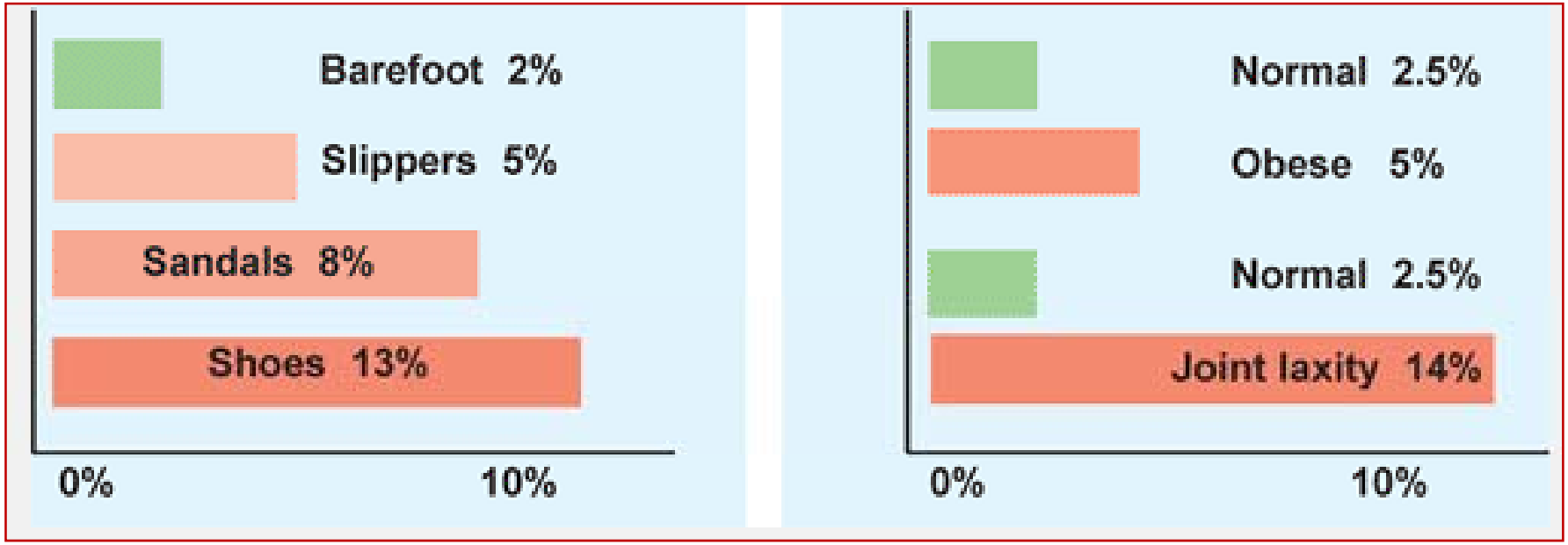
A Familial flatfeet Each member of this family had flexible flatfeet. None were symptomatic. Demonstrating the flatfoot in the asymptomatic adult provides reassurance for the parents.



C Flexible flatfeet The longitudinal arch absent on standing (white arrows) appears on toe standing (yellow arrows).



Flatfeet are normal in infants and young children. The arch develops whether the child wears shoes or goes barefoot. So special wedges, inserts, or heels are not necessary for the normal toddler who has flexible flatfeet.



B Associations of flexible flatfeet These studies from India demonstrate that flatfeet are more common in adults who wore shoes as children, the obese, and those with joint laxity. From Roe and Joseph (1993).

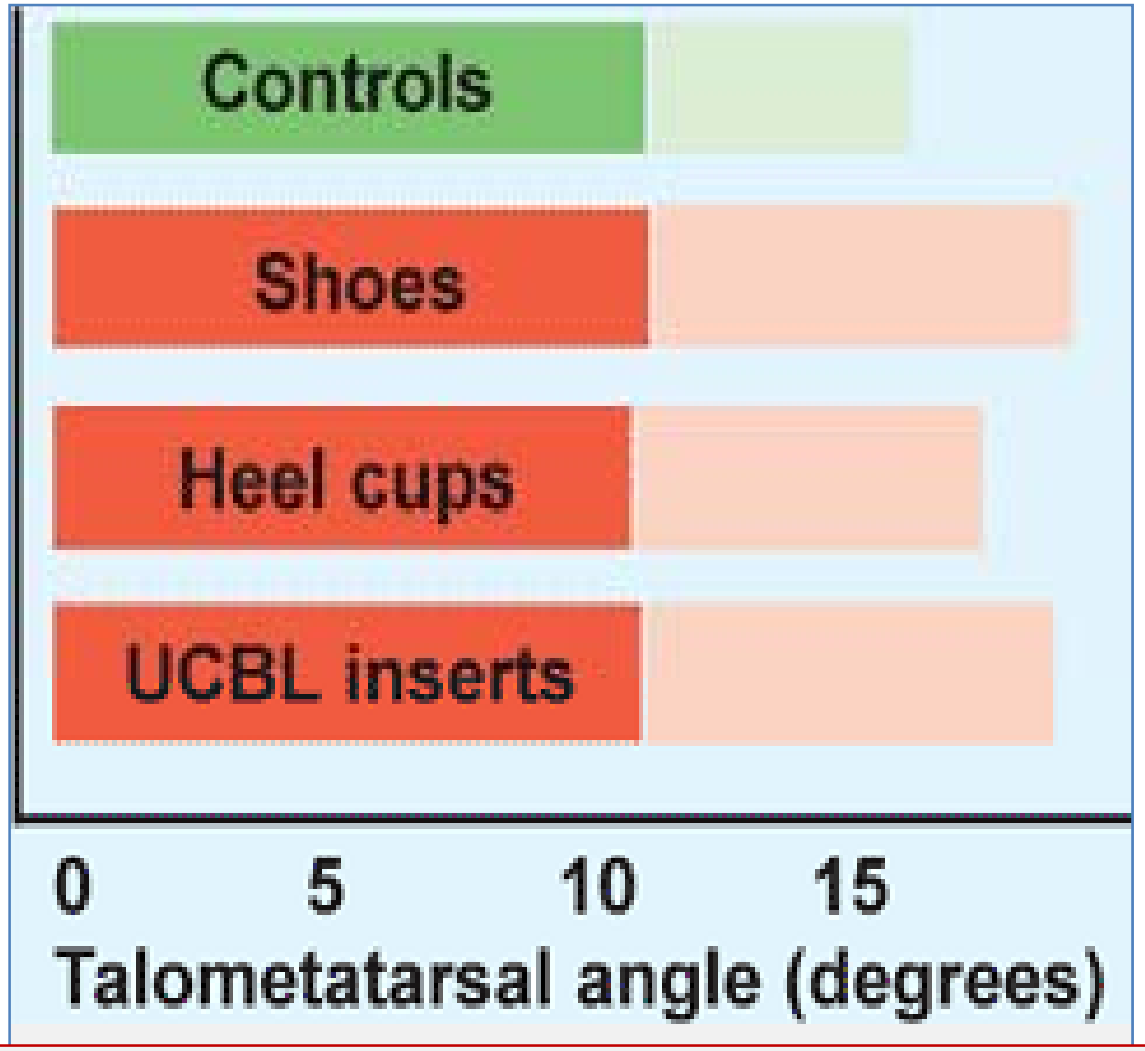
Types

Physiological	Pathological
* Very common.	* Rare
* Flexible.	* Stiff.
* Asymptomatic.	* Symptomatic!!
* > 98%.	* < 2%.

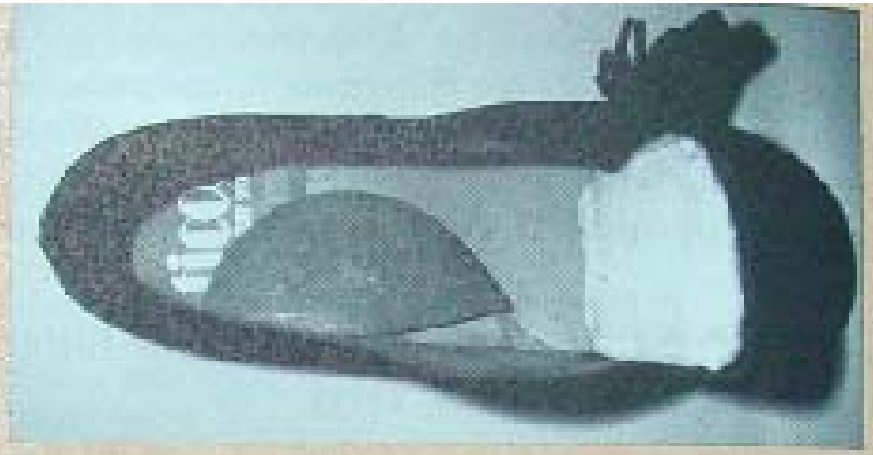
Category	Disorder
Flexible flatfoot	Developmental flatfoot Hypermobile flatfoot Calcaneovalgus foot
Pathologic flatfoot	Hypermobile flatfoot + tight heel-cord + lateral tibial torsion + obesity Tarsal coalitions Talocalcaneal Calcaneonavicular Neurogenic flatfoot Severed posterior tibialis tendon Vertical talus

E Classification of flatfeet Flatfeet are categorized into flexible (or physiologic) and pathologic types.

A Arch develops on toe standing This is a characteristic finding in flexible flatfeet.



B Effect of shoe modifications in flatfeet This prospective, controlled study compared arch development with various treatments. No difference was found. Talar metatarsal angles before (light shade) and after (dark shade) treatment.



Four Treatment Groups in Prospective Randomized Trial

1. Regular shoe (control)
2. Corrective shoe
3. Helfet heel cup
4. UCBL insert

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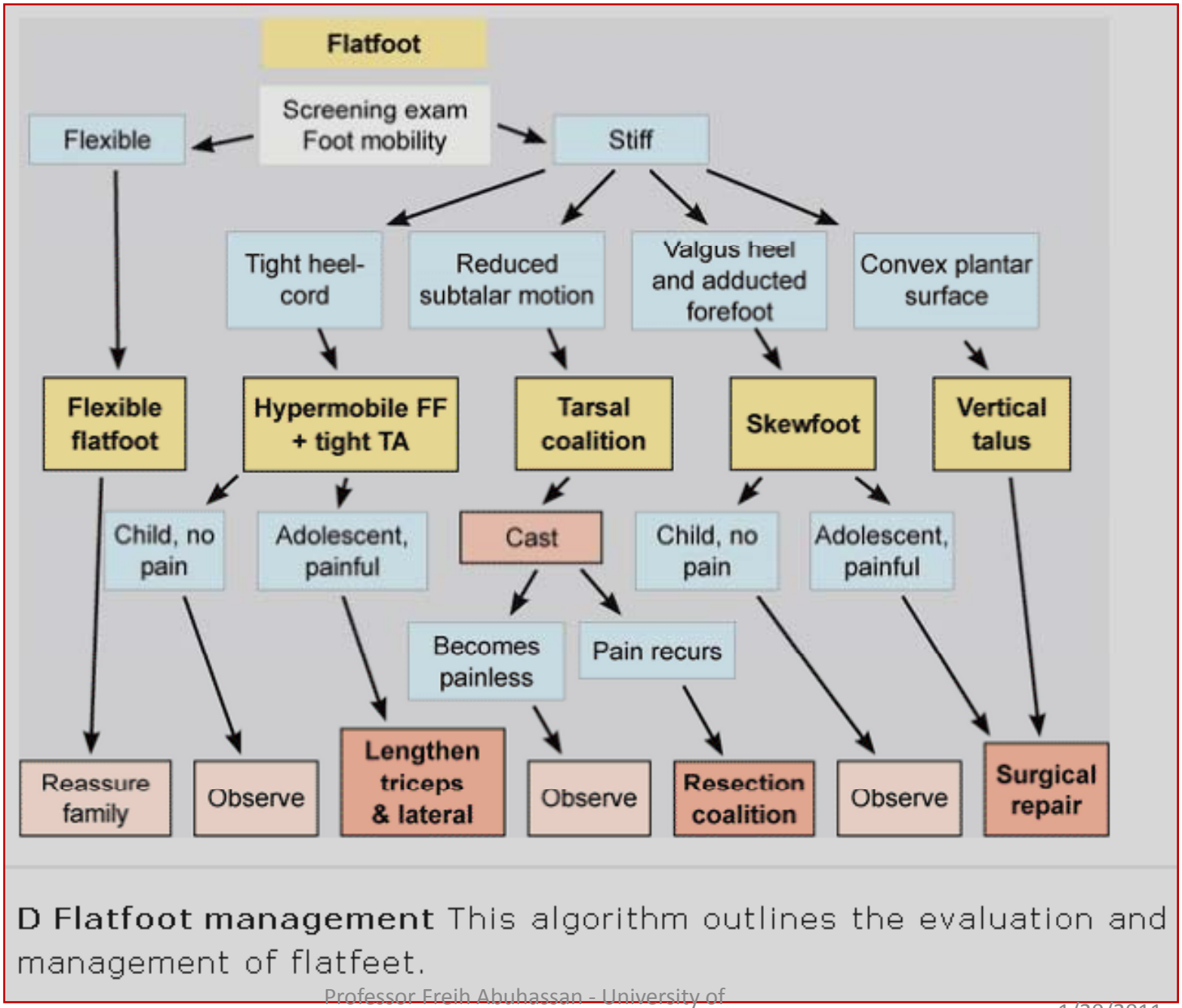


D Flatfoot management This algorithm outlines the evaluation and management of flatfeet.

E Calcaneovalgus deformity This is a positional deformity that requires no treatment.

Normal child needs normal shoes

Tarsal coalition

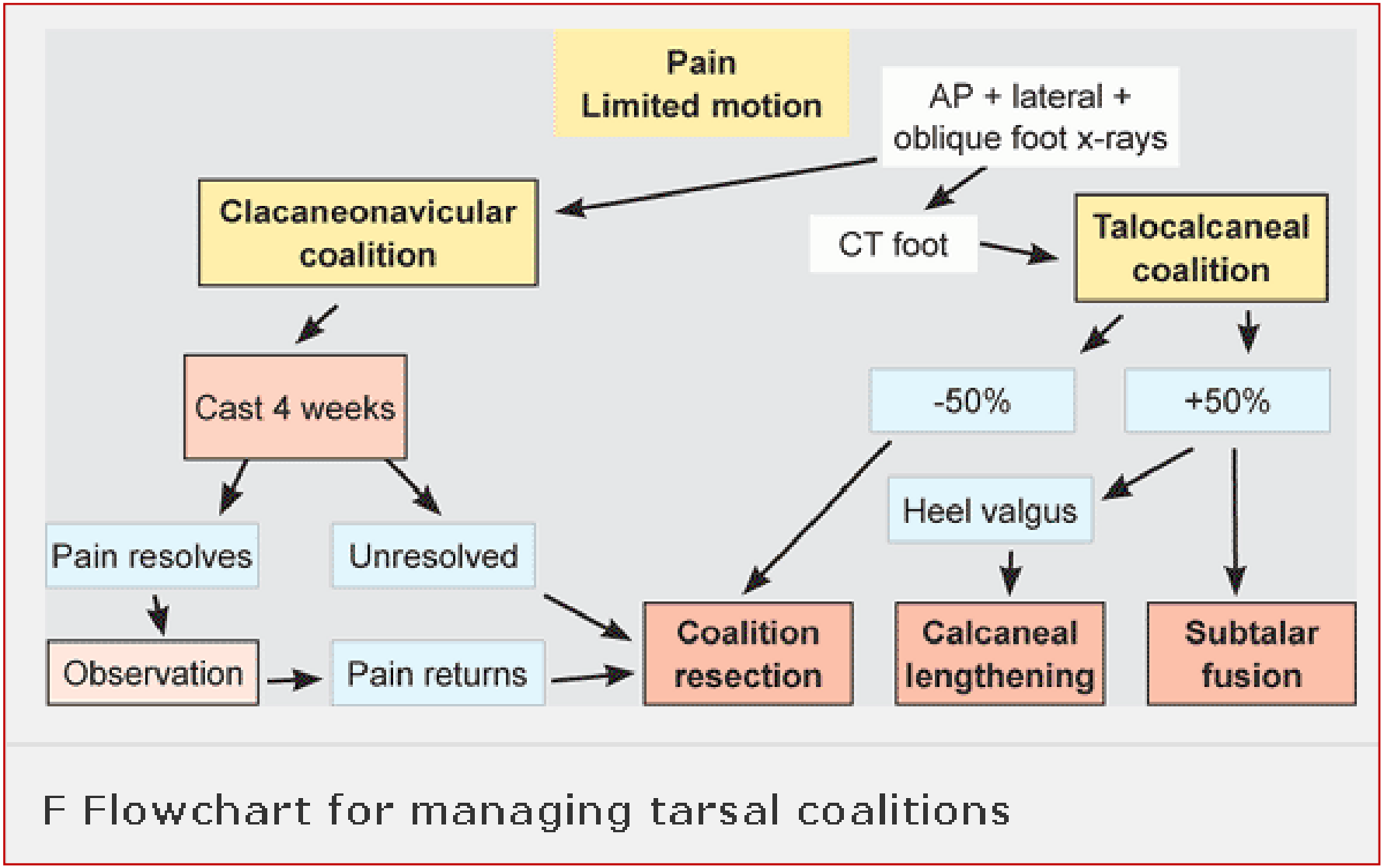
Type	Type of connection
I	Bony
II	Cartilaginous
III	Fibrous

A "Ant-eater sign" The calcaneonavicular coalition is seen in lateral radiographs with this characteristic feature (arrows).

B Calcaneonavicular coalition This C-N coalition is readily seen on oblique radiographs of the foot before resection (red arrows). Surgical resection (orange arrow) reduced discomfort and restored motion.

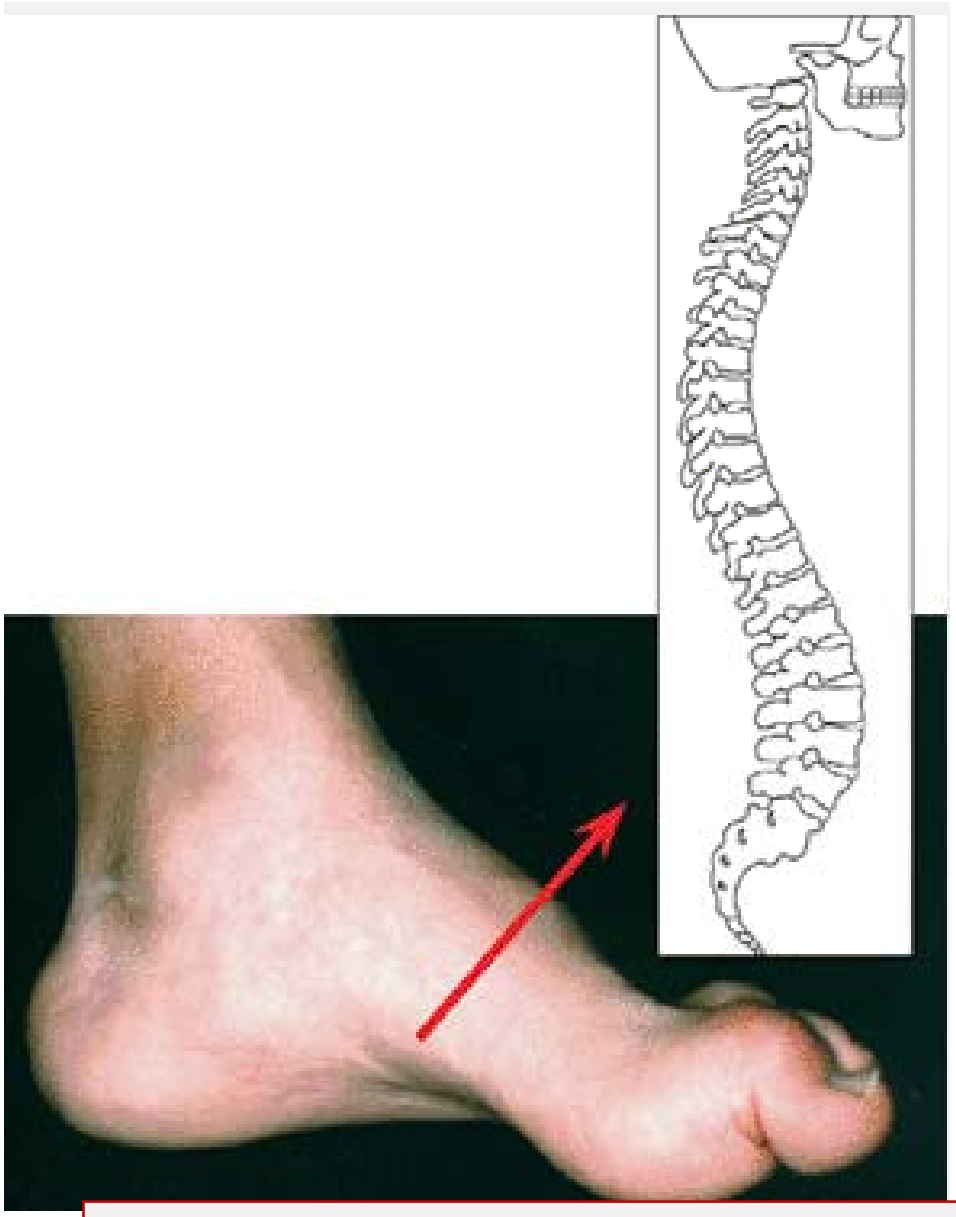
C C-sign of Lateur The *C-sign of Lateur* (arrow) is often present with subtalar coalitions.

D Subtalar coalition The middle facet subtalar coalition (arrow) is readily identified by CT imaging.



F Flowchart for managing tarsal coalitions

Cavus foot



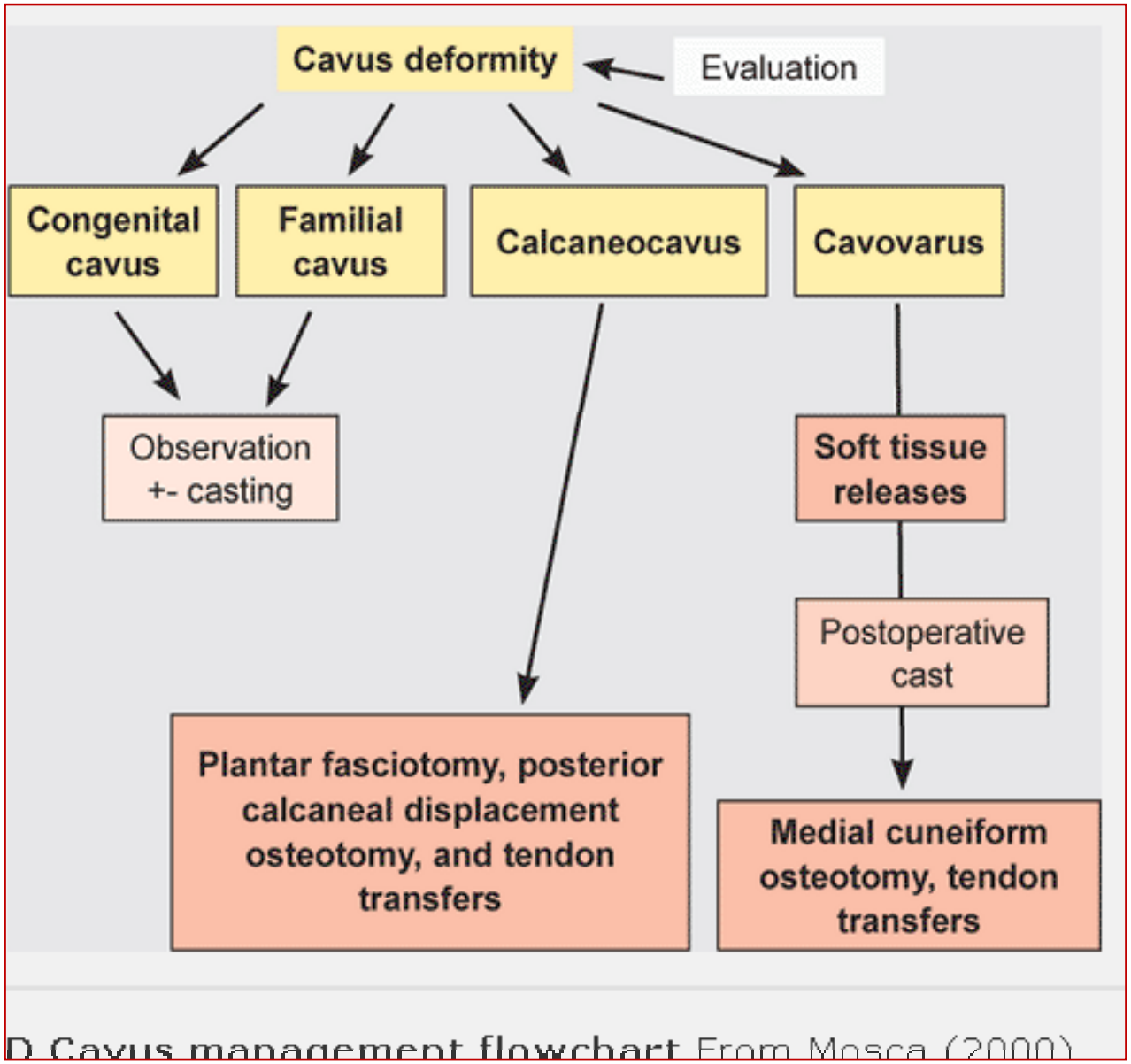
Cavus–think spine The high arch should prompt an evaluation of the spine

Fig. 5.54 Cavus varus Foot Deformity. The major deformity the forefoot. Note the clawing of the toes (arrow).

C Skin irritation with cavus deformity The cavus deformity increases the load on the metatarsal heads. If sensation is poor, as in the child with spina bifida, skin breakdown (arrow) is common.

Category	Type	Etiology
Physiologic	Cavovarus	Familial
Pathologic	Cavovarus	Clubfoot residual cavus Idiopathic Neuromuscular disease Friedreicht ataxia Charcot-Marie-Tooth Spinal dysraphism
	Calcaneocavus	Spina bifida Poliomyelitis Overlengthened heel-cord

D Classification of cavus deformity This classification includes the majority of causes of cavus feet. Pathologic cavus is often associated with neurologic disorders.



D Cavus management flowchart From Mosca (2000)

Limb Length Equalization & Deformity Correction illustrations

Causes of LLD

= Congenital.

= Growth arrest.

Trauma ,infection

= Neoplastic.

= Neurological.

Biological principles of lengthening

Closed osteotomy (5-7 days delay) →Distraction→Tension.

Distraction Osteogenesis

Effects of >2cm LLD

1. Asymmetrical gait.
2. Pelvic obliquity
3. Scoliosis
4. Hip & Patello F. OA on the long limb side
5. Cosmetic.

LLD in General Population

= 70% had some LLD

= 25% had 1-1.5cm LLD

= 5% had 2-2.5cm LLD

Advantages of LLD in patients with

= Stiff knee.

= Paralytic limb.

Contraindications of lengthening

- Sensory & motor deficit.
- Unstable joint.
- Psychological problem.
- Inability to discard the orthosis post op.
- Uncooperative patient.

Principles of correction

1. Correction of deformity first.
2. Leave paralytic limb shorter.
3. Length of shortening. (<2cm)

Options for treating LLD

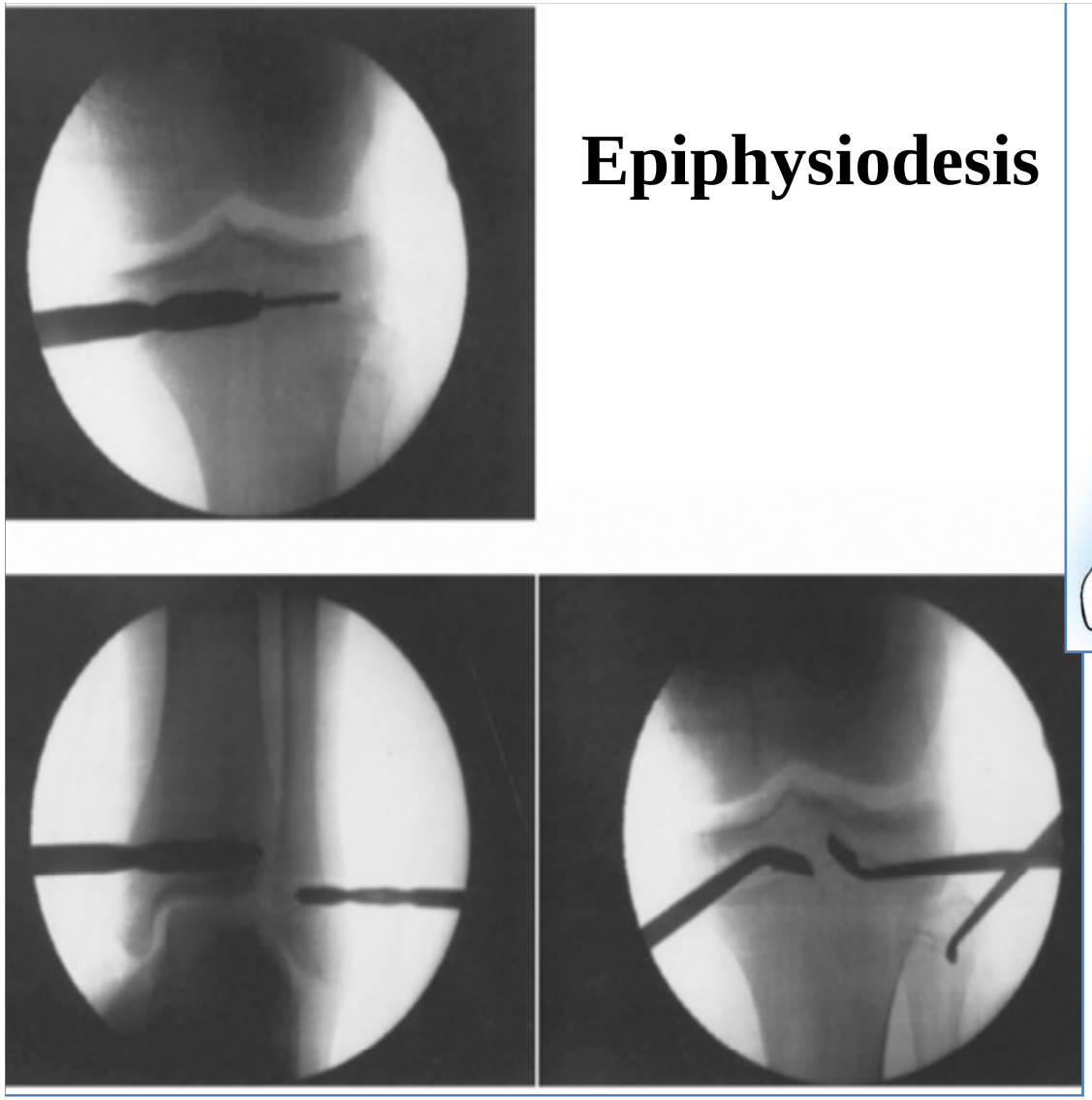
= Shoe elevation or orthoses

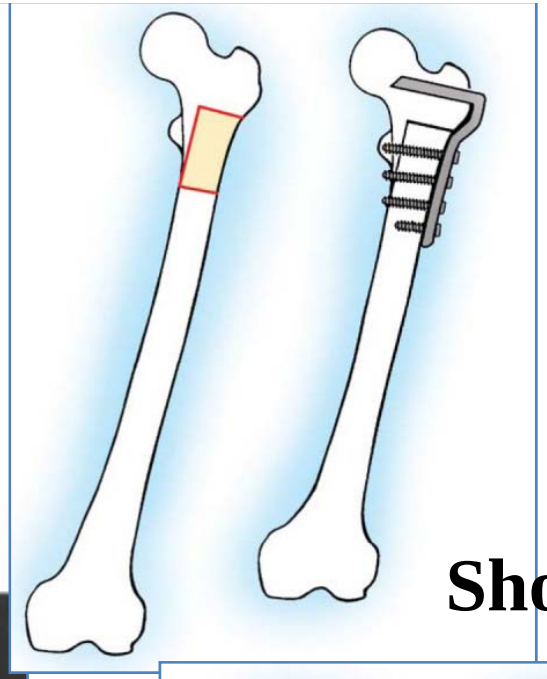
= Epiphysiodesis

= Surgical leg shortening

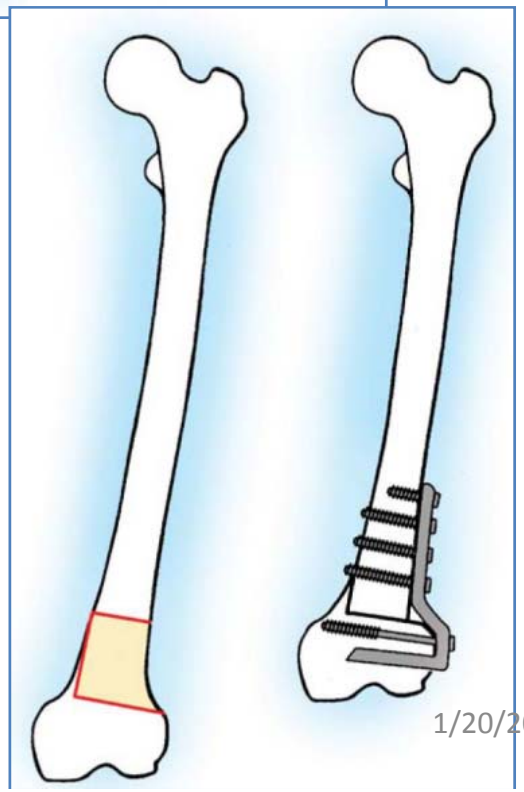
= Surgical leg lengthening.

Epiphysiodesis



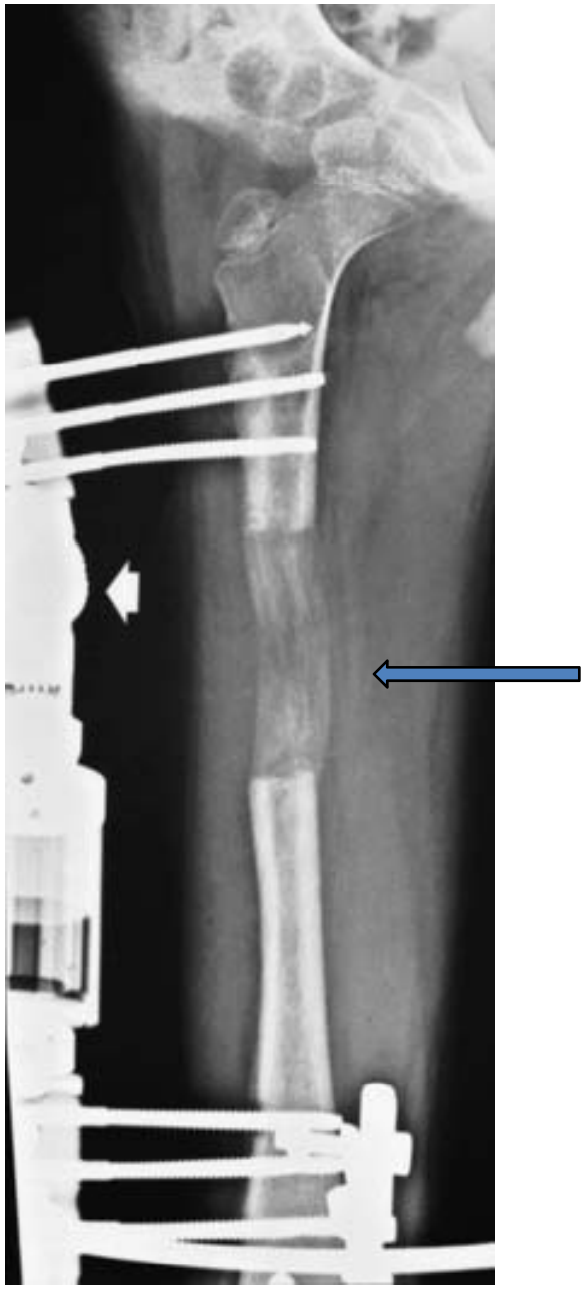


Shortening



General Guidelines for the R of LLD

LLD	Treatment
<2 cm	= None (or lift in shoe)
2-6 cm	=Epiphysiodesis or shortening
>6 cm	= Lengthening
>15-20 cm	= Lengthening (staged or combined with epiphysiodesis).



New lengthed bone

Complications of lengthening

1. **Bone**

- **Consolidation problems.**
- **Axial deviation.**
- **Fracture.**

2. Joints

- Contracture & subluxation.
- Loss of ROM.

3. Nerves

- Direct injury.
- Traction injury.

4. **Blood vessels**

- **Hypertension .**
- **Compartment syndrome.**
- **DVT.**
- **Direct injury.**

5. **Pin sites.**

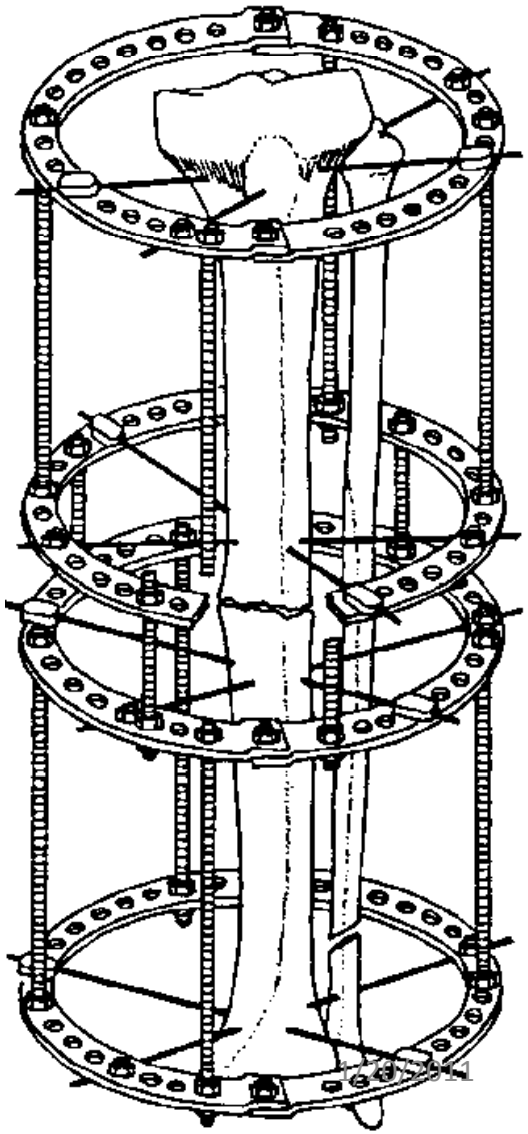
- **Infection.**
- **Tethering.**

6. **Psychological distress**
7. **Wound.**

- **Pain.**
- **Infection.**

Current modes of lengthening

1-Circular Bone Lengthener

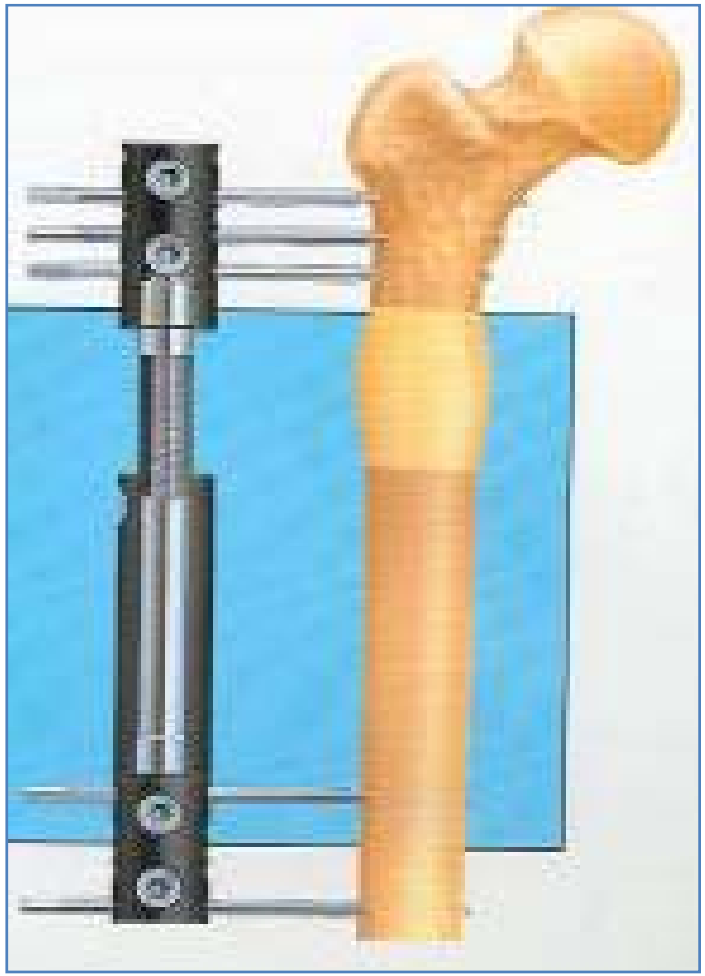


Problems of ilizarov method

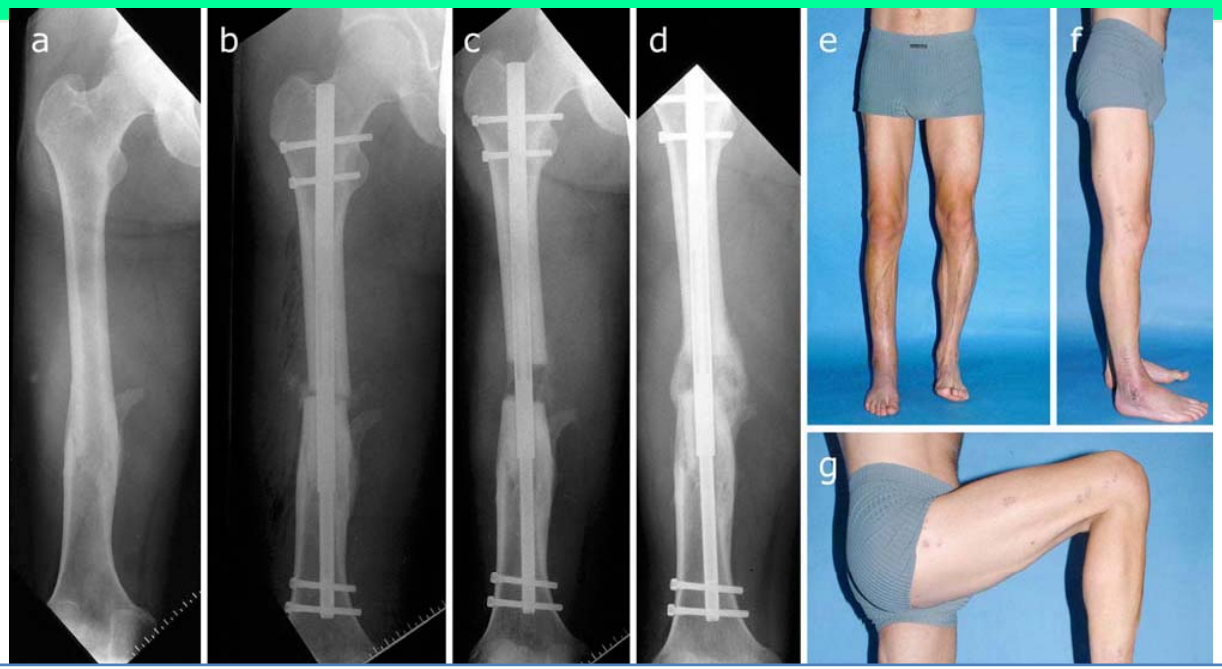
- Non-standardized techniques
- Dependence on personal creativity of surgeons
- More labour-consuming assembly
- Multiple outpatient visits necessary
- Decreased quality of life while fixator in place
- Problems with non-compliant patients
- High incidence of pin-site infection
- Contractures of adjacent joints caused by transfixation of muscles

2-Unilateral External lengthener

Orthofix

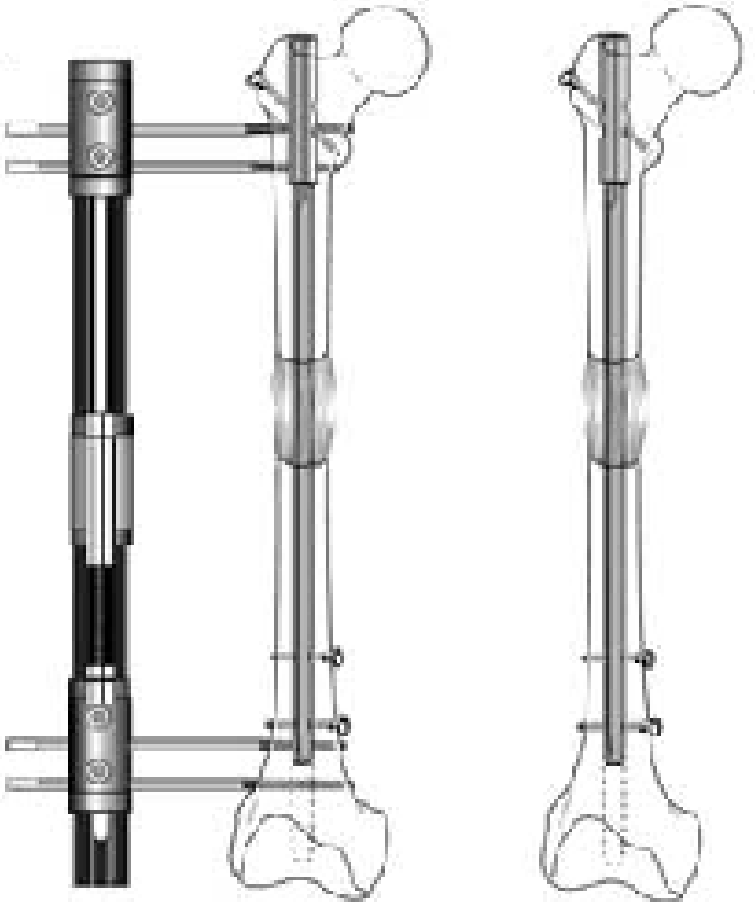


3-Intramedullary Skeletal Kinetic Distractor- ISKD

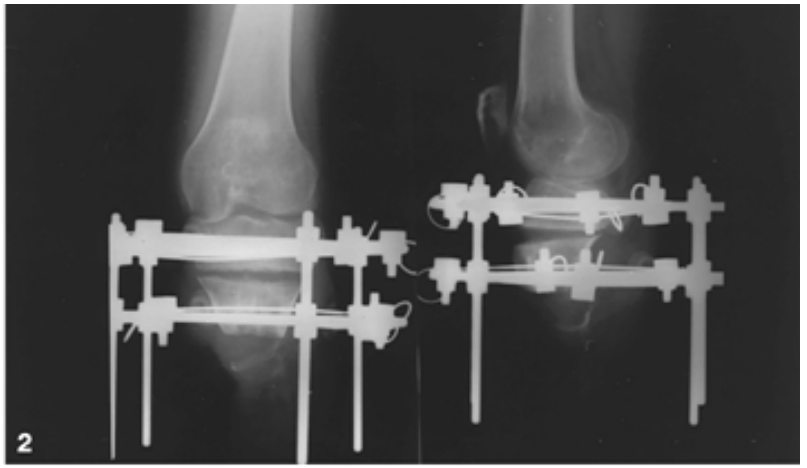


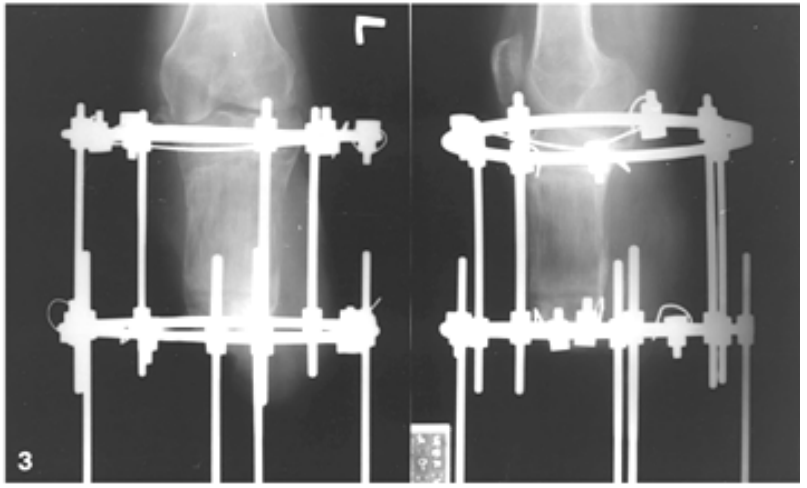
It is designed to lengthen for a predetermined distance, then stop.

4-Combined External and Internal Bone Lengthening system



Stump Lengthening





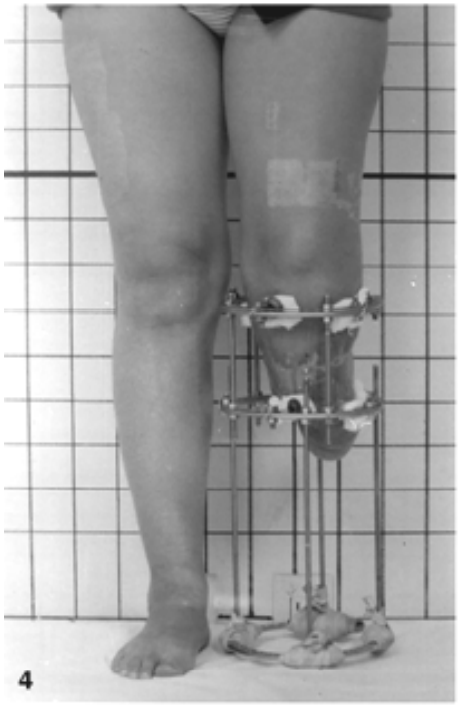
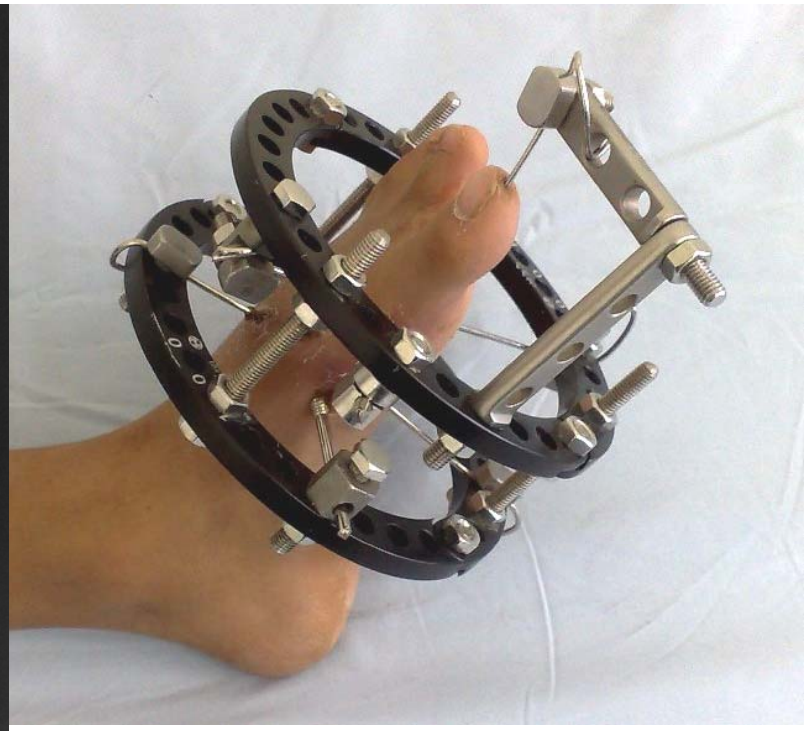


Fig. 1. — Metacarpal lengthening of the thumb in an 11-year-old girl.
A. Postoperative appearance on day one after surgery.
B. Fourteen months after osteotomy, radiography showing good bone healing.





Small bone lengthening