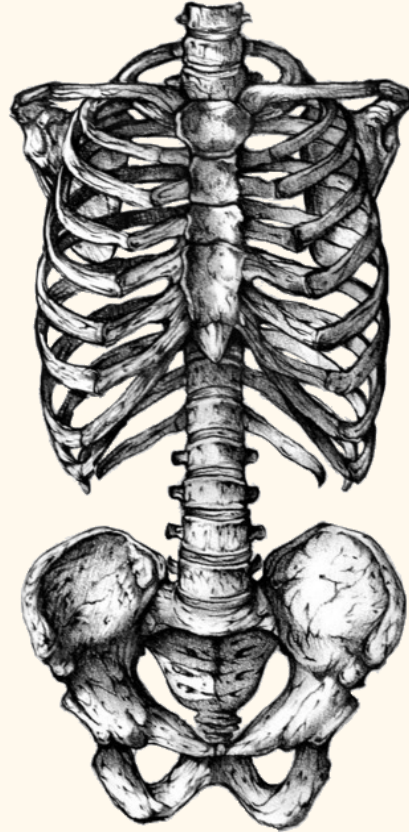


Lecture 12

Pediatric common lower limb disorders



Objective:

1. **Intoeing** → level of causes, special tests for each level, know normal angles of rotational profile, treatments, parents education.
2. **Genu varus & valgus** → physiological vs. pathological, rickets clinical & radiological evaluation, when operate.
3. **Blount** → pathology level, types, how to read XR, MRI when needed, surgery.
4. **CTEV** → 3 types, clinical picture, Ponseti treat, surgery options.
5. **L.L in C.P** → types, clinical assessment, treatments.
6. **Limping** → due (pain- week- deformed), uni or bi, proper assessment.
7. **L.L.I** → true vs. apparent, proper assessment to know cause & level, effects if not treated, >2cm, options of treat.
8. **Leg aches** → clinical picture, D.D, treatment.

Intoeing

Most common cause of intoeing is cerebral palsy and developmental dysplasia of the hip (DDH).




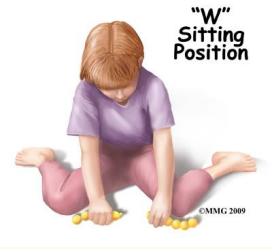
1. Terminology

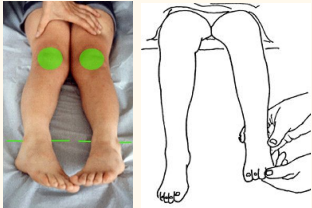
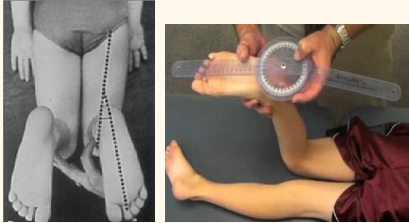
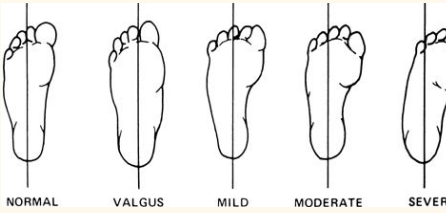

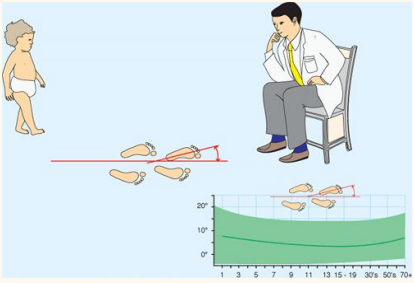
Version: normal variations of limb rotation, it may be exaggerated

Torsion: abnormal limb rotation, Internal or external. It may be complex if there is compensatory torsion

2. Evaluation

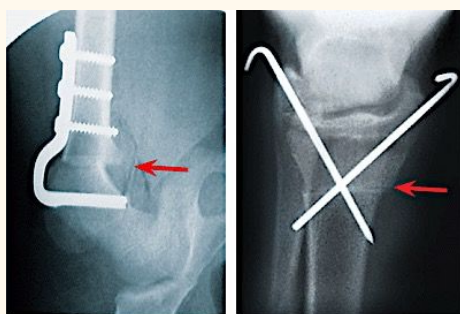
- ❖ Detailed history
 - Onset, who noticed it, progression.
 - Main complain is frequent fall.
 - How sits on the ground.
- ❖ Screening examination (head to toe).
- ❖ **Asses rotational profile:**

Pathology at the level	Special Test	
<p>Femoral anteversion:</p> <p>Excessive internal rotation of the head of the femur the patient can't cross his legs and sits in "<u>W</u>" position. In children between 3 and 10 years.</p>	<p>Hips rotational profile: supine(→ IR/ER normal = 40-45/45-50), prone.</p> <ul style="list-style-type: none"> - Assessment of the hip range of motion, assessment of version of the hip. - Supine and prone position. 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. - In supine position the patella should be looking upward and it is the landmark for the rotation angle , In prone position the leg is the landmark. 	 

Pathology at the level	Special Test	
Tibial torsion	<p>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</p>	<p>Supine Sitting</p> 
	<p>Foot Thigh Axis → normal (0°) to (-10°)</p> <ul style="list-style-type: none"> - Assessing the angle between the thigh and foot with the knee flexed. By the age of 8 years, the torsion of the tibia reaches its adult value which is about 15° externally. 	
Forefoot adduction	<p>Heel bisector line → normal along 2 toe.</p> <ul style="list-style-type: none"> - Draw an imaginary line bisecting the ankle, this line should pass by the second toe or the first web space. If it passes lateral to the third toe, this indicates metatarsus adductus. 	
Wandering big toe	--	
To identify in-toeing	<p>Foot Propagation Angle → normal is (-10°) to (+15°).</p> <ul style="list-style-type: none"> - To assess the direction of the foot when the child walks. - If the angle decreased > In-toeing > Internal rotation. - If increased > out-toeing > external rotation o (-)inward (+)out ward 	

3. Treatment:

- ❖ Establish correct diagnosis.
- ❖ Parents education.
- ❖ Annual clinic F/U → assess degree of deformity.
- ❖ **Femoral anteversion** → sit cross legged.
- ❖ **Tibial torsion** → spontaneous improvement.
- ❖ **Forefoot adduction** → anti-version shoes, or proper shoes reversal.
- ❖ **Adducted big toe** → spontaneous improvement.
- ❖ Operative correction indicated for children:
 - (> 8) years of age.
 - With significant cosmetic and functional deformity → <1%.



Genu Varus & Valgus

Normal Genu Varum and Genu Valgum	Abnormal
<p style="text-align: center;"> 0-18 months 18-30 months 3-4 years 8-10 years </p>	<p style="text-align: center;"> Varus Knock knees (valgus) </p>

1. Types:

Physiological is usually → bilateral

Pathological → can be unilateral

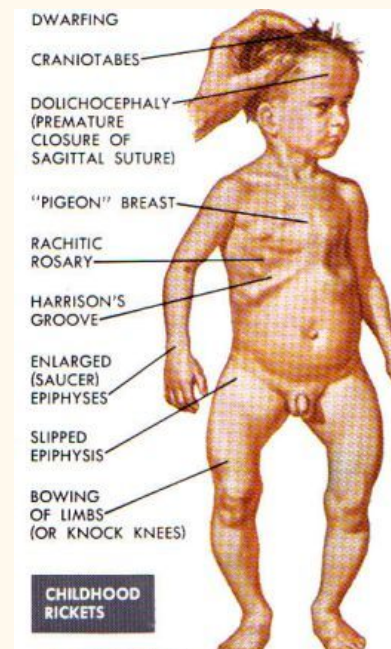


Important

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

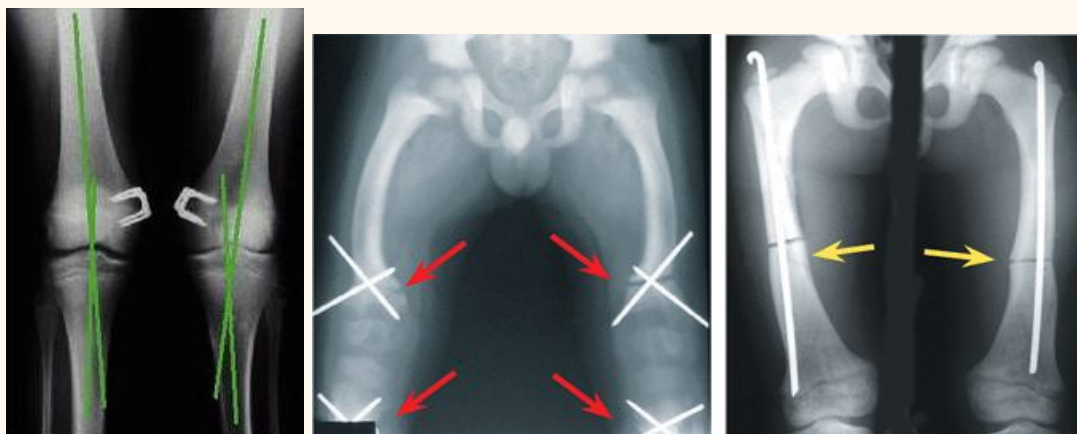
2. Evaluation

- History (detailed).
- Examination (signs of Rickets).**
- Laboratory.
- Imaging (widening of the growth plate, cyst formation, rickets pathology).
- Complications: early osteoarthritis



3. Management principles:

- ❖ **Non-operative:**
 - Physiological → usually.
 - Pathological → must treat underlying cause, as rickets.
- ❖ **Epiphysiodesis** (minimal invasive, keep it maximum 18 months).
 - 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 (puberty).

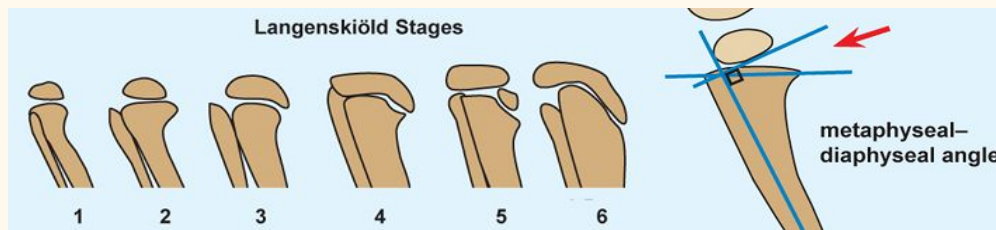


Proximal Tibia Vara (BLOUNT DISEASE)..

- ❖ Blount disease: damage of proximal medial tibial growth plate of unknown cause, usually:
 - Overweight
 - Dark skinned
- ❖ Types:
 - Infantile → < 3y of age, usually Bilateral & early walkers
 - Juvenile → 3 -10 y, combination
 - Adolescent → > 10y, usually unilateral



1. Staging



2. Investigation

❖ MRI is mandatory:

- Severe cases.
- Recurrence.



3. Treatment:

- ❖ Mostly surgical:
 - More late more damage.
 - High stage; bad prognosis.

Bilateral	Unilateral

Club Foot

1. Etiology

- ❖ **Postural** → fully correctable, needs only intensive P.T.
- ❖ **Idiopathic** congenital talipes equinovarus (CTEV) → partially correctable.
- ❖ **Secondary (Spina Bifida)** → rigid deformity, pt needs workup.
- ❖ Syndromic clubfoot: Larsen's syndrome (multiple joint dislocation) Amniotic band Syndrome.



2. Clinical examination Characteristic Deformity :

- ❖ **Hind foot:**
 - Equinus (Ankle joint, tight A.T).
 - Varus (Subtalar joint).
- ❖ **Mid & forefoot:**
 - Forefoot Adduction.
 - Cavus (pronation).
- ❖ Deformities don't prevent walking.
- ❖ Calf muscles wasting.
- ❖ Foot is smaller in unilateral affection.
- ❖ Callosities at abnormal pressure areas.
- ❖ Abnormal cavus crease in middle of the foot



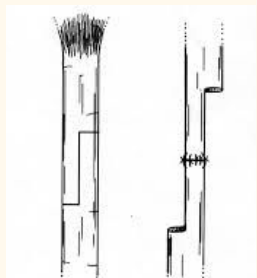
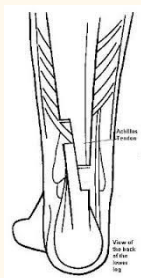
3. Management:

- ❖ **The goal of treatment for is to obtain a foot that is plantigrade, functional, painless, and stable over time.**
- ❖ A cosmetically pleasing appearance is also an important goal sought by surgeon and family.
- ❖ **Manipulation and serial casts:**
 - Technique "Ponseti" serial casting → weekly (usually 6-8w).
 - Validity up to 12-months → soft tissue becomes more tight.
 - Maintaining correction "Dennis Brown Splint" → 3-4y old
- ❖ **Indications of surgical treatment:**
 - Late presentation (>12m old).
 - Complementary to conservative treatment, as residual forefoot adduction (also > 12m).
 - Failure of conservative treatment (>9m old).
 - Recurrence after conservative treatment (>9m old).



❖ Types of surgery:

- Soft tissue → > 9-12 m old.
- Bony → > 3-4 y old.
- If severe & rigid → arthrodesis (types), >10y old.



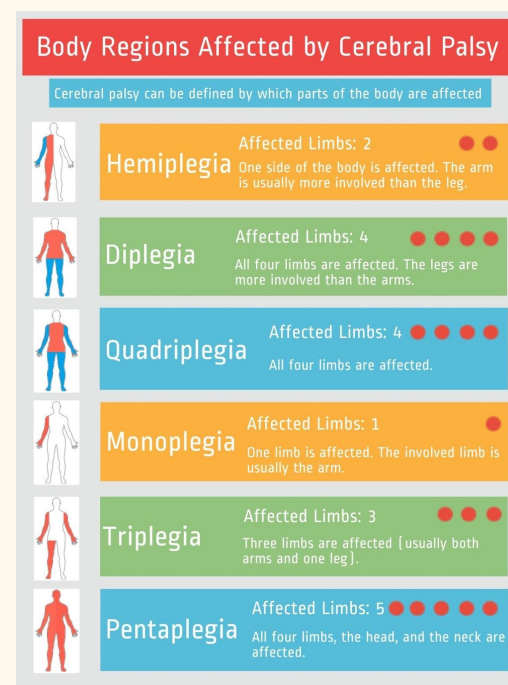
Lower Limb Deformities In Cerebral Palsy Patients

- ❖ C.P is → a non-progressive brain insult that occurred during the perinatal period.
- ❖ Causes → skeletal muscles imbalance that affects joint's movements.
- ❖ Can be associated with:
 - Mental retardation (various degrees).
 - Hydrocephalus and V.P shunt.
 - Convulsions.
- ❖ It's not-uncommon
- ❖ Types:

Physiological classification:

- Spastic: increase tone of the muscle, surgery to fix muscle contracture (commonest & best prognosis)
- Athetosis: slow, involuntary, repetitive, convoluted, writhing movements of the fingers, hands, toes, and feet (**Surgery contraindicated**).
- Ataxia: they cannot balance (**Surgery contraindicated**)
- Rigidity.
- Mixed.

Topographic classification:



1. Clinical Picture 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, tight achilles tendon (Ankle ROM).
- Varus/Valgus Podoscope

❖ Gait:

- Intoeing (femoral anteversion & tibial torsion).
- Scissoring.
- Crouch.

❖ Right hemiplegia classic appearance:

- Flexed elbow.
- Flexed wrist.
- Foot equinus.

Hips → Thomas test.	Knees → popliteal angle	Ankles → Achilles tendon shortening

3. Management:

❖ Is multidisciplinary approach:

- Parents education, Social / Government aid.
- Pediatric neurology → diagnosis, F/U, treat fits.
- **Physiotherapy (home & center)** → joints R.O.M, gait training.
- Orthotics → maintain correction, aid in gait.

❖ Others:

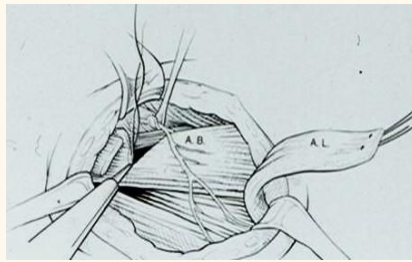
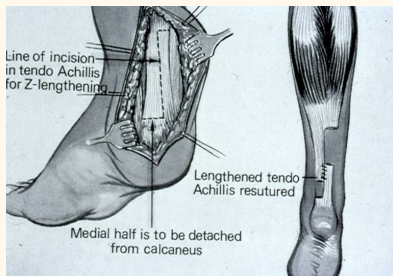
- Neurosurgery (V.P shunt).
- Ophthalmology (eyes sequent).

❖ **Indications of Orthopedic surgery:**

- Severe contractures preventing P.T.
- P.T plateaued due to contractures.
- Perennial hygiene (sever hips adduction).
- In a non-walker to sit comfortable in wheelchair
- Prevent:
 - Neuropathic skin ulceration (as feet).
 - Joint dislocation (as hip).

❖ **Options of Surgery:**

- Tendon elongation.
- Tendon Transfer.
- Tenotomy.
- Neurectomy.
- Bony surgery → Osteotomy/Fusion.



Limping: Abnormal gait.

❖ Due to:

- Deformity (bone or joint).
- Weakness (general or nerve or muscle).
- Pain (where).

❖ Types of Limp (In one or both limbs):

- Painful gait: Antalgic gait (usually unilateral) (Trauma – Tumor – Infection).
- Painless gait (usually bilateral) (Syndromic – Congenital)

1. Diagnosis:

❖ History (detailed).

❖ Examination:

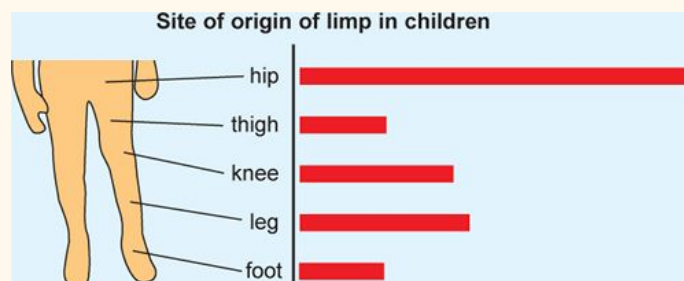
- Gait good analysis.
- Above pelvis → Back (scoliosis).
- Below pelvis → Hips, knees, ankles, & feet.

❖ Neurovascular

2. Management:

❖ Generalization can't be made.

❖ Treatment of the cause:



Limb Length Inequality

- ❖ If The Cause Was MSK.
- ❖ True vs. apparent

1. Etiology:

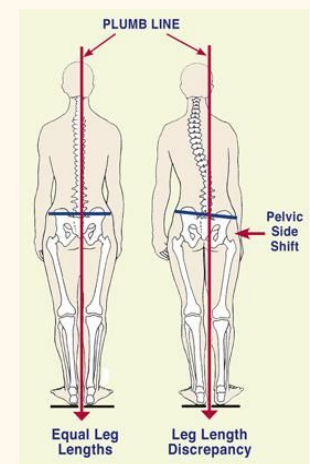
- ❖ Congenital → as DDH.
- ❖ Developmental → as Blount's.
- ❖ Traumatic → as oblique # (short), or multifragmented (long).
- ❖ Infection → stunted growth or dissolved part of bone.
- ❖ Metabolic → as rickets (**unilateral**).
- ❖ Tumor → affecting physis

2. Adverse effects & clinical picture:

- ❖ Gait disturbance.
- ❖ 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.
- ❖ Scoliosis (secondary).

3. Evaluation

- ❖ Clinical measures of discrepancy:
 - 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.



4. Management depends on the severity (>2cm):

- ❖ For shorter limb:
 - Shoe raise.
 - Bone lengthening.
- ❖ For longer limb:
 - Epiphysiodesis (temporary or permanent).
 - Bone shortening.

Leg Aches

- ❖ “Growing pain” (cramping, achy muscle pains at age 2-12 yr), increase with walking.
- ❖ Benign:
 - In 15 – 30 % of normal children.
 - F > M.
 - Unknown cause.
 - No functional disability, or limping .
 - Resolves spontaneously, over several years.
- ❖ Clinical features → **diagnosis by exclusion.**

1. H/O:

- ❖ At long bones of L.L (Bil).
- ❖ Dull aching, poorly localized.
- ❖ Can be without activity.
- ❖ At night.
- ❖ Of long duration (months).
- ❖ Responds to analgesia

2. O/E:

- ❖ Long bone tenderness → nonspecific, large area, or none.
- ❖ Normal joints motion.

3. D.D from serious problems, mainly tumor:

- ❖ Osteoid osteoma.
- ❖ Osteosarcoma.
- ❖ Ewing sarcoma.
- ❖ Leukemia.
- ❖ SCA.
- ❖ Subacute O.M

4. Management

- ❖ Reassurance.
- ❖ Symptomatic:
 - Analgesia (oral, local).
 - Rest
 - Massage

Take Home Message

1. Intoeing → is one of 4 causes, treatment depends on the level, mainly observe, operate >8y old
2. Genu varus & valgus → phys vs. patho, rickets, when operate
3. Blount → early walkers, treatment mainly surgery
4. CTEV → 3 types, treat as young as possible, Ponseti better to avoid surgery
5. L.L in C.P → mainly treat spastic, PT importance, surgery indications
6. Limping → due (pain- week- deformed), above or below pelvis
7. L.L.I → proper assess (cause & level), treated >2cm, options of treat
8. Leg aches → symptomatic treatment

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