433 Teams

ORTHOPEDICS

Lec.6: Common Lower Limb Disorders

1. Leg aches
2. Limping
3. In-toeing & out-toeing
4. Leg length inequality
5. Genu varus & valgus
6. Proximal tibia vara
7. Club foot
8. Deformities seen in cerebral palsy patients

Ortho433@gmail.com

MED 433
طب ٤٣٣
جامعة الملك سعود
King Saud University

1.Leg ache

It is a growing pain (cramping, achy muscle pains at age 2-12 yr), increase with walking. Benign problem.

Cramping in both legs in 15% to 30% of **normal children**

- **Benign**
- In 15 – 30 % of normal children
- No functional disability
- Female > Male
- Resolves spontaneously, over several years
- Unknown cause

Clinical features:

Diagnosis by **exclusion** of other Causes of the pain (Tumor – Trauma – Infection)

History: **Pain**

- **Site:** long bones of Lower limb (calf, shin, or thigh) usually bilateral
- **Onset:** Of long duration (months) & there is no hx of trauma
- **Characteristics:** Dull aching pain, poorly localized (suggestive of tumor)
- **Relieving factors:** Responds to analgesia (NSAID)
- **Aggravating factors**: Activity (but it can be **without** any activity)
- **Time:** At night (sometimes after intense childhood activities)
- **Constitutional symptoms:** to exclude malignancy

Examination:

- Long bone tenderness (nonspecific) for a large area, or none
- Normal joints motion

Differential diagnosis:

- Osteoid osteoma (presented with dull aching pain at night and responds to analgesia)
- Osteosarcoma (constitutional symptoms)
- Ewing sarcoma
- Leukemia
- Sickle cell anemia (ask about family history)
- Subacute Osteomyelitis

Management:

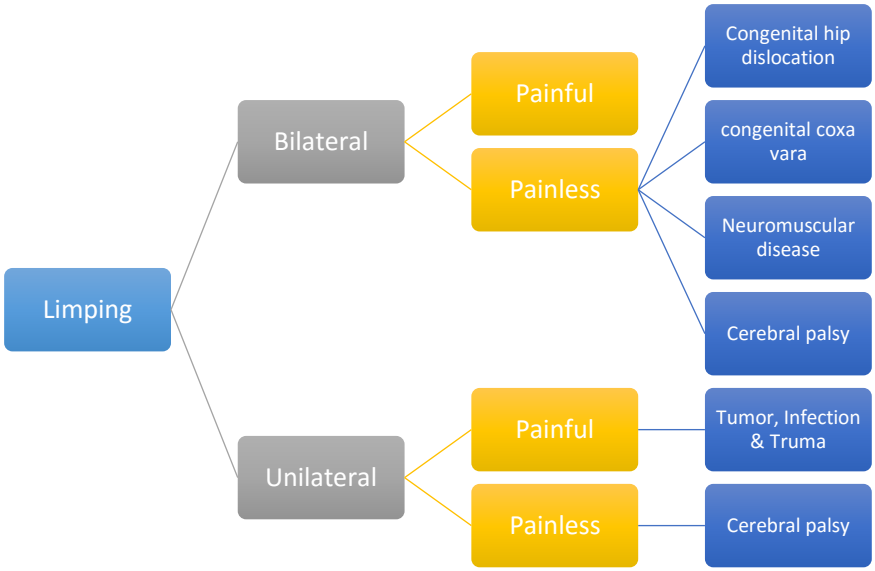
- Symptomatic (Analgesia, rest, massage).
- Reassurance.

2. Limping:

- Abnormal gait due to pain, weakness or deformity

Normal gait: gait cycle has two phases: Stance Phase, the phase during which the foot remains in contact with the ground, and the. Swing Phase, the phase during which the foot is not in contact with the ground.

- Most common cause is due to hips then legs problems.
- **Types of Limp (In one or both limbs):**
  - **Painful gait:** Antalgic gait (usually unilateral)
    (Trauma – Tumor – Infection)
  - **Painless gait** (usually bilateral) (Syndromic – Congenital)
- - Weakness (general or nerve or muscle),
- - Deformity (bone or joint)
- History (**Mainly** age of onset)
- Examination: Evaluate the limp by studying the child's gait while the child walks in the clinic hallway.
  - Above pelvis: back (scoliosis)
  - Below pelvis: Hips, knees, ankles, & feet
- **Trendelenburg gait:** When the hip abductor muscles (gluteus medius and minimus) are weak, the stabilizing effect of these muscles during gait is lost. (bilateral = waddling gait)
- **Trendelenburg test:** ask the patient to stand using his 2 legs, notice the level of the shoulders. Then ask him to stand on one leg, if the patient bend his body/waist to the other side that's mean a positive test. See the video https://youtu.be/wHVMPD45IFo
- **Management:** Treat the underlying cause.



3. In-toing and Out-toing: "Main Complain is **frequent fall**"

Terminology:

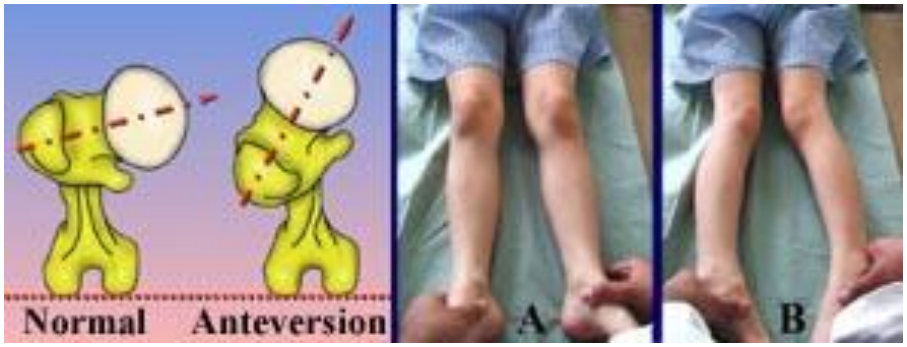
- **Version**: normal variations of limb rotation (It may be exaggerated).
- **Torsion:** abnormal limb rotation (Internal or external).

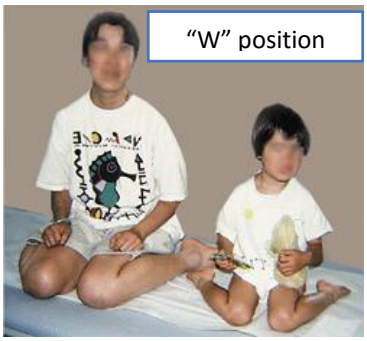
a. In-toing:

most common cause of in-toeing is cerebral palsy and developmental dysplasia of the hip (DDH).

In-toeing conditions:

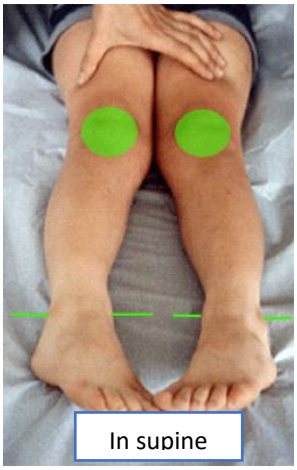
a. **Femoral Anteversion:** Excessive internal rotation of the head of the femur. The patient usually presents with frequent fall. Also from the history, the patient can't cross his legs and sits in "W" position (see the pic).

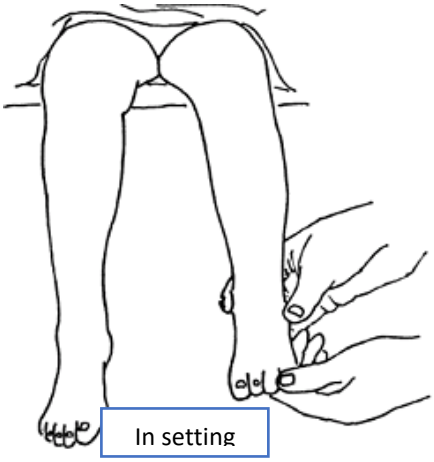


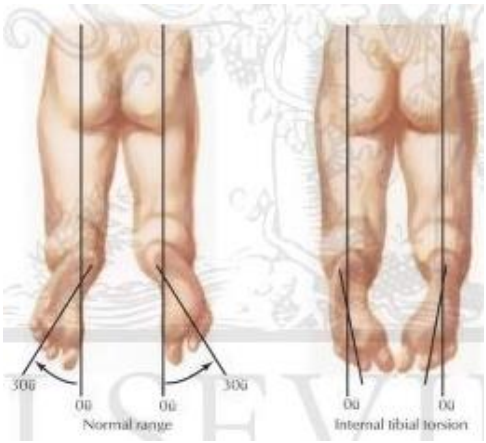


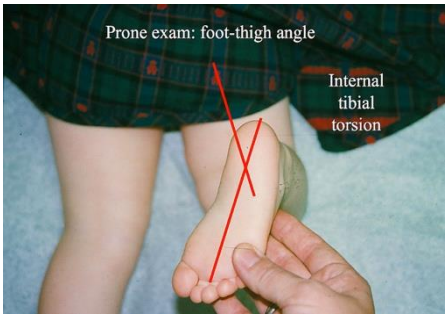
b. Tibial Torsion

For OSCE: Assess the intermalleolar axis (normally lateral malleolus is posterior and the medial is anterior) If the lateral malleolus was in the same level or more forward to the medial = Tibial torsion

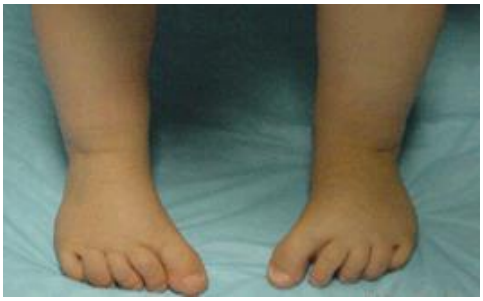

In supine

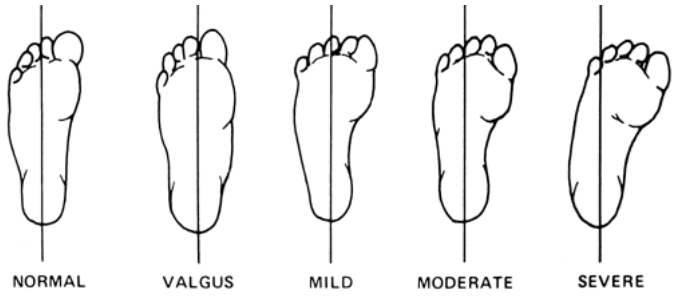

In setting



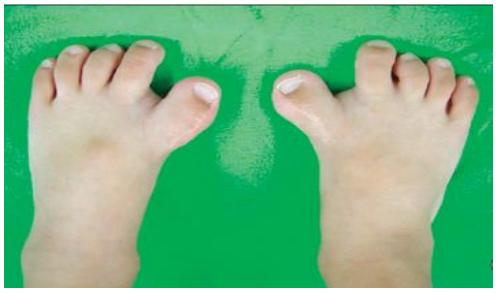


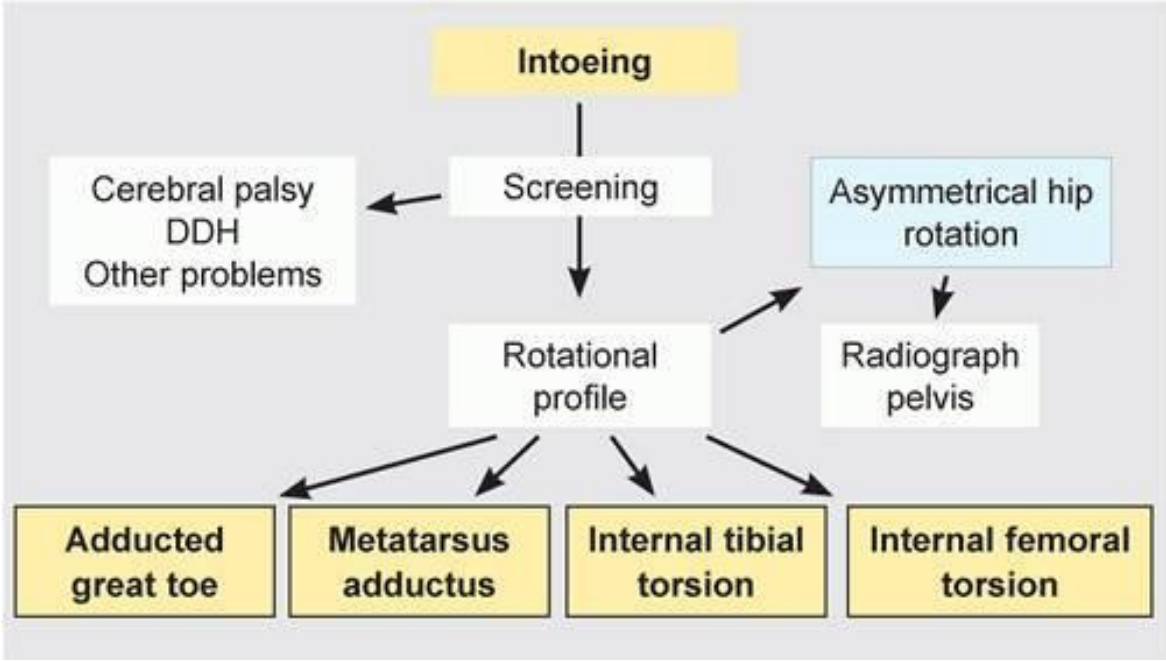
c. Forefoot adduction



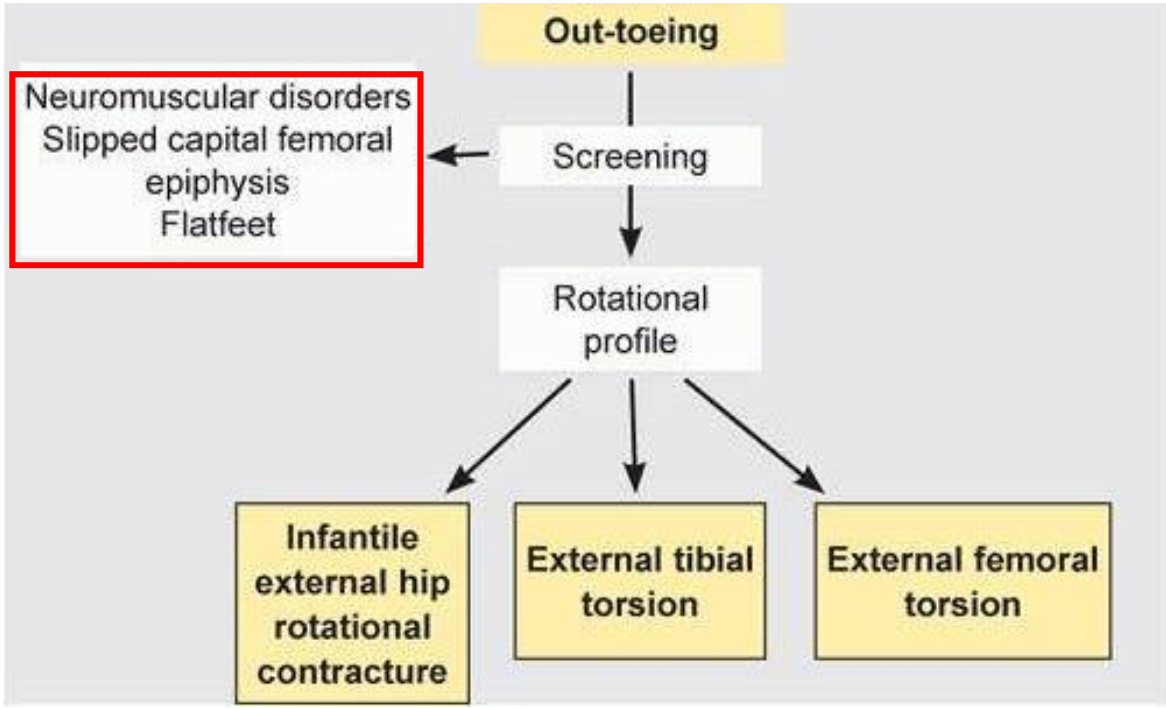


d. Adducted big toe





b. Out-toing:

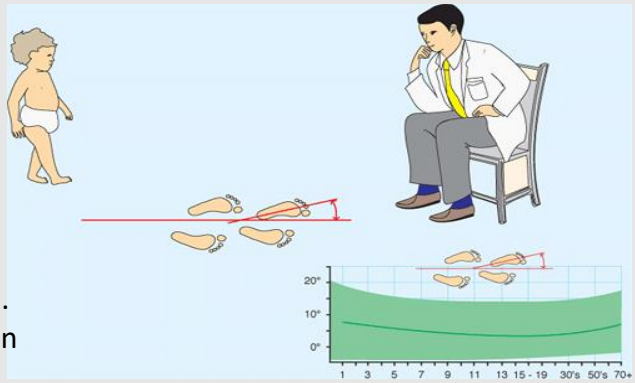


Evaluation of In-toeing & Out toeing:

- **History.**
- **Examination:** Assess rotational profile (Foot progression angle, Hips Rotational Profile, Foot Thigh Axis and Heal Bisector Line).

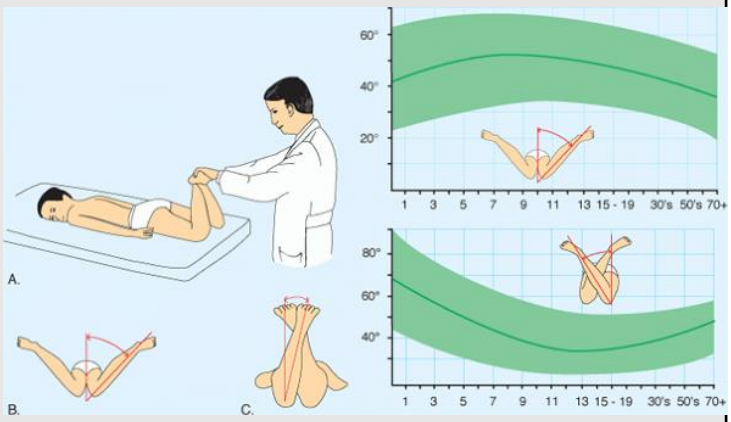
1st: Foot Progression Angle:

- To assess the direction of the foot when the child walks
- how much the foot is outward (Out-toeing) or inward (In- toeing) on an imaginary line on the ground
- The child should walk about 30 feet.
- Normally foot is everted (N= -5° to +15°)
  - If decreased > In-toeing > Internal rotation.
  - If increased > out-toeing > external rotation
- Surgery is indicated if the deformity is severe or it past the age of spontaneous correction.



2nd: Hips rotational profile

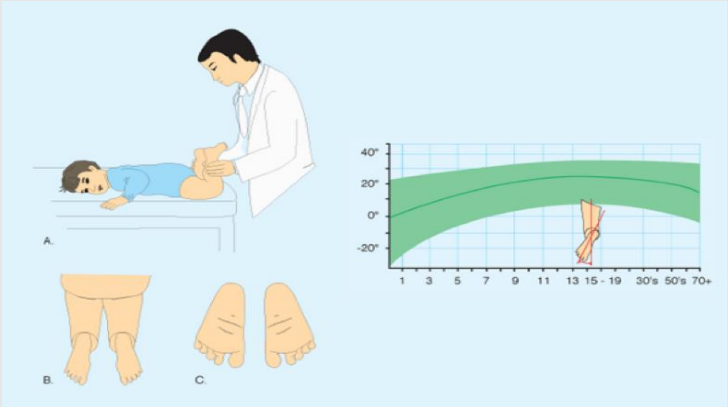
- Assessment of the hip range of motion, assessment of version of the hip
- Normally, external rotation is similar to or slightly more than internal rotation. If internal rotation is more than external rotation, this indicates excess femoral anteversion.



3rd: Assessment of the Foot Thigh Axis (assessment of the tibial torsion)

The child lies prone on the table and the physician assesses the angle between the thigh and foot with the knee flexed (long axis of the foot should be on the same axis of the thigh) (N= 10°-15°)

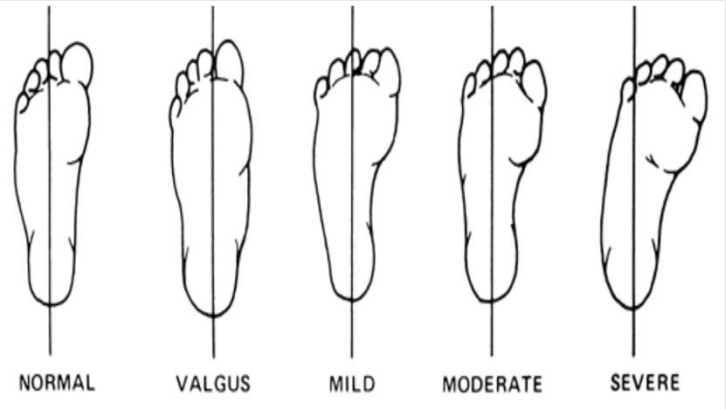
By the age of 8 years, the torsion of the tibia reaches its adult value which is about 15° externally



4th: Assessment of the relation between the forefoot and the hindfoot

Draw an imaginary line bisecting the ankle, this line should pass by the second toe If it passes lateral to the third toe, this indicates metatarsus adductus.

Used to assess metatarsus adductus



Management:

- **General considerations:**
  - Establishing correct diagnosis
  - **Allow spontaneous correction** (observational management)
  - Control child's walking, sitting or sleeping is extremely difficult and frustrating
  - Shoe wedges or inserts are ineffective
  - Bracing with twister cables limits child's activities
  - Night splints have no long term benefit
  - **Operative correction** indicated for children: (> 8) years of age With significant cosmetic and functional deformity → <1%
- **In-toeing:**
  - Annual clinic follow-up to assess the degree of deformity
  - **Femoral anti-version:** encourage the patient to sit in crossed-leg position (femoral derotation osteotomy)
  - **Tibial torsion:** spontaneous improvement
  - **Forefoot adduction:** anti-version shoes or proper shoes reversal
  - **Adducted big toe:** spontaneous improvement
- **Out-toeing:**
  - Usually **does not** improve spontaneously
  - Will need an operation: After the age 8y or if the foot propagation angle >30°

4.Limb Length Inequality:

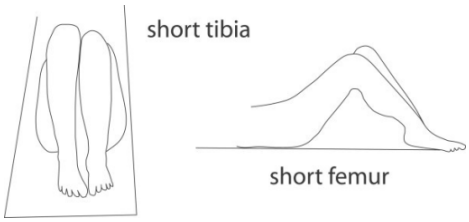
Etiologies	
Congenital	As DDH
Developmental	As Blount's (will explain later in this lecture)
Traumatic	As oblique # (short), or multifragmented (long)
Infection	stunted growth or dissolved part of bone
Metabolic	As rickets (Bilateral)
Tumors	Affecting the physis

Clinical features

- Gait disturbance (tip toe walking or Trendelenburg gait).
- Equinus deformity: ex. Shortening in Rt. Side, child will involuntarily start to plantar flexion the Rt. foot (walk on tiptoes) to compensate for The affected movement. With time, PF will become Fixed > cannot do dorsal flexion. Or he will put the left foot down to equalize the legs
- Pain: back, leg: Child with back pain think about Length Inequality
- Scoliosis (secondary)

Screening examination: Clinical measures of discrepancy

- **Measuring tape**
  - **Apparent Length:** from umbilicus to medial malleolus
  - **True Length:** from ASIS to medial malleolus
- **Giliazi test:** when patient lies supine and both knee flexed look at the knees from front and side if one knee goes **backward**= problem in the femur If one knee goes **downward** = tibia problem



- **Imaging methods (Centigram):** a type of x-ray, is one of the most imp. methods of determining LLD. A long film of the 2 limbs from hip to toes is taken, while a ruler is put in the x-ray to measure the difference between the 2 limbs in length.

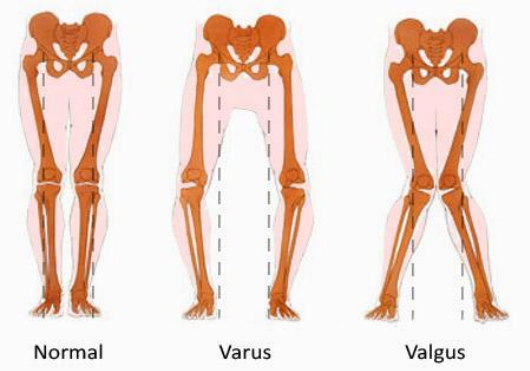
Management principles:

Depends usually on the cause. Some syndromes will resolve spontaneously, and others (trauma, tumor and infection) will not. E.g. If the patient has LLD due to Salter-Harris fracture distal femur at age of 2 years; expected discrepancy at age of 10 will be around 9-10 cm (and it will increase in the time). So, it patient needs immediate intervention to arrest the discrepancy.

- Depends on the severity: (>2cm)
  - LLD < 2 cm: Observe (the body with its muscles can compensate)
  - LLD 2-5 cm: Shoe lift (Shoe raise) (for the whole foot NOT only heel)
  - LLD > 5 cm: Consider surgery or active treatment
- **For the shorter limb:**
  - **Bone Lengthening**: (More common) Osteotomy then insert a device that will start to lengthen bit-by-bit 1 mm per day (or so), by having the patient manipulate a screw of the external apparatus. (Observe the patient because of the neurovascular structure)
  - **Shoe raise**
- **For the longer limb:**
  - **Bone shortening** (remove part of bone. usually we don't use it)
  - **Epiphysiodesis** (temporary or permanent) (stop the growth)
  - temporary Epiphysiodesis is done when you want to do shortening in young children that still have growth potential
  - Permanent method is done for children that are close to skeletal maturity (12-13 y/o). They'll have around 4-5 cms of growth potential left to reach.

5.Genu Varus & Valgus:

- Bow legs (genu varus)
- Knock knees (genu valgus)



Etiologies:

- **Physiologic:** observe and reassure the parents (usually bilateral). The natural history for genu (knee) development:
  - Born – 2 years: Genu varus
  - 2-5 years: Genu Valgus
  - after 5 years the legs will straight to be normal

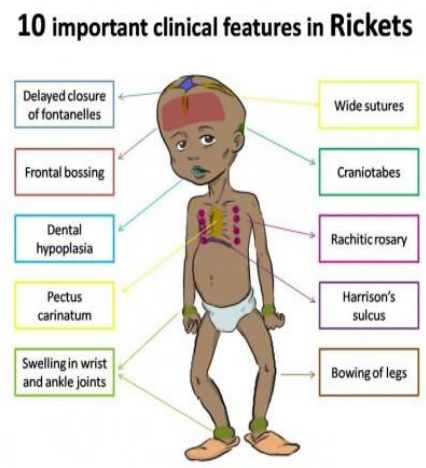
Intrauterine Babies they are cross legged, when they born they will have normal bowing as they grow older at 1 and half or 2 years they will be in maximum bowing then at the age of 3-4 they will be in maximum valgus, after 4 they improve to adult angle (normally men about 5-7 degrees and women up to 10 of valgus). If rickets developed in a 2 y/o he will have Varus deformity and Older than 2 y/o will have valgus deformity

- **Pathologic:** trauma, infection, tumor or syndromes

Feature	Physiologic	Pathologic
Frequency	Common	Rare
Family history	Usually negative	May occur in family
Diet	Normal	May be abnormal
Health	Good	Other MS abnormalities
Onset	Second year for bowing Third year knock-knees	Out of normal sequence Often progressive
Effect of growth	Follows normal pattern	Variable
Height	Normal	Less than 5th percentile
Symmetry	Symmetrical	Symmetrical or asym
Severity	Mild to moderate	Often beyond ±2 SD

Evaluation:

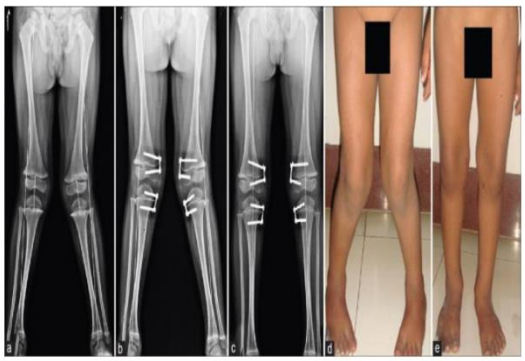
- **History**
- **Examination** (e.g. Signs of Rickets)
- **Laboratory** (Ca level and vit.D)
- **Imaging:** Centigram



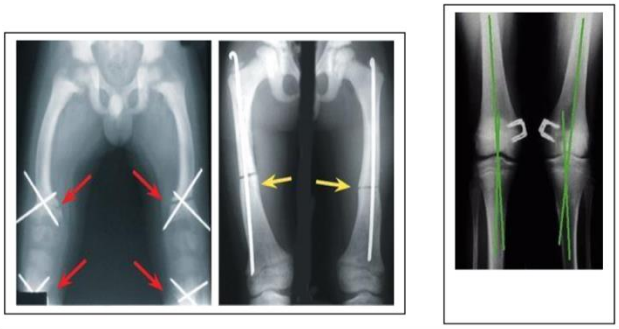
Complications: early osteoarthritis

Management:

- **Non-operative:**
  - Physiological: Observation
  - Pathological: must treat underlying cause, (e.g. in Rickets give vit D)
- **Epiphysiodesis**
  - **Valgus**: Insert clip on medial side of bone to stop it from growing and allowing the lateral side to continue growing
  - **Varus**: Insert clip on lateral side of bone to stop it from growing and allowing the medial side to continue growing
- **Corrective osteotomies** (tibia & femur together)



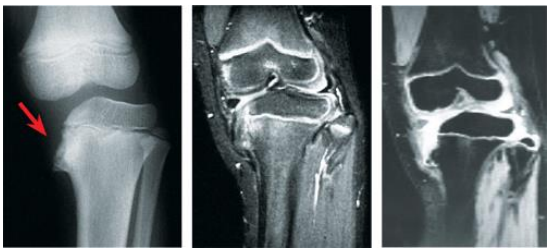
Epiphysiodesis

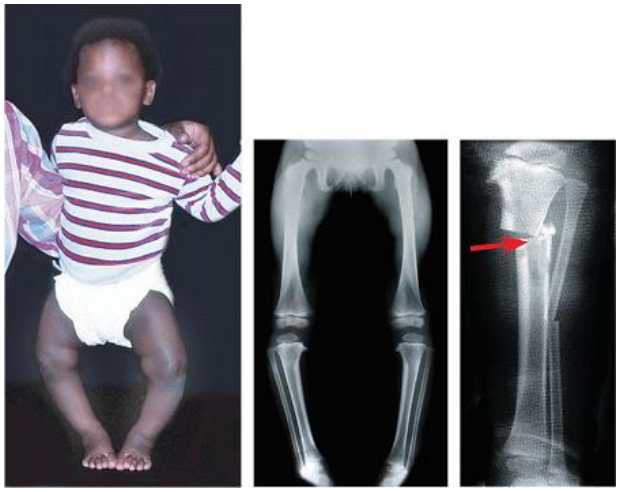


Corrective osteotomies

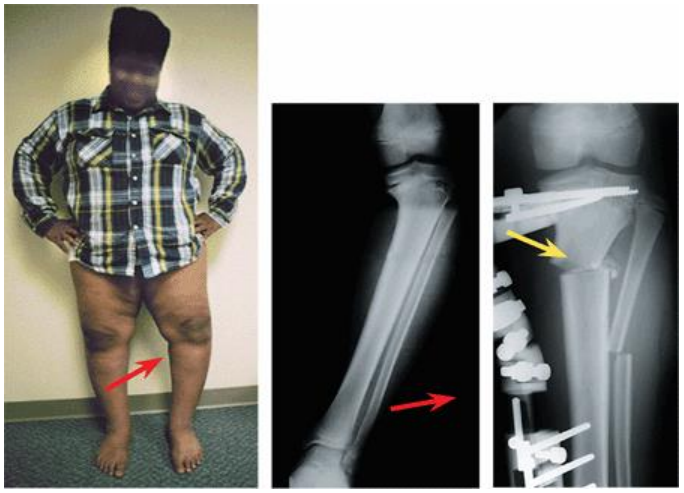
6. TIBIA VARA (BLOUNT DISEASE):

- Damage of proximal medial tibial growth plate of unknown cause (special entity of Genu Varus).
- **Staging:** Radiological (M.D.A = metaphyseal diaphyseal angle)
  - Metaphyseal Diaphyseal angle < 11° observe closely
  - Metaphyseal Diaphyseal angle > 15° operate
- MRI is mandatory to know the stage (How severe – recurrence)
- **Types:**
  - **Infantile:** usually in over weight & early walkers (bilateral)
  - **Juvenile**: (bilateral)
  - **Adolescent:** > 10y, usually over weight & (unilateral)
- **Treatment:**
  - Mostly surgical
  - More late more damage
  - High stage; bad prognoses





Bilateral



Unilater

7.Club foot:

Etiology

- **Postural:** Abnormal postural in the uterus. Spontaneous correction (fully correctable)
- **Idiopathic (CTEV):** Congenital Talipes Equino Varus (partially correctable)
- **Secondary (Spina Bifida)**: Neurological and muscular problems (rigid deformity), Most common cause **(Spina Bifida)**

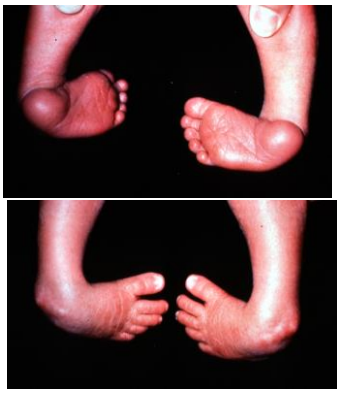
Diagnosis: Diagnosis by **exclusion** the DDx

- **Differential diagnosis (DDx):**
  - If deformity is identified after delivery, try to do correction manually. (If corrected successfully > Postural)
  - **If not >** Idiopathic or secondary
  - **Neurological lesion** that can cause the deformity "Spina Bifida" (excluded by spine x-rays then MRI)
  - Other abnormalities can explain the phenomenon:
    - Arthrogryposis: multiple joints contractions (stiff joints) and the muscles are fibrous
    - Myelodysplasia

- **concomitant congenital anomalies** (exclude by x-ray)
  - Proximal femoral focal deficiency
  - Tibial hemimelia (a rare congenital anomaly characterized by deficiency of the tibia with a relatively intact fibula)
- **Syndromic clubfoot**
  - Larsen's syndrome (multiple joint dislocation)
  - Amniotic band Syndrome

Clinical examination: (the patient usually presents with pain due to unequal distribution of the weight on the foot)

- **Hind foot: (Calcaneus, Ankle, Tibia)**
  - Equinus: fixed plantar flexion of ankle Joint (FPF) (Ankle joint)
  - Varus: inversion of subtalar joint (Subtalar joint)
- **Midfoot:**
  - Cavus (high-arched foot)
- **Forefoot**
  - Adduction or supination (of talus)
- **Additional findings** (does not affect the walking)
  - Short Achilles tendon (due to FPF)
  - High and small heel (due to FPF)
  - No creases behind Heel (due to FPF)
  - Abnormal crease in middle of the foot (due to forefoot add)
  - Affected foot is smaller (obvious if unilateral)
  - Callosities (dead skin) at abnormal pressure areas
  - Internal torsion of the leg
  - Calf muscles wasting
  - Deformities don't prevent walking

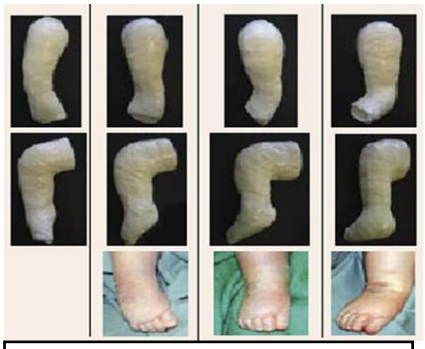


Management:

The goal of treatment for is to obtain a foot that is plantigrade (straight foot), functional, painless, and stable over time, which looks cosmetically acceptable and fits normal shoes. A cosmetically pleasing appearance is also an important goal sought by surgeon and family

- **Manipulation and serial casts:**
  - **Ponseti technique:** 3 stages, change the cast every week. Age limit is up to 12 months (after 12 the soft tissue will become more tight. The younger they are the better the result)
  - Then maintain correction by**: Dennis Brown splints** until 3-4 years old (To maintain external rotation of the feet)
  - Success rate is very high.

- Follow up watch and avoid recurrence, till 9 years old (the foot at age of 9 will be fully developed, not maturing anymore after 9 it will only increase in size)
- Avoid false correction by going in sequence
- **When to stop?** not improving, pressure ulcers
- **Indications of surgical treatment**
    - Late presentation, after 12 months of age.
    - Complementary to conservative treatment
    - Failure of conservative treatment
    - Recurrence after conservative treatment



Ponseti technique

- **Types of surgery**

i. **Soft tissue only** (regain function) (before 5 years)
    - Lengthening soft tissues and tendons

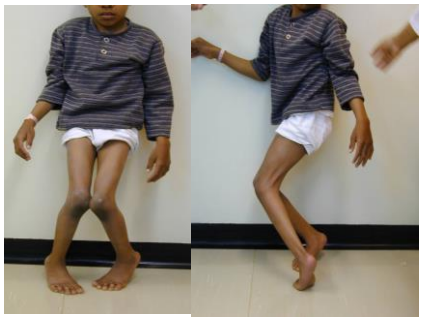
ii. **Bony + soft tissue** (regain function) (after 5 years)
    - Wedge osteotomy: wedge removed of calcaneus

Dennis Brown splints

iii. **Salvage** (regain appearance) If sever, rigid, and in an older child
    - Triple osteotomy (talus – calcaneus – navicular)
    - Most common salvage procedure
    - Loss of inversion or eversion. (Patient will feel pain walking on uneven ground; otherwise, they will walk normally)

8. Lower Limb Deformities in CEREBRAL PALSY (CP):

A non-progressive brain insult that occurred during the peri-natal period. Causes skeletal muscles imbalance that affects joint's movements.



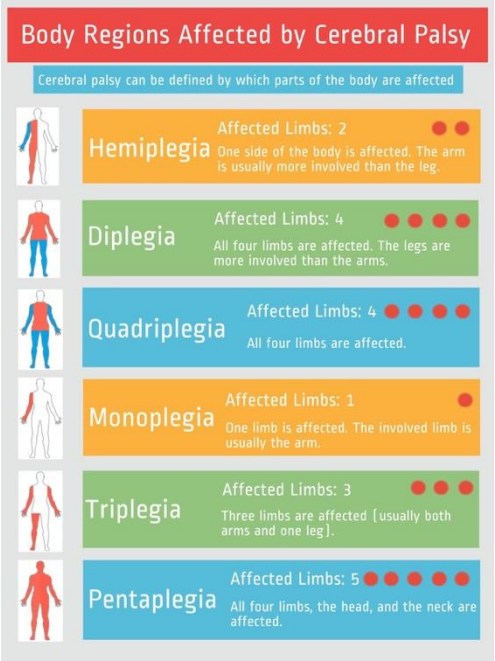
Can be associated with: Mental retardation (various degrees), Hydrocephalus and V.P shunt, Convulsions

Classifications:

- **Physiological classifications:**
    - **Spastic:** surgery to fix muscle contracture (commonest & best prognosis)

- **Athetosis:** slow, involuntary, convoluted, writhing movements of the fingers, hands, toes, and feet **(Surgery contraindicated)**
- **Ataxia: (Surgery contraindicated)**
- **Rigidity**
- **Mixed**

- **Topographic classification:**
  - **Monoplegia:** one limb affected
  - **Diplegia:** all limbs are affected but the lower limbs are more
  - **Paraplegia:** only lower limbs
  - **Hemiplegia:** one side of the body (arm &leg) affected
  - **Bilateral hemiplegia:** both sides are affected but uppers more than the lowers
  - **Triplegia:** three limbs affected
  - **Quadriplegia or tetraplegia:** all four limbs (+/- trunk, tongue and windpipe) affected



Examination and assessment:

- **Hip:**
  - **Flexion:** Do Thomas test to assess fixed flexed deformity of hip
  - **Adduction:** Scissoring gait (Hip Range of movement(ROM))
  - **Internal Rotation:** In toeing (Hip ROM)
- **Knee:**
  - **Flexion:** Popliteal angle: Flex hip then extend knee > normally angle of knee extension is 0°. If not, we subtract the measured angle on examination from 180°. That will give us the popliteal angle.
- **Ankle**
  - Equinus (Ankle ROM)
  - Varus/Valgus Podoscope
- **Gait**
  - In-toeing (femoral anterversion & tibial torsion)
  - Scissoring

Management:

- Multidisciplinary approach
  - Parents education
  - Pediatric neurology diagnosis, Follow-up, treat fits
  - Physiotherapy (home & center) joints R.O.M, gait training
  - Orthotics maintain correction, aid in gait
  - Social / Government aid
- Other
  - Neurosurgery (V.P shunt)
  - Ophthalmology (eyes sequent)
- **Surgery indications:**
  - Sever contractures preventing physiotherapy.
  - Physiotherapy is plateaued due to contractures
  - Perennial hygiene (sever hips adduction) (predispose to fungal infections and dermatitis)
  - In a non-walker, to sit comfortable in wheelchair
  - Prevent:
    - Neuropathic skin ulceration (as feet)
    - Joint dislocation (as hip)
- **Options of Surgery**
  - Neurectomy
  - Tenotomy
  - Tenoplasty
  - Muscle lengthening
  - Tendon Transfer (rarely done)
  - Bony surgery Osteotomy/Fusion > for longstanding deformities.

Done By:

Ahmed Alhussien

Suliman Alsuliman

Team Leader: Abdulrahman Albasseet (A1)